DIETARY DIVERSITY, MORBIDITY PREVALENCE AND NUTRITIONAL STATUS OF CHILDREN (6 – 23 MONTHS OLD) IN KIBERA INFORMAL SETTLEMENT, NAIROBI COUNTY, KENYA

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A RESEARCH THESIS SUBMITTED IN PARTIAL FULFILMENT OF THE REQUIREMENTS FOR THE AWARD OF THE DEGREE OF MASTER OF SCIENCE (FOOD, NUTRITION AND DIETETICS) IN THE SCHOOL OF APPLIED HUMAN SCIENCES OF KENYATTA UNIVERSITY

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DECLARATION

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

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DEDICATION

This thesis is dedicated to: The Almighty God, My husband Muthomi, to my children Prince, Jewel and Angelo, Miriti's family and all friends who made the whole study process a success.

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DEFINITIONS OF TERMS

Minimum dietary diversity- Proportion of children 6–23 months of age who receive foods from four or more food groups during the previous day. The seven food groups used for tabulation of this indicator were: grains, roots and tubers; legumes and nuts; dairy products (milk, yoghurt and cheese); flesh foods (meat, fish, poultry and liver/organ meats); eggs; vitamin A-rich fruits and vegetables; and other fruits and vegetables (WHO, 2008b).

Nutrition status - Percentage of underweight (weight-for-age below-2 Standard deviation (SD) of the WHO Child Growth Standards median), percentage of stunting (height-for-age below -2 SD of the WHO Child Growth Standards median), percentage of wasting (weight-for-height below -2SD of the WHO Child Growth Standards median) among children 6-23 months of age.

Minimum meal frequency- Proportion of breastfed and non-breastfed children 6–23 months of age who receive solid, semi-solid or soft foods the minimum number of times or more (minimum is defined as: two times for breastfed infants 6–8 months; three times for breastfed children 9–23 months; and four times for non-breastfed children 6–23 months) in the previous day (WHO, 2008b).

Minimum acceptable diet- Proportion of breastfed children 6–23 months of age who had at least the minimum dietary diversity and the minimum meal frequency during the previous day, and non-breastfed children 6–23 months of age who received at least two milk feedings and had at least the minimum dietary diversity not including milk feeds and the minimum meal frequency during the previous day (WHO, 2008b).

OPERATIONAL DEFINITIONS

Morbidity prevalence - All individuals affected by the illness within two weeks prior to the study

Household - A group of people who live together and share at common meals

ABBREVIATIONS AND ACRONYMS

CHWs	-	Community Health Workers
FGD	-	Focus Group Discussion
FANTA	-	Food and Nutrition Technical Assistance
FAO	-	Food and Agriculture Organization
GOK	-	Government of Kenya
HDDS	-	Household Dietary Diversity Score
IYCF	-	Infant and Young Child Feeding
KDHS	-	Kenya Demographic and Health Survey
KEMRI	-	Kenya Medical Research Institute
MUAC	-	Mid Upper Arm Circumference
NGO	-	Non-Governmental Organizations
PAHO	-	Pan American Health Organization
UN	-	United Nations
UN-HABITAT-		United Nations Human Settlements Programme
UNICEF	-	United Nations Children's Fund
SD	-	Standard Deviation
WHO-	-	World Health Organisation

ABSTRACT

About 150 million children under five years are malnourished with 70% being in the developing world and 27% of these children are in Africa. Dietary diversity has been associated with improved nutritional status. Presence of diseases suppresses immunity; depress the appetite inhibiting the absorption and nutrient uptake compromising nutritional status. Informal settlements are associated with limited nutritious foods, inadequate clean water and inadequate health care facilities. This study was carried out to assess the dietary diversity, morbidity prevalence and nutritional status of children in Kibera informal settlement. A cross-sectional analytical study design was used where 277 children from 273 households were randomly selected from two locations. A researcher administered questionnaire and focus group discussion guide were used for data collection. Anthropometric measurements were used to determine the nutrition status. Dietary diversity was assessed with 24-hour recall and 7-day- food frequency questionnaire. The 24 hour recall was analyzed by use of Nutri-survey computer software; ENA for SMART was used to convert anthropometric data to Z-scores. Chi-square was used for establishing the relationship for categorical variables. The average size of a household was 3.9 (range 2-8) people. The caregivers were mostly young mothers who were housewives with mainly primary school level of education. The rates of stunting, underweight and wasting were 25.3%, 8.6% and 4.0% respectively. Over two-thirds (64.1%) of the infants were reported to have been sick within the past 2 weeks and only 26.0% sought consultation within twenty four hours. Most caregivers did not seek medical assistance since 66.7% considered the illness as mild while 23.5% lacked money to pay at the facility. Minimum dietary diversity score was determined where 79.4% of the children had received food from the four food groups and above. It was 92.6% in 18-23 months old category, 12-17 months old category was 80.2% and 70.6% in 6-11 months old category. Dietary diversity increased with an increase in age of the child whereby older children consumed a high DDS. Sex and stunting had a significant relationship where more boys were stunted than girls (Chi-square test; p=0.003). Age of the child was also associated with stunting among the children (Chi-square test; p=0.009) with more among the older children. Mothers with some level of education had better nourished children (Chi-square test; p=0.001). Occupation of the mother was associated with underweight and stunting (Chi-square test; p=0.006 and p=0.009 respectively). There was association between education level and the DDS score, P = 0.003), household source of income and the DDS score (P=0.003); there was relationship between dietary diversity and the number of times a child is fed. Children who were ill were more likely to be stunted (Chi-square test; p= <0.001). Thus this study recommends households sensitization on consumption of cheaper proteins and vegetables to improve dietary diversity, promote awareness on health seeking behaviors for prompt treatment, adult education to improve knowledge of caregivers especially on nutrition in regard to child feeding.

CHAPTER ONE: INTRODUCTION

1.1 Background information

Globally about 150 million children under five years are malnourished with 70% being in the developing world and about 27% of these children are in Africa. Out of these, more than one million children in the world today are estimated to be deficient in key vitamins and minerals particularly vitamin A, iodine, iron and zinc (UNICEF, 2008). Monotonous diets based on a very small number of foods contribute to micronutrient malnutrition (Arimond *et al.,* 2004). An appropriate diet is a critical component for proper growth and development of children (Aggarwal *et al.,* 2008, Butte *et al.,* 2000). The first two years of life are a critical window for ensuring optimal child growth and development (World Health Organization [WHO], 2008a). Nutritional deficiencies during this period can lead to impaired cognitive development, compromised educational achievement and low economic productivity (Moursi *et al.*, 2008) which become difficult to reverse later in life (WHO, 2008a).

Lack of diversified diet is particularly a severe problem among poor populations in the developing world as most diets are based predominantly on starchy staples (Krebs-Smith *et al.*, 2003). For infants and young children, the problem is critical because they need energy and nutrient dense foods to support their growth and develop physically, mentally and even to live a healthy live (Allison *et al.*, 2015)

Diversified diets provide essential macro and micro nutrients without which malnutrition sets in and as diets become less diversified all forms of child malnutrition and poor health increases, therefore, improving infant and young child

feeding patterns specifically with reference to dietary diversification is critical towards achieving improved nutrition, health and development (WHO, 2007). It is for these reasons among others that dietary diversity has been included as a specific recommendation in the revised global set of indicators of Infant and Young Child Feeding (IYCF) of the children aged 6-23 months (WHO, 2007).

One of the main contributing factors to poor dietary diversity is low income that is associated with poor diet (Foote, 2004). Households with low income are more susceptible to lack of food variety and food insecurity (Arimond *et al.,* 2004). Studies have shown a significant trend in increase of food diversity with increasing level of education (UNICEF, 2009).

Poor urban settlements which are expanding at a fast rate present unique challenges with regards to child health and survival. The global assessment of slums undertaken by United Nations Human Settlements Programme (UN-HABITAT) in 2008 showed that Sub-Saharan Africa has the highest number of slums with 62% of the urban population living in slums. These slums are characterized by poor environmental sanitation and livelihood conditions (Kimani-Murage & Ngindu, 2007). Slum areas are associated with limited nutritious foods, inadequate clean water and inadequate health care facilities.

Urbanisation in Kenya is increasing at a rapid pace. Urban growth rates are estimated at 1.2% with the population of Nairobi alone increasing by 1.75 million in less than 20 years, the largest proportion of the increase being in the slums. Dramatic population increases have led to widespread poverty with 70 to 75% of slum dwellers

defined as poor compared to 46% of the national population (Abdulla, MacAuslan & Schofield, 2011). Having lost their traditional livelihoods, urban poor came as migrants in search of livelihood opportunities only to find their lack of education and skills, and lack of capital – both financial and social – a barrier to formal and self-employment. About 65% are primary school dropouts and only 5% have vocational skills (Abdulla et al., 2011). This, coupled with an average income of less than five hundred shillings per week, leaves urban poor with little prospect for employment or financial assistance and hence vulnerable to food insecurity. They hence resort to living in illegal slum settlements throughout the city, struggling to provide one meal a day for their families (Abdulla et al., 2011).

1.2 Problem statement

A number of studies linking dietary diversity to nutrient intake particularly among young children have observed that dietary diversity is associated with improved nutritional and health status (Hatloy *et al.*, 2000; Ruel 2002; Arimond & Ruel, 2002). However, in most cases, the children are fed with staple foods within the community which lack variety and diversity of nutrients (Anna, *et al.,* 1999). Most of the habitually used foods are unfortified cereal based foods characterized by low energy and low variety of nutrients (Owino, 2008). The findings of a study by Kipruto (2013), in Korogocho slum, indicated that complementary feeding was low in dietary diversity. The mean dietary diversity was (2.4 ± 1.3), implying that many children ate foods from only 2 out of the 7 recommended groups with the number of food groups consumed increasing with the age of the child. Lack of diet diversification contributes to inadequate food intake which further leads to low nutrients intake. Low intake of energy leads to protein energy malnutrition while low intakes of micronutrients lead

to low body immunity (Chua *et al.*, 2012). This consequently leads to high susceptibility to infections such as diarrhoea and respiratory infections (Chua *et al.*, 2012). The ramifications of childhood under nutrition are severe. Inadequate nutrition leads to a number of physical disabilities, impaired cognitive development, and an increased risk of morbidity due to infectious diseases (Allison and Guy, 2015).

Despite the intuitive link between diet diversity and nutrient intake, the relationship between dietary diversity and nutrient intake has not yet been sufficiently assessed across different settlements. There is need to continually monitor nutritional status of children in these poor settings to continuously inform the various stakeholders for action.

1.3 Justification

Beyond meeting needs for essential nutrients, diverse diets are increasingly recognized as playing a role in the prevention of deficiencies as well as chronic diseases. Dietary diversity has been associated with improved nutritional status suggesting that diversity may indeed reflect higher dietary quality and greater likelihood of meeting daily energy and nutrient requirements (Arimond *et al.*, 2004). Nutritious foods should be included in the diet and more emphasis should be placed on increasing the variety among all the children (Moursi *et al.*, 2008).Adequate human nutrition involves regular intake of a wide range of nutrients, some of which are synthesized in the human body but many of which are not. Therefore these nutrients need to be consumed on a frequent basis even if in small quantities.

1.4 Purpose of the study

This study aimed to determine dietary diversity, morbidity prevalence and nutritional status of children 6 - 23 months of age in Kibera informal settlement, Nairobi.

1.5 Specific objectives of the study

The objectives of this study were to;

1. Establish the socio-demographic and economic characteristics of households with children 6 to 23 months of age in Kibera informal settlement, Nairobi
2. Assess the minimum dietary diversity of children 6 to 23 months of age in Kibera informal settlement, Nairobi
3. Assess the morbidity prevalence and health seeking behaviour for children aged 6-23 months of age in Kibera informal settlement, Nairobi
4. Assess the nutritional status of children aged 6-23 months of age in Kibera informal settlement, Nairobi
5. Determine the relationship among dietary diversity, morbidity prevalence and nutritional status of children 6 to 23 months of age in Kibera informal settlement, Nairobi.

1.6 Hypotheses

Ho_1. There is no significant relationship between dietary diversity and morbidity patterns of children 6 to 23 months of age in Kibera informal settlement, Nairobi

Ho_2. There is no significant relationship between dietary diversity and nutrition status of children 6 to 23 months of age in Kibera informal settlement, Nairobi

Ho_3. There is no significant relationship between morbidity prevalence and nutrition status of children 6 to 23 months of age in Kibera informal settlement, Nairobi.

1.7 Significance of the study

The findings of this research have generated information on how dietary diversity affects morbidity prevalence and nutrition status. The study has generated information that is useful to the Ministry of Health and other agencies working in child health and survival programmes. The information generated is suitable in designing appropriate interventions to improve child feeding practices especially during complementary feeding. Giving children a variety of foods ensures their health and survival hence mitigating child malnutrition in the target area and other similar areas. Findings of this study further contribute to the body of knowledge to ongoing research efforts on infant and young child feeding.

1.8 Delimitation of the study

The study was only carried out among children aged 6-23 months in Kibera informal settlement of Nairobi County and thus the research findings can only be applied to the area and other areas with similar characteristics.

1.9 Limitation of the study

The study was cross sectional and thus data collected may not show variation in dietary practices and morbidity prevalence by seasons of the year.

1.10 Conceptual framework

The conceptual framework used for this study was adopted and modified from UNICEF's conceptual framework on the determinants of malnutrition (UNICEF, 1998) (Figure 1.1).

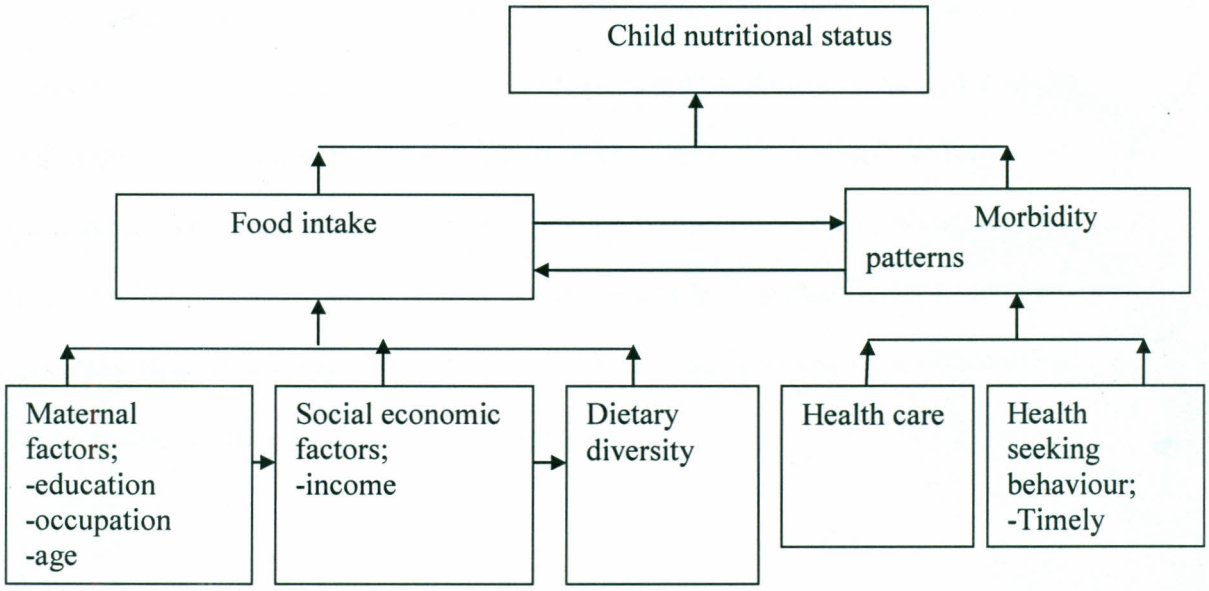

Figure 1.1: Conceptual framework on determinants of child nutrition status (adapted and modified from UNICEF's Conceptual Framework on the determinants of malnutrition (UNICEF, 2008).

Child nutrition and health status is greatly influenced by the dietary intake and morbidity status which are the immediate causes of malnutrition. According to UNICEF (1998) several factors exhibit complex interaction to determine the nutritional status of children. Nutrient intake affects both the nutrition status and morbidity patterns among children. Diseases affect nutrient needs while compromising nutrient intake and at the same time, they lead to nutrient losses e.g. diarrhoea, vomiting and fever which are very common among children. There is a synergistic relationship between morbidity patterns and dietary intake where they influence each other. When the diet is not adequate and diversified, it affects the child's morbidity status as there is reduced immunity and increased chances of developing infections.

On the other hand, morbidity patterns affects dietary intake due to poor appetite which affect nutrient intake, placing children at a high risk of malnutrition and poor health (Bukusuba, Kikafunda & Whitehead, 2009). Dietary diversity is mainly influenced by socio-economic status and maternal demographic factors such as age, occupation and level of education. Poor health seeking behaviour can lead to insufficient health care. This may lead to diseases which in turn affect the dietary intake with unintentional consequence affecting the child nutritional status.

CHAPTER TWO: LITERATURE REVIEW

2.1 Overview of Malnutrition among children

A worldwide study by UNICEF, (2009) reveals that some 5.6 million children die every year in part because they are not getting enough of the right nutrients. In addition, 146 million children are at risk from dying early because they are underweight. Nationally 28% of children are classified as chronically stunted (KDHS, 2014). The national per capita energy supply per day is less than the recommended rates. Micronutrient deficiencies are highly prevalent in Kenya, particularly at crucial stages of the life cycle when needs for specific minerals and vitamins are high. Children under five years are particularly affected by deficiencies of vitamin A (84% of children), iron (73.4%) and zinc (51%) (GOK, 2007).

Among the causes of malnutrition, a survey in Bangladesh identified diet diversity as a key problem (UNICEF, 2009). Almost half of children under five, a crucial age for development, did not receive the minimum meal frequency. In addition, two thirds of the children of the same age group did not meet the minimum dietary diversity (at least four food groups per day). A study done by Chege, *et al.*, (2010) concluded that the children in Kibera, an informal settlement, had poor nutrition status as depicted by the high levels of under nutrition. This was mainly due to the consumption of fewer meals per day, inadequate consumption of kilocalories and other nutrients. This was compounded by the effect of the various infections with nutrition implication noted among the children.

The indirect effects of malnutrition on the urban poor are even more striking: A high general death rate, high infant mortality rate, high morbidity rate and lower

expectations of life. Thus food plays a prominent role in providing physical, mental and social wellbeing which is the (Allison *et al.,* 2015) definition of health. Malnutrition is the single greatest contributor to child mortality at 53% (WHO 2007). The immediate causes of malnutrition are inadequate food intake and disease while the underlying causes include poor maternal/child care practices, household food insecurity, inadequate health services. Malnutrition in children can be attributed to a variety of factors including poor infant and young child feeding practices, poor maternal nutrition, low access to adequate and diversified diets, childhood illnesses and inadequate access to health and nutrition services (G.O.K, 2011).

Most of the studies have focused on breastfeeding practices (Njeri (2012); Ochola, (2008) and Muchina (2010) while few studies (Kimani-Murage *et al,* (2011) and Adere (2006) focused on complementary feeding. To improve adequate diet consumption in low-resource settings during this critical period of growth and development, factors associated with diversified food intake should be investigated to provide information necessary for focused and appropriate interventions. This study therefore investigated the prevalence of malnutrition among 6-23 year old children in Kibera slum.

2.2 Complementary feeding practices among children

The complementary feeding period is defined as the period during which breast milk must be complemented by other foods of sufficient quantity and quality to cover infant's nutritional needs (WHO, 2007). According to WHO (2007), complementary feeding period starts from 6 to at least 24 months and this is the most critical period for infants' growth and development (WHO, 2003). Appropriate complementary

feeding entails; introduction of complementary foods at 6 months with continued breastfeeding up to at least 2 years and beyond, correct feeding frequency for age and consumption of a diverse diet (Arimond *et al.,* 2004).

The measurement of feeding practices in children aged 6 months and older involves assessing various dimensions of feeding simultaneously. In 2008, WHO published the document Indicators for assessing infant and young child feeding practices. The core list include indicators for dietary diversity (a proxy for adequate micronutrient-density of foods and liquids other than breast milk), feeding frequency (a proxy for adequate energy intake from non-breast milk sources), and minimum acceptable diet among breastfed and non-breastfed children aged 6–23 months (WHO, 2008b)

Scientific evidence indicates that inappropriate feeding practices can have profound consequences for the growth, development and survival of infants and children (Sapkota *et al.,* 2013). Various inappropriate complementary feeding practices such as; untimely introduction of complementary food, improper feeding frequency and low dietary diversity of complementary foods have been shown to have numerous negative effects on children's health (Agarwal *et al.,*, 2008; WHO, 2007).

All the children (aged 6-8 months old) in a study by Kipruto, (2013) had appropriately been introduced to complementary feeding. The findings on minimum dietary diversity in this study by Kipruto (2013) in Korogocho slum, showed a lower rate of children achieving the minimum dietary diversity (17.9%) and also low minimum adequate diet (15.4%). Most studies report that children are appropriately introduced to complementary foods at six months but the foods are inadequate in diversification

and the number of times in which the children are fed (Kipruto, 2013, Mueni, 2012). The nutritional inadequacy of the complementary diet, both in quality and quantity, and the undermining effects of infections on the nutritional status of the child remain major problems affecting infants and young children in the world today (Nti & Lartey, 2007).

The most common foods given to breastfeeding children age 6-23 months are foods made from grains (80%), fruits and vegetables rich in vitamin A (64%), food made from roots and tubers (38%), and other fruits and vegetables (33%). Children are also fed protein-rich foods such as legumes and nuts (25%); meat, fish, and poultry (21%); and eggs (17%). About 13% children are fed with cheese, yogurt, and other milk products, and 5% are given fortified baby foods. Other than breast milk, liquids fed to children in this age group include other liquids such as juice or clear broth (63%) and other milk (49%)and 5% of breastfeeding children age 6-23 months are also given infant formula (KNBS,2014).

2.2.1 Minimum dietary diversity

Dietary diversity which is defined as the consumption of an adequate variety of food groups has been accepted as an aspect of dietary quality and can indicate nutritional adequacy (FANTA $ FAO, 2007). A more diversified diet is highly correlated with such factors as caloric and protein adequacy. According to Hoddinott and Yohannes (2002), dietary diversity refers to a diet that focuses on the variety of food consumption to maintain overall health and vitality. Consumption of foods from at least 4 food groups on the previous day would mean that in most populations the child has a high likelihood of consuming at least one animal-source food and at least one

fruit or vegetable that day, in addition to a staple food (grain, root or tuber). Breast milk is not counted because the indicator is meant to reflect the quality of the complementary food diet. As a consequence, this indicator may show 'better' results for children who are not breastfed than those who are breastfed in populations where formula and/or milk are commonly given to non-breastfed children (WHO, 2008b). Dietary diversity is very low globally, especially where the daily diet is dominated by one main staple food (UNICEF, 2008). Variety of foods is important, as a good way of ensuring intake of all the nutrients needed and offsetting food boredom (Hatloy *et al.,* 2000). The demographic and health survey indicated that Forty-one percent of children 6 – 23 months had an adequately diverse diet that is; they had been given foods from the appropriate number of food groups (KNBS, 2014).

A study done in Malaysia by Chua *et al.*, (2012), indicated poverty and other factors at the household level such as illiteracy among the underlying causes of illness and malnutrition that lead to morbidity and mortality. A study done by Olack, (2011) in Kibera (Gatwekera and Soweto locations) indicated that majority (90%) of the respondents experienced food shortages. The 2005 food security study done in the same area found that 18% of households consumed just two food groups on a daily basis and this translated into a poor nutrition status (FANTA/FAO, 2007).

A review of childhood diets in sub-Saharan Africa illustrated how limited variety in a young child's diet significantly deteriorates nutritional status and contributes to retarded growth (Wamani et al., 2007). Poor-quality diets lacking variety and palatability can influence appetite, leading to inadequate intake of nutrients among children thus diminished growth (Patricia, 2004). Chinese children (12-47 months

old) whose complementary diets consisted of > 3 food groups had better height for age scores compared to those provided with < 3 food groups (Foote *et al.*, 2004). A study done in Western Kenya, shows that only 3% of the preschool children had consumed highly diversified diets (Ekesa, 2008). A study in Kibera by Chege, *et al.*, (2010) indicated that the average number of meals consumed by preschool children per day was 3.4. For children under five, the problem is particularly critical because they need energy and nutrient dense foods to grow and develop both physically and mentally and to live a healthy life (Hoshiar *et al.*, 1997).

Several studies suggest that dietary diversity may reflect higher dietary quality and greater likelihood of meeting daily energy and nutrient requirements. Nonetheless, if though there is link between dietary diversity, high quality diets, and improved nutritional status in children, however, malnutrition has remained a public health concern in Kenya (KNBS, 2010).

2.2.2 Minimum meal frequency

Minimum meal frequency is defined as the proportion of children 6-23 months old who receive solid, semi-solid or soft foods (but also including milk feeds for non-breastfed children) the minimum recommended number of times or more (WHO, 2008a). The number of meals should be: 2 times for breastfed infants 6–8 months; 3 times for breastfed children 9–23 months and 4 times for non-breastfed children 6–23 months (WHO, 2008b). "Meals" include both meals and snacks (other than trivial amounts).

In terms of meal frequency, Romulus-Nieuwelink *et al.,* (2011) in a study conducted among breast-fed infants aged 8 months in Brazil found out that feeding frequency according to the minimum recommended frequency of 3 meals per day was common. The findings concurred with those of a cohort study in Burkina Faso by Sawadogo *et al.*, (2006) assessing the time of introduction and dietary diversity of complementary foods at 9 months where the infants received on average 2 meals per day and 3 meals at 12 months of age.

An educational intervention to promote appropriate complementary feeding practices and physical growth in infants and young children in India established that the mean meal frequency for children 9 months old was 4.4 and 3.9 times for intervention and control groups respectively. At 18 months of age, the meal frequency was 5.9 and 5.4 for intervention and control groups respectively (Bhandari *et al.,* 2004). In Kenya, the national data indicates that 72.5%, 65.0%, 60.7% and 57.7% of children are fed the minimum recommended times or more for 6-8months, 9-11 months, 12-17 months and 18-23 months age sub-categories respectively (KNBS, 2010). Kenya demographic and health survey indicated that 51percent of children 6 – 23 months had been fed the minimum number of times appropriate for their age (KNBS, 2014). This indicates a decline in child feeding in terms of frequency of feeding from the previous survey.

A study by Kipruto in Korogocho slum (2013) indicated that 88.3% of the children had received minimum meal frequency. A study by Mueni (2014) in Kahawa West also found a high number of children able to achieve meal frequency (95.9%). Despite the fact that minimum meal frequency is common in various settings, findings

need further investigation to determine the challenges, if any, faced by slum dwellers in achieving minimum meal frequency.

2.2.3 Minimum acceptable diet

Minimum acceptable diet is the proportion of breastfed children 6–23 months of age who attained the minimum dietary diversity and the minimum meal frequency the previous day, and non-breastfed children 6–23 months of age who received at least two milk feedings and had at least the minimum dietary diversity not including milk feeds and the minimum meal frequency during the previous day. In Ethiopia 11.9% children received the minimum acceptable diet of which the low level was attributed to low maternal literacy, different cultures and lower economy (Ergib M, Ashenafi, Semaw, Fisaha, 2014). A study by Kipruto (2013) indicated that 15.5% of the children had achieved the minimum acceptable diet (children 6–23 months old who attained the minimum dietary diversity and the minimum meal frequency during the previous day) which was largely contributed to by the low dietary diversity. Mueni (2014) reported a higher rate of children (75.6%) who were able to receive minimum acceptable diet which was attributed to more mothers having the knowledge on proper child feeding.

In Kenya, about 22% children age 6-23 months consume an acceptable diet (KNBS, 2014). Minimum acceptable diet is considered adequate if a child consumes varied diets and at the recommended meal frequencies.

2.3 Dietary diversity assessment methods

The individual dietary diversity score (IDDS) aims to capture nutrient adequacy. Many studies in several different age groups have shown that an increase in individual dietary diversity score is related to increased nutrient adequacy of the diet. Dietary diversity scores have been positively correlated with increased mean micronutrient density adequacy of complementary foods (FANTA and FAO, 2007) and micronutrient adequacy of the diet in non-breastfeeding children (Hatloy *et al.,* 1998) adolescents (Mirmiran *et al.,* 2006*)* and adults (Foote *et al.,* 2004).

2.4 Childhood morbidity

According to WHO (2008a) under nutrition is the largest contributor to the global burden of disease in children. Infants in developing countries have high rates of infectious and parasitic diseases; this is responsible for the higher demand of energy requirements. These infectious diseases are important determinants of stunting (Caballero, 2002). Respiratory illnesses contribute to growth faltering but diarrhoea greatly affects child's growth because it is associated with mal-absorption of nutrients hence having a growth limiting effect on the infant. A study by Caballero, (2002) has shown that five to sixteen percent of pneumonia, diarrhoea and malaria morbidity are responsible for moderate to severe underweight.

Malnutrition occurs when dietary intake is inadequate and health is unsatisfactory, being the two immediate causes of malnutrition. In developing countries, infectious diseases, such as diarrheal and acute respiratory diseases are responsible for most nutrition-related health problems. Unavailability of food, inadequate health systems, unhealthy environment resulting to the absence of proper care in households and

communities are necessary elements of the underlying causes of malnutrition (G.O.K, 2011).

Early malnutrition also increases the risk of other chronic diseases later in life such as diabetes, hypertension, renal diseases and cardiovascular diseases which leads to high adult health care costs. Nutrient deficiencies interfere with optimal growth and may cause common childhood illnesses such as diarrhoea and acute respiratory infections (KNBS, 2014). Literature also shows that undernourished children have lowered resistance to infection and are more likely to die from common childhood ailments like diarrhoeal diseases and respiratory infections; and for those who survive, frequent illness saps their nutritional status, putting them into a vicious cycle of recurring sickness, faltering growth and diminished learning ability (Caballero, 2002).

Presence of other diseases like metabolic diseases, gastrointestinal diseases, allergies and some other infections suppress immunity and also depress the appetite thus inhibiting the absorption and nutrient uptake. This also alters the body's metabolic rate so that less energy and nutrients are available for growth affecting the health of an individual. A quarter of children surveyed in Kibera (Gatwekera and Soweto locations) reported an illness two weeks prior to the survey mostly gastrointestinal symptoms, rashes, respiratory symptoms and fever among others (Olack, 2011).

Extreme food insecurity persists in many parts of Kenya. This consequently leads to reduction in food intake and lack of a varied diet increasing the risk of morbidity and mortality. According to a nutrition survey in two villages in the Kibera slum, 90% of respondents were experiencing food shortages and were coping by eating less expensive foods (OXFAM, *et al.*, 2009).

Under nutrition and childhood morbidity have a synergistic relationship. The interrelationship of the two is in such a way that illness can suppress appetite precipitating under nutrition of a child while, on the other hand, nutritional deficiencies increase the susceptibility of the child to infectious diseases (Nti & Lartey, 2007)

2.5 Nutritional status among under five children

Any damage caused by nutritional deficiencies during the first two years of life could lead to impaired cognitive development, compromised educational achievement, and low economic productivity (Arimond *et al.*,2004). Infant malnutrition results in growth retardation and smaller adult stature and also is correlated with inadequate immune response and increased risk of childhood mortality (Black *et al.*,2003). An estimated 6% of under-five deaths can be prevented by ensuring optimal complementary feeding among which dietary diversity and meal frequency are the most important ones, significantly contributing to the realization of Millennium development goal 4 (Black *et al.*,2003).

Stunting is the outcome of failure to receive adequate nutrition over an extended period and is also affected by recurrent or chronic illness. Stunting is associated with reduced productivity and human capital in adulthood; so early nutrition is also an important contributor to economic development. Other long-term effects of stunting include metabolic alterations that can result in non-communicable illnesses, such as hypertension and other obesity-related disorders. Stunting is rooted in poor fetal growth and continues up to two years after birth with the window of opportunity being conception up to two years (1000 days) (G.O.K, 2011)

Comparison of Kenya Demographic and Health Survey data over time indicates an overall improvement in children's nutritional status in Kenya (KNBS, 2014). Since 1998, stunting has declined from 38 percent to 26 percent, wasting has declined from 7 percent to 4 percent, and the proportion of underweight children has declined from 18 percent to 11 percent. Kenya has met the 2015 Millennium Development Goal (MDG) target of reducing the prevalence of underweight children under age 5 to 11 percent (Ministry of Devolution and Planning, 2013) in KNBS, (2014).

Stunting in Nairobi is at 17%. Analysis of this indicator by age group shows that stunting is highest in children age 18-23 months (36%) (KNBS, 2014). Stunting in children generally decreases with education of the mother. Children of mothers who did not complete primary school (34%) or who have no education (31%) are more likely to be stunted than children of mothers with a secondary or higher education (17%) according to KNBS, (2014).

Wasting represents the failure to receive adequate nutrition and typically is the result of recent illness episodes, especially diarrhoea, or of a rapid deterioration in food supplies. Nationally, 4% of children are wasted and 1% are severely wasted (KNBS, 2014). Wasting levels are highest among children in the age groups 6-8 months and 9-11 months (each 7%). Typically during this period, children are introduced to complementary foods, which may vary in quality and quantity, and are more vulnerable to diseases (KNBS, 2014). Children whose mothers have no education have a higher chance of wasting (10%) than children whose mothers have some education (4% or less). Wasting in children generally decreases with increasing household wealth (KNBS, 2014).

Underweight reflects the effects of both acute and chronic malnutrition. Proportion of Kenyan children who are underweight (low weight-for-age) is 11%with 2% classified as severely underweight (KNBS, 2014). It is higher among children whose mother is thin (24%) than children of mothers with a higher BMI (11% or less). The proportion of underweight decreases as mother's educational level increases and as household wealth increases (KNBS, 2014). In Ethiopia, Mandefro (2015) reported that 47.6%, 29.2% and 13.4% of them were stunted, underweight, and wasted respectively which was attributed to presence of diarrhea in the past two weeks, male sex and uneducated fathers.

A study by Kariuki, (2002) in Kibera slum (Siranga) indicated that 34.6% of the children were stunted, 6.2% wasted and 26.5% underweight which was attributed to high morbidity rate in the study location. A study by Kipruto in Korogocho slum indicated stunting prevalence in children aged 6-23 months old as 20.1% attributed to double burden of poor feeding practices and high morbidity. In a study by Mueni (2014), reported that 13.3% children were stunted. In these studies, the figures were lower than the national figures in children under five years possibly because they considered children aged 6-23 months old and also to the fact the stunting rates increases with child age.

Under nutrition, particularly in children, is a vice locked around humanity, preventing individuals and even whole societies from achieving their full potential. Children who are undernourished have lowered resistance to infection and are more likely to die from such common childhood ailments as diarrhoeal diseases and respiratory infections. Those who survive may be locked into a vicious cycle of recurring

sickness and faltering growth, often with irreversible damage to their cognitive and social development (UNICEF, 2009). Dietary diversity among children 6-23 years and morbidity patterns will be determined to ascertain whether the dietary intake is adequate since inadequate intake contributes to child's nutritional status.

2.6 Summary of literature review

Under nutrition and childhood morbidity have a synergistic relationship. The interrelationship of the two is in such a way that illness can suppress appetite precipitating under nutrition of a child while on the other hand nutrition deficiencies increase the susceptibility of the child to infections. Without good nutrition the body has a weakened immune system that is more susceptible to infectious organisms and less able to fight them off when they are present. Very often infection and malnutrition becomes a spiral that leads to more illness and malnutrition and for many especially young children to death.

Consumption of quality diet is essential for growth and development as inadequate intake of energy and nutrients is a primary cause of child under nutrition. Diet quality can be reflected by dietary diversity. Dietary diversity is positively correlated with the intake of nutrients and growth of children. Poverty as exhibited in the slums may contribute to a decrease in diversity of food consumed. Selection of predominantly cheaper foods that are less nutrient dense, high in saturated fat and sugar, highly refined and low in fibre will further deprive micronutrients in the diet of children. Consequently, the low nutritional quality of the diets could predispose the children to poor growth and development.

During this age span, 6-23 months, children are very vulnerable. This is the age span when growth falters, usually due to a combination of frequent illnesses and inadequate diet that are often present as children transit from breastfeeding to the family diet. Limited variety in a young child's diet significantly deteriorates nutritional status and contributes to retarded growth. Poor-quality diets lacking variety and palatability can influence appetite, leading to inadequate intake of nutrients among children thus diminished growth. Malnutrition in Sub-Saharan Africa contributes to high rates of childhood morbidity and mortality. However, little information on the nutritional status of children is available from informal settlements (Olack, et al., 2011).

There is increasing evidence, with resulting international concern, that there exists high level of nutritional deprivation combined with the heavy burden of disease in young children which has negative consequences for a child's long term overall development. A clear understanding and awareness of the heavy burden of malnutrition and disease among children is of great importance. This study was designed to address this gap by providing information on the nutrition status, dietary diversity and morbidity burden among young children.

CHAPTER THREE: METHODOLOGY

3.1 Study design

The study adopted a cross-sectional analytical study design. This design was justified as it described the current situation and established if there was a relationship among dietary diversity, morbidity prevalence and nutrition status of children age 6 to 23 months living in Kibera informal settlement.

3.2 Study variables

The independent variables were: Socio-demographic factors; sex, age, education level, occupation and income. Dietary factors,; dietary diversity and frequency of food consumption as well as morbidity patterns duration and prevalence of illness.

The dependent variables were; Nutrition status as determined by Z- scores (wasting, stunting and underweight).

3.3 Study area

The study was carried out in Kibera informal settlement in Nairobi District. Kibera is the largest slum in East Africa and located in Langata Division, Nairobi County, Kenya. It has a cosmopolitan population. The occupation of the population is mainly small business or casual employments in the industries within Nairobi. It is located 5 kilometres from the city centre. The 2009 Kenya Population and Housing Census reports Kibera's population as 287,000 (APHRC,2014).

Kibera informal settlement has been associated with lack of adequate nutritious foods, clean water and health care facilities. Moreover, the area is associated with poor sanitation, poverty and congestion. The lack of sanitation combined with poor

nutrition among residents' accounts for many illnesses and diseases (APHRC, 2014).The slum originated in 1918 as Nubian soldiers' settlement.

3.4 Study population

The target population comprised of caregivers with children 6 to 23 months of age living in Kibera informal settlement, Nairobi.

3.4.1 Inclusion criteria

This study included households with children aged 6 to 23 months and had who resided in the area for at least two years

3.4.2 Exclusion criteria

The children from households enrolled in other intervention programmes and terminally ill children were excluded from the study. This was based on caregivers self-reports and information on the health card.

3.5 Sample size and sampling technique

3.5.1 Sample size determination method

The desired sample size was calculated using the Cochran (1963) formula as cited by Fisher *et al.,* (1998). Formula is $n= [z^2pq/d^2]$.

p is the proportion of the population estimated to have characteristics being measured (Kenyan population estimated to be receiving at least 4 food groups which is 22% according to Ohiokpehai et al, (2007). q is the population without characteristics being measured (1-0.22).

n= 1.96x1.96x0.22x (1-0.22)/0.05x0.05 = 263

Sample size was 263 children.

Due to possibility of non- response 10% was added to make a sample of 289 children. During data collection however, there were occurrences of non-response reducing the sample size to 277 children being included in the study. This number was obtained after interviewing 273 households whereby all children were included in the survey if the household had more than one child to avoid bias.

3.5.2 Sampling technique

Purposive sampling was used to select Kibera informal settlement as the study area. It was selected as it is the largest slum in East Africa which is cosmopolitan. The slum is divided into 9 locations. Lindi and Makina locations were randomly selected and involved in the study. Within these locations households that met the criteria were selected and involved in the study.

Households in the study area were selected using two stage cluster sampling technique. This is because of lack of accurate population data to allow for simple random sampling and also the arrangement of the households were not in a manner to facilitate systematic sampling. In the first stage of sampling, the 2 locations were segmented into 12 smaller discrete cluster areas. This was conducted with the help of village elders and Community Health Workers (CHWs) who were residents in the area. The number of clusters (12) was relatively large and few households were sampled per cluster, therefore, this resulted in a low sampling variance thus increasing the reliability of the findings (United Nations, 2005).

In stage two, one cluster area out of the 12 was selected by simple random sampling using a table of random numbers. Modified EPI method was used to select households where mothers/caregivers and their children 6-23 months old were present

in the cluster area. The modified EPI method involved going to the approximate centre of the randomly selected cluster and randomly choosing a direction by spinning and walking in the direction the pen pointed to the edge of the cluster. At the edge, the pen was spinned again until it pointed into the body of the cluster. Households having mothers/caregivers and children 6-23 months were enumerated following the direction of the second spin (both left and right side) until the other edge of the cluster area. A table of random numbers was used to select the first house to be visited. The subsequent households were chosen by proximity in the direction. This meant that the total number of households that were visited in any cluster area did not exceed 12. The same method was used for all the cluster areas (after they had randomly been selected using table of random numbers) until the required number of children was obtained.

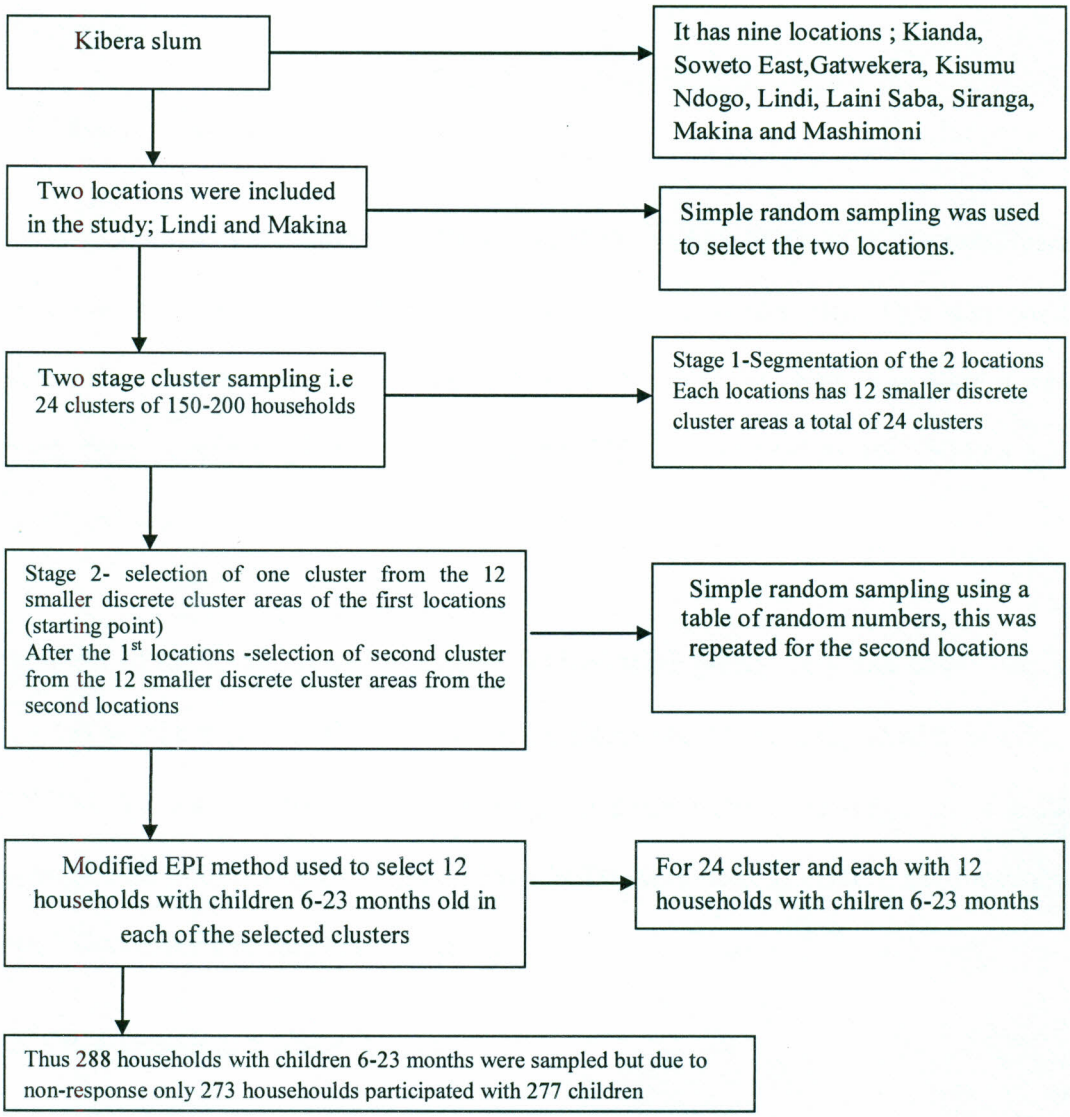

Figure 3. 1: Flow chart on the sampling procedure

3.6. Research instruments

3.6.1 Researcher administered questionnaire

A detailed researcher questionnaire was administered to the subjects. This contained questions on socioeconomic characteristic, how often the child is fed, what foods are given to the child, illnesses suffered by the child, and nutrition status information

(weight and height measurements were taken) (Appendix II). This was administered at household level.

3.6.2 Focus group discussion guide

Focus group discussion guide (FGD) was used to conduct FGDs with the caregivers from the study group to gather qualitative data (Appendix III). This generated information on community's perception on foods given to the child, how often it was given, reasons on what is fed to the children, illnesses suffered by the children and nutritional status.

Members of the focus group discussions (FGDs) were purposively and conveniently selected to take part with the help of village elders and Community Health Workers (CHWs). To enhance homogeneity, each FGD participants were made up of 6-12 mothers with children below 2 years. Two FGDs were held in each of the locations after quantitative data had been collected.

3.6.3 Pre-testing of the instruments

Pre-testing of the data collection instruments was done in Gatwekera location. The data collection tools were tested to check whether they would adequately collect all the required information. They were then adjusted accordingly to ensure that all the data needed was collected. The pre-testing was conducted to establish accuracy of questions and clarity and to determine the length of interviews. During pre-testing an effort was made to check for consistency in the interpretation of questions and to identify ambiguous items. After review of the instruments all suggested revisions were made before being administered in the actual study.

3.6.4 Validity and reliability of the instruments

Once the questionnaire had been developed, validation was done by subjecting it to nutrition experts to assess whether the findings truly represent the phenomenon being measured. Inputs from the experts were then incorporated. The Test-retest method was used to test the reliability of the questionnaire in producing the same results. The subjects of the pre-test were interviewed two times (with a span of one week between the interviews). A comparison was then made between the answers obtained from both interviews and the necessary adaptations were made. Correlation coefficient was determined using Cronbach correlation formula by Cronbach *et al.,* (2004) which yielded a correlation coefficient of 0.7 which was acceptable. The pre-test subjects were allowed to make comments and give suggestions concerning the questionnaire.

3.6.5 Data collection techniques

The researcher and the assistants administered the questionnaire to the mother/caregiver in face-to-face interviews during a one-time visit to the household. Mothers were asked specific questions to elicit information on dietary diversity, morbidity, socio-demographic and economic characteristics. Weight was measured in kilograms at 10 grams accuracy. The child was weighed in minimal clothing. Two weights were taken by the research assistants and recorded and, in cases of large variances the measurements were repeated until an acceptance variance of +1 or -1 was obtained. A UNICEF Salter Scale Model 235 6 S was used to measure the weight of the children. Age was recorded from the child health cards for those who were able to provide the cards or estimated by the caregiver. The length of the child was measured in centimetres using a paediatric height board of standard design (SECA) with 0.1 Centimetre accuracy. Children were measured while lying on their

back on the length board. The length measurement was taken twice and an average of the two computed. In cases of large variances, the measurements were repeated until an acceptance variance was obtained.

Anthropometry provides one of the most important indicators of children's nutritional status. Height, weight and age data are used to compute three summary indices of nutritional status: height-for-age, weight-for-height and weight-for-age. These three indices are expressed as standardized scores (z-scores) or standard deviation units from the median for the child growth standards recommended by the World Health Organization. Children who fall below -2 Z-scores below the reference median are regarded as undernourished, while those who fall more than -3 Z-scores below the reference median are considered severely undernourished (KNBS, 2010).

Dietary intake was assessed by using a 24-hour recall and 7 day food frequency. The 24 –hour recall foods and beverages were consumed twenty-four hours prior to the interview to assess the types of foods being consumed.. Dietary diversity score is established based on the different number of food groups the index child consume in the previous 24 hours. Seven food groups are recommended internationally by WHO (2007) These are ; grains, roots and tubers, legumes and nuts, dairy products, meat and animal products, eggs, vitamin A rich fruits and vegetables, and other fruits and vegetables. Minimum dietary diversity was based on a child having consumed foods from four or more of the food groups. Minimum meal frequency was adequate it was 2 times for breastfed infants 6-8 months, 3times for breasted infants 9-23 months and 4 times for non-breastfed children of 6-23 months. Minimum acceptable diet was attained if a child had the minimum meal frequency and minimum dietary diversity (WHO, 2007).

7 day Food frequency questionnaire consists of a list of foods and a selection of options relating to the frequency of consumption of each of the foods listed. It was done based on locally available foods. The respondents were asked to state the number of times the foods were consumed within a week. They are useful for gathering information on individuals and for looking at the habitual intake of a range of foods as well as validate information from the 24 hour recall.

Two FGDs with the mothers /caregivers was conducted in each of the 2 locations, making a total of 4 FGDs. The FGDs were conducted at the end of the household interviews in each of the locations to solicit information on dietary diversity and morbidity patterns in the area of study. Each FGD had a minimum of 6 and a maximum of 12 mothers/caregivers with children below 2 years. Members of the FGDs were recruited by the researcher with the help of community leaders, Community Health Workers (CHWs) and village elders. The researcher moderated the discussions while one of the assistants recorded the discussion. Each FGD lasted between 45 to 90 minutes and the discussions were tape recorded and non-verbal communication documented.

3.7 Recruitment and training of research assistants

Six research assistants were recruited to participate in the study. The selection criteria was; attainment of the Kenya Certificate of Secondary Education and fluency in Kiswahili and English languages. Previous participation in nutrition surveys was an added advantage. The research assistants underwent a three-day training which was facilitated by the researcher. The training entailed the use of lectures, discussions, role plays and exercises with the help of training aids. They were first taken through the

objectives and methodology of the study. The training also involved rigorous guidance on questionnaire administration and anthropometric measurements.

The research assistants were exposed to a practical experience in conducting the interviews and taking anthropometric measurements during class room demonstrations, role plays and also during pre-testing of the questionnaires. The responses recorded by the research assistants were compared with those recorded by the researcher and appropriate advice was given to the assistants on areas they needed to improve.

3. 8 Data analysis and presentation

Data were analyzed using Statistical Package for Social Sciences (SPSS) software version 16. The data from 24 hour recall were analyzed by use of Nutri-survey computer software. Anthropometric data was entered and analyzed using ENA for SMART Software version 2010 and then exported to SPSS for cross analysis with other variables. Nutrition status was classified according to WHO child growth standards, 2006 and described using percentages of mean (standard deviation). Pearson product moment correlation was used to determine the relationship for continuous variables namely income, dietary diversity score, number of meals, z-scores, duration and frequency of illness. Chi-square was used for establishing the relationship between categorical variables such as gender and nutrition status. Simple and multiple regression analysis were used to determine the contribution of dietary diversity to morbidity patterns to nutrition status. Data from FGDs was transcribed, coded and common themes established. Selected responses from FGDs were also directly quoted to exemplify common perceptions among the respondents. A p value

of <0.05 was used as the criterion for statistical significance. Conclusions were finally drawn and triangulated with quantitative data from the questionnaires.

3.9 Logistical and ethical considerations

A recommendation letter to seek authority to conduct the study was provided by the Kenyatta University Graduate School. Ethical clearance was obtained from Ethical Committee from the Kenya Medical Research Institute (KEMRI). Research permit authorizing the carrying out of the research was obtained from the National Council of Science and Technology (NACOSTI) (Appendix VII). Authority to conduct the study in Kibera informal settlement was sought from the chief's office in Kibera. The questionnaires were administered to the respondents upon obtaining an informed written or thumb print consent (Appendix I). Before consent was obtained, the researcher and the research assistants explained the purpose of the study and respondents were assured of confidentiality of the information they gave. To ensure privacy, names and other means of identity were not used during the data collection. Children with moderate and severe malnutrition and those with untreated symptoms of an illness were referred to the nearest health facility.The researcher ensured that all information obtained was kept in strict confidence and was only for purpose of the study.

CHAPTER FOUR: RESULTS

4.1 Characteristics of the study population

Presented in this chapter are the study findings as per the objectives as follows: Demographic and socio economic characteristics of the study population. Minimum dietary diversity of the study population, food consumption patterns, morbidity prevalence and health seeking behaviour, Nutritional status of the study population; and relationships between dietary diversity, morbidity prevalence and nutrition status. During data collection, there were occurrences of non-response which reduced the sample size to 277 children being included in the study. This number was obtained after interviewing 273 households whereby all children were included in the survey if the household had more than one child to avoid bias.

4.1.1 Characteristics of the children

Two hundred and seventy seven (277) children were included in the study. Both sexes were almost equally represented with 44.7% being males and 55.5% females (Table 4.1). Majority of the children were in the age range of 6-11 months (39.1%), 12-17 months age category were 36.4% while 18-23 category were 24.5% of the children (Table, 4.1). Almost all the respondents were mothers to the children in the study 94.5% with 2.2% by fathers, 1.8% by a grandparent and 1.5% by an aunt.

Table 4. 1: Demographic characteristics of the study children

Children's demographic characteristics	N=277	
	N	%
Sex of the child		
Male	124	44.7
Female	153	**55.3**
Age of the children (months)		
6-11months	108	**39.1**
12-17 months	101	36.4
18-23 months	68	24.5
Relationship of respondent to the principle child	258	**94.5**
Mother	6	2.2
Father	4	1.5
Aunt	5	1.8
Grandparents		

4.1.2 Socio-demographic profiles of households

Two hundred and seventy three households were surveyed during the study. The youngest caregiver was 17 years old while the oldest was 61 years old. About two-thirds (64.8%) of the caregivers had primary school education while 35.2% had secondary education. The average size of a household was 3.94 (sd) people (Table 4.2).

Table 4. 2: Socio-demographic characteristics of the Caregivers

Socio-demographic characteristics	N=273	
	N	%
Caregivers' age (years):		
<25 years	135	**49.5**
25-34 years	108	39.6
35 years and above	30	11.0
Education:		
No formal education	9	3.4
Primary school level	158	**64.8**
Secondary school level	96	35.2
Tertiary level	10	3.7
Parity (number of Children):		
Household size:		
Mean	3.94(2-8)	

4.1.3 Socio-economic profiles of the households

The major occupation for the husbands was small scale trading (50.2%), followed by casual labourers who were 33.2% while 9.6% were formally employed and 7.0% were unemployed. More than half of the mothers (65.6%) were housewives, 15.5% were engaged in casual labour and 11.2% were involved in small scale trade while only 5.8% were in formal waged labour (Figure 4.1)

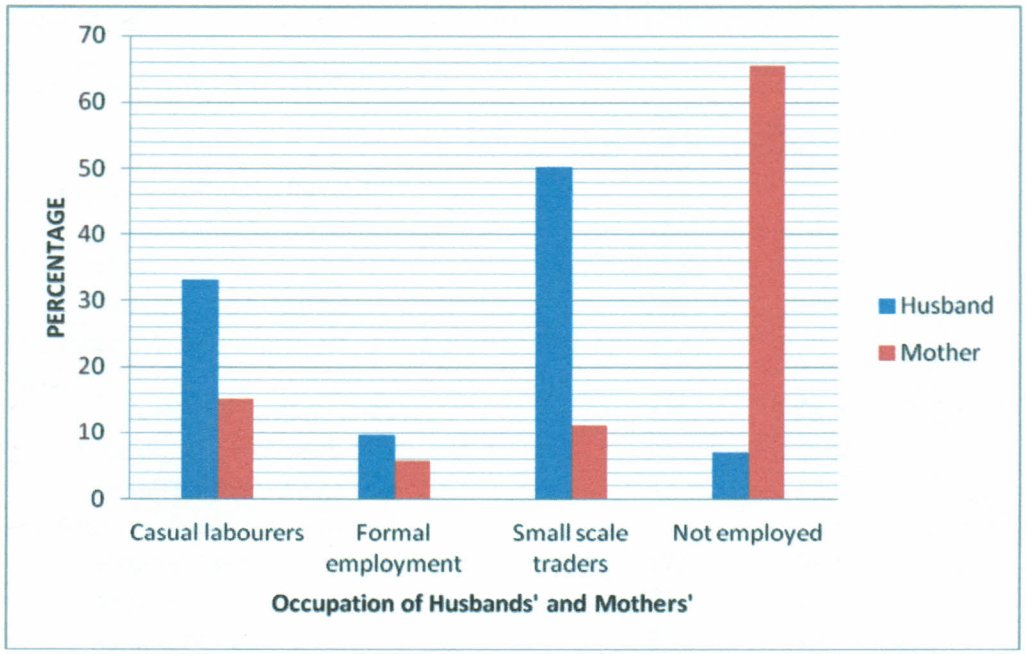

Figure 4. 1: Occupation of the husbands' and mothers'

Most of the families (58.2%) depended on casual labour as their main source of income followed by small scale business (28.6%) and lastly formal employment (13.2%). More than half (58.2%) of the households estimated to allocate the largest percentage (>75%) of their income to food while (26%) allocated 50% to 74% percentage of their income on food. Only 15.8% allocated a smaller percentage (<49%) of their income to food. The majority of the households allocated over half of their income to food expenditure indicating high levels of poverty in the study area. In most of the families (64.1%), husbands provided the households with food, 32.6% depended on the mother while the others 1.8% and 1.5% respectively depended on grandparents and relatives for their food provision (Table 4.3).

Table 4. 3: Socio-economic characteristics of the study population

Socio-economic characteristics	N=273	
	N	%
Main source of family income:		
Formal employment	36	13.2
Casual labour	159	**58.2**
Small scale business	78	28.6
Estimated % household of income allocated to food:		
Largest percentage (>75%)	159	**58.2**
Medium percentage (50%-74%)	71	26.0
Smallest percentage (<49%)	43	15.8
Provider* of food in a household:		
Father/Husband	175	**64.1**
Mother	89	32.6
Grand parents	5	1.8
Relatives	4	1.5

Provider refers to a household member who is the breadwinner and brings food home or contributes the largest percentage of income used to access food.

4.2 Minimum dietary diversity of children 6 – 23 months

The mothers were requested to state what their children consumed the previous day. Dietary diversity was then computed based on 7 food groups as recommended by WHO (2008b) which comprise of: grains, roots and tubers; legumes and nuts; dairy products; flesh foods (meat, fish, poultry and organ meats); eggs; vitamin-A rich fruits and vegetables; other fruits and vegetables. Consumption of any amount of food from each food group was sufficient to count except if a food item was only used as a condiment.

Majority (88.6%) of the children had eaten food prepared from grains, tubers and roots. Over three quarters (79.1%) of the children had consumed vitamin A rich fruits and vegetables while less than third (24.2%) had intakes of iron rich foods (flesh

meats). The consumption of other fruits was relatively higher at 93.0%. The consumption of proteins was highest from dairy products (84.6%), and lower in legumes (41.0%) and least for eggs (14.7%) (Figure 4.2)

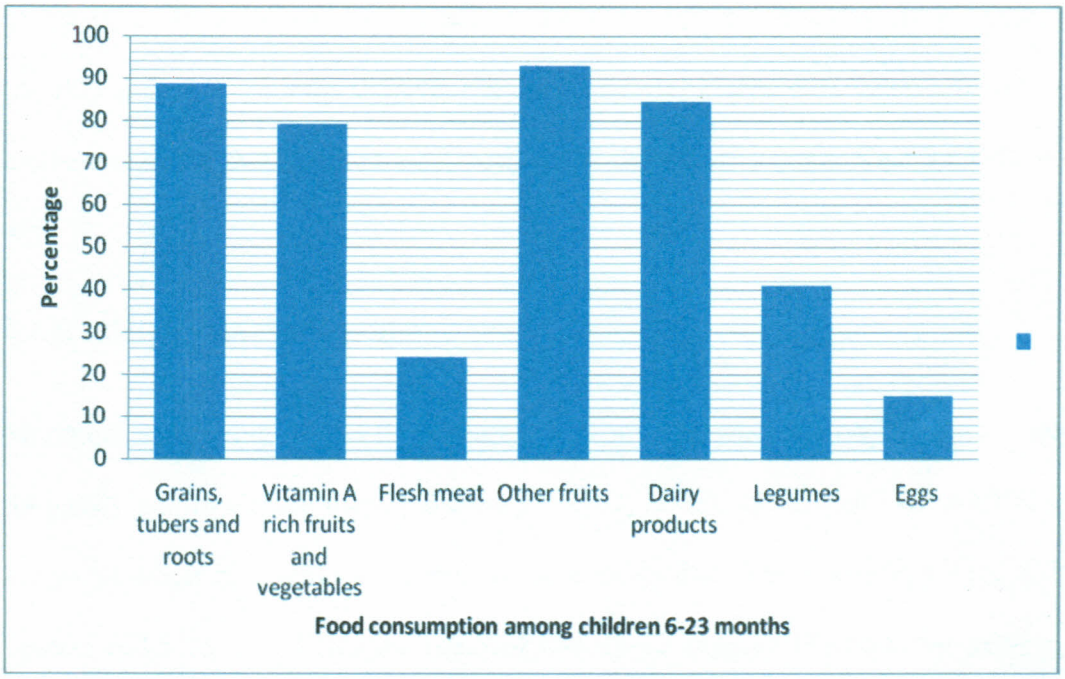

Figure 4. 2: Dietary diversity among children 6-23 months

Children of 6–23 months of age both breastfed and non-breastfed who receive foods from 4 or more food groups are considered to have diverse diet (WHO, 2007). More than three quarters (79.4%) of the children had received food from the four food groups and above. The highest in consuming more than four food groups were in 18-23 months old category (92.6%). This was followed by 12-17 months old category (80.2%) and the last was the 6-11 months old category (70.4%).the mean dietary diversity score (sd) was 3.66± 1.03. Dietary diversity increased with an increase in age of the child (Table 4.4).

4.2.1: Minimum meal frequency

The number of meals consumed by the children in all the age categories ranged from 1 to 6.The minimum meal frequency was achieved by most (89.9%) of the children 6-23 months old with the same trend in the 6-11 months (95.4%), 12-17 months (86.1%) and 18-23 months (86.8%) old age categories (Table 4.4). During the FGDs mothers reported that children 6-23 months old should consume at least 3 meals in a day.

4.2.2: Minimum acceptable diet

Minimum acceptable diet is the children 6-23 months who receive minimum meal frequency and minimum dietary diversity (WHO, 2007). More than half (69.7%) of all the children had achieved minimum acceptable diet. Those children aged 6-11 months (68.5%), 12-18 months (68.3%) and 18-23 months (73.5%) had achieved minimum acceptable diet (Table 4.4).

Table 4. 4: Dietary diversity score, minimum meal frequency, minimum acceptable diet

	N= 277	
	N	%
Dietary diversity score		
Children 6-23 months N=277		
<4 food groups	57	20.6
≥4 food groups	220	**79.4**
Mean dietary diversity score (sd)	**3.66± 1.03**	
Children 6 – 11 months N= 108		
<4 food groups	32	29.6
≥4 food groups	76	70.4
Children 12-17 months N=101		
<4 food groups	20	19.8
≥4 food groups	81	80.2
Children 18-23 months N=68		
<4 food groups	5	7.4
≥4 food groups	63	92.6
Minimum Meal Frequency		
Children 6-23 months N=277		
No	28	10.1
Yes	249	**89.9**
Minimum Acceptable Diet		
Children 6-23 months N=277		
No	84	30.3
Yes	193	**69.7**

4.3: Food consumption patterns by children 6 – 23 months

This study sought to establish the food consumption patterns and dietary intake among the children. Respondents were asked to state the frequency of consumption of the selected food items given to their children in the last 7 days prior to the data collection. The listed food items were the ones locally available, familiar and commonly used by the community. The foods included; meat and other animal

products, grains, roots and tubers, legumes and nuts, dairy products, eggs, vitamin A rich fruits and vegetables and other fruits and vegetables.

4.3.1: Consumption patterns of meats and animal products by children 6 – 23 months

The meats and animal products considered in the study were beef, liver, fish, *omena* (is a small silvery sardine-like fish) and organ meat. Their consumption patterns in the last 7 days preceding the study is as shown in Table 4.5. Findings reveal about 54.2% of the study children did not consume beef even in a single day while only 4.0% consumed beef four days during that week. A small number of child 6.3 % consumed beef only in three days whereas 17.6% and 16.8% respectively consumed beef once and twice in those last seven days.

The results further show that 82.4 % of children did not consume liver at all for those last 7 days whereas about only 11.4% consumed liver once. For omena and organ meats, similar poor consumption patterns were observed with 55.3 % of children and 80.2% of them having not consumed omena or organ meats respectively not even in a single day. Consumption of fish was most common where only 40.7% of the children having not consumed fish in the last seven days and more than half of the children having consumed it either once (24.9%), twice(17.9%), thrice (10.3%) or four times (5.1%) within the seven days.

Table 4. 5: Consumption patterns of meats and animal products by children 6-23 months

Frequency of consumption	% of the total n = 277				
	Beef	Liver	Omena	Fish	Organ meat
Once a week	17.6	11.4	22.7	24.9	9.5
Twice a week	16.8	4.0	10.7	17.9	5.1
Thrice a week	6.3	1.1	6.2	10.3	1.5
Four times a week	4.0	0.7	3.6	5.1	2.6
Not consumed	54.2	82.4	55.3	40.7	80.2
Daily	1.1	0.4	1.5	1.1	1.1
Total	100	100	100	100	100

4.3.2: Consumption patterns of grains, roots and tubers by children 6 – 23 months

The study established the consumption patterns of grains, roots and tubers. These were; maize, millet, *chapati* (is an unleavened flatbread made from wheat grain), sweet potatoes, cassava, irish potatoes, rice and sorghum. The results showed that maize grain was consumed by majority of the children daily at 40.3% while 29.7% of them consuming it in four days during that week preceding the study. The second most consumed grain was millet whereby 35.6% of children consumed millet based foods daily. Cassava was not often consumed as 90.1% did not consume it at all. *Chapati*, Sweet potatoes and irish potatoes were consumed by 8.5%, 0.4% and 11.0% of children respectively daily. Rice was consumed by 18.7% of the children having had consumed it daily in that week, 23.1% twice and 22.7% thrice in the same week (table 4.6).

Table 4. 6: Consumption patterns of grains, roots and tubers by children 6-23 months

Frequency of consumption	% of the total N = 277							
	Maize %	Millet %	*Chapati* %	Sweet potatoes %	Cassava %	Irish potatoes %	Rice %	Sorghum %
Once a week	2.6	1.1	10.3	17.6	3.3	10.3	12.8	1.8
Twice a week	10.3	3.7	20.1	8.0	1.8	13.9	23.1	4.4
Thrice a week	13.2	6.2	17.9	2.6	0.4	11.7	22.7	2.6
Four times a week	29.6	18.5	25.3	2.9	2.6	22.0	16.8	6.3
Not consumed	4.0	34.8	17.9	68.5	90.1	31.1	18.7	64.5
Daily	40.3	35.6	8.5	0.4	1.8	11.0	5.9	20.4
Total	100	100	100	100	100	100	100	100

4.3.3 Consumption patterns of legumes by children 6 – 23 months

Most of the children (84.6%) did not consume peas in the last seven days prior to the study (table 4.7) with none having consumed it daily. Small percentages of the children 7.3%, 1.5%, 1.1% and 5.5% consumed peas for one day, two days, three days and four days in a week respectively. Groundnuts were also not consumed by most of the children (80.2%). Children who consumed them the whole week were only 1.1% with 18.8%, 4.4%, 3.3% and 2.2% consuming groundnuts once, twice, thrice or four times a week prior to the study. Beans consumption was fair compared to cowpeas as a smaller percentage of children, 42.5 % did not consume them at all for the last seven days prior to the data collection. Those who consumed beans daily were about 4.8% while 15.8 % consumed beans twice during that week. About 20.2% of the children consumed beans once while 17.9% consumed in two days within those last seven days. More than half (61.2 %) of the children had not consumed green grams at all within the week. Slightly more than a quarter of the children had consumed green grams once within the week while 11.0%, 5.4% and 3.3% of the children had consumed them twice, thrice and four times respectively within the week.

Table 4. 7: Consumption patterns of legumes by children 6-23 months

Frequency of consumption	% of the total N= 277			
	Peas %	Beans %	Green grams %	Groundnuts %
Once a week	7.3	20.7	17.6	18.8
Twice a week	1.5	15.8	11.0	4.4
Thrice a week	1.1	7.7	5.4	3.3
Four times a week	5.5	8.5	3.3	2.2
Not consumed	84.6	42.5	61.2	80.2
Daily	0	4.8	1.5	1.1
Total	100	100	100	100

4.3.4 Consumption patterns of dairy products by children 6 – 23 months

The findings (table 4.8) reveal that milk was consumed by more than half of the children, 61.9% daily. Most of the caregivers reported that the milk consumed was in sweetened tea or added to porridge and baby foods to have them in a smooth consistency.

Table 4. 4: Consumption patterns of dairy products by children 6-23 months

Frequency of consumption	% of the total N =277
	Milk %
Once a week	2.2
Twice a week	1.8
Thrice a week	6.2
Four times a week	19.1
Not consumed	8.8
Daily	61.9
Total	100

4.3.5 Consumption patterns of eggs in any form by children 6 – 23 months

The consumption patterns of eggs were as indicated in. More than half (60.8%) of children did not consume eggs for the last 7 days prior to the data collection (table 4.9). Daily consumption of eggs observed was very low at 1.1%. Those who

consumed once were 20.1% while 13.2% consumed twice and 4.4% consumed eggs three times within the week.

Table 4.9: Consumption patterns of eggs by children 6-23 months

Frequency of consumption	% of the total N =277
Once a week	20.1
Twice	13.2
Thrice	4.4
Four times	0.4
Not consumed	60.8
Daily	1.1
Total	100

4.3.6 Consumption patterns of vegetables by children 6 – 23 months

Most consumed vegetable was tomatoes whereby 47.3% of the children consumed it daily (table 4.10). This was followed by cowpea leaves with 8.4% of the children having had consumed it daily while almost a quarter of the children, 23.1% had consumed it in four days during the week. The results reveal that the consumption patterns of majority of vegetables was poor with more than half of children, 50.9%, 54.6% and 53.1%, having had not consumed carrots, pumpkins, and cabbage respectively. Spinach was fairly consumed by most of the children as 13.9% had consumed it once, 17.6% consumed it twice, 15.0% consumed thrice and 19.5% consume dit four days within the week. Consumption of other traditional vegetables other than cowpea leaves and/ amaranth leaves was minimal.

Table 4. 10: Consumption patterns of vegetables by children 6-23 months

Frequency of consumption	% of the total N = 277					
	Carrots%	Cowpeas leaves%	cabbage%	Spinach%	Tomatoes %	pumpkins %
Once a week	9.5	11.7	23.1	13.9	4.4	12.8
Twice a week	9.2	12.1	10.6	17.6	8.1	8.1
Thrice a week	9.9	17.6	7.7	15.0	6.2	9.5
Four times a week	15.7	23.1	5.1	19.5	17.3	11.8
Not consumed	50.9	27.1	53.1	28.6	16.7	54.6
Daily	4.8	8.4	0.4	5.5	47.3	3.3
Total	100	100	100	100	100	100

4.3.7 Consumption patterns of fruits by children 6 – 23 months

Table 4.11 shows that the most consumed fruits were mango and ripe bananas whereby in both 10.3% of children had consumed them daily. More than half of the children had not consumed any melon, pawpaw, passion fruit or avocado (68.5%, 66.3%, 83.5%, 49.5%) respectively. These findings show that there was inadequate consumption of fruits and this would likely lead to micronutrient deficiencies.

Table 4. 11: Consumption patterns of fruits by children 6-23 months

Frequency of consumption	% of the total N = 277							
	Avocado %	Mango %	Pawpaw %	Passion fruit %	Ripe banana %	Orange %	Guava %	Melon %
Once a week	23.1	14.3	17.6	6.6	11.4	20.5	1.8	20.9
Twice a week	10.6	11.4	7.0	4.4	20.9	21.2	1.5	5.1
Thrice a week	11.0	14.7	4.4	2.2	20.9	11.4	0.7	2.6
Four times a week	4.8	25.3	2.5	2.7	24.6	8.7	0	2.6
Not consumed	49.5	24.2	66.3	83.5	12.1	34.8	96.0	68.5
Daily	1.1	10.3	2.2	0.7	10.3	3.3	0	0.4
Total	100	100	100	100	100	100	100	100

A 24-hour recall is not considered to be representative of habitual diet at an individual level but is adequate in mean intakes whereas food frequency questionnaires are useful for gathering information on habitual intake of a range of foods. The 24 hour recall indicated a high number of children receiving food from more than the four food groups, but from the food frequency there was less consumption of food from animal sources, eggs, fruits and legumes with none being consumed by not more than a quarter of the children daily. Findings of food consumption patterns of the various foods observed in the study showed lack of diet diversity.

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

4.4 Morbidity prevalence and health seeking behavior among children 6 – 23 months

The Infant morbidity was determined based on a two-week recall by the mother. More than half (64.1%) of the infants were reported to have been sick. Of those infants reported to have been sick, 36.0% had respiratory infections (ARIs) defined as colds, cough and difficulty in breathing, 27.4% had diarrhoea, 6.3% suffered from vomiting, 22.3% had fever; while 8.0% and had skin infections (Table 4.12). Majority (88.0%) of mothers sought assistance when their children were sick mainly from public health facilities (43.5%), 25.3% went to private clinics while 19.5% sought assistance from a pharmacy. Almost three quarters of the mothers sought assistance after twenty four hours whereas only 26.0% of the caregivers were able to seek consultation within

twenty four hours. The reasons mainly given by those who did not seek for any assistance is that majority (66.7%) considered the illness as mild, 23.5% of the caregivers lacked money to pay at the facility while 9.5% were either too busy or felt that they will wait for too long time at health facility before receiving the service (Table 4.12).

Table 4. 12: Child morbidity and health seeking behaviour

Child morbidity	N=277	
	N	%
Children sick in the past 2 weeks	175	64.1
Prevalence of common illness[+] N=175		
Diarrhea	48	27.4
Vomiting	11	6.3
Fever with chills like malaria	39	22.3
Fever cough and difficulty in breathing	63	**36.0**
skin infections	14	8.0
Assistance sought when child was sick[+] N=154	154	88.0
Private clinic	39	25.3
Public health facility	67	**43.5**
NGO/FBO	6	3.9
Pharmacy	30	19.5
Others	12	7.8
How soon was assistance sought N=154		
Within 24 hours	40	26.0
After 24 hours	114	74.0
Why no consultation done N=21		
Mild illness	14	66.7
Lack of money to visit pay at the health facility	5	23.8
Too busy/long waiting time at health facility	2	9.5

[+] Multiple responses
NGO/FBO- Non Governmental Organization/Faith Based Organization
Others- Tradition healers, CHWs, mobile clinics and local herbs

4.5 Nutritional status of children aged 6-23 months old

4.5.1 Wasting (weight-for-height) based on Z scores

Wasting describes the current or short term nutritional status due to inadequate dietary intake or recent episodes of illness causing loss of weight and the onset of malnutrition. Wasting is also referred to as acute malnutrition. The total percentage of children aged 6-23 months old category wasted was 4.0% (CI 1.69-6.31) Over three quarters (81.9%) of the children aged 6-23 months old were normal while (2.9%) and (1.1%) were moderately and severely wasted respectively. Total percentage of children wasted (GAM) in the age categories was: 4.6% (CI 2.13-7.07) in 6-11 months old; 3.0% (CI 0.99-5.01) in 12-17 months old and 4.4% (CI 1.98-6.82) in 18-23 months old (Table 4.13)

Table 4. 13: Distribution of study children by Nutritional Status: Wasting

Child nutritional status: Wasting	N= 277				
	Male	Female	N= total	%	CI
Weight for Length Z scores					
6-23 months N=277					
Overweight and obese	17	22	39	14.1	10.0-18.2
Normal	102	125	227	81.9	77.3-86.4
Moderately wasted	3	5	8	2.9	0.92-4.88
Severely wasted	2	1	3	1.1	0.13-2.33
Global Acute Malnutrition	5	6	11	4.0	**1.69-6.31**
6-11 months N=108					
Overweight and obese	8	5	13	12.0	8.1-15.83
Normal	41	49	90	83.3	78.9-87.6
Moderately wasted	1	3	4	3.7	1.48-5.92
Severely wasted	1	0	1	0.9	0.21-2.01
Global Acute Malnutrition	2	3	5	4.6	**2.13-7.07**
12-17 months N=101					
Overweight and obese	4	9	13	12.9	8.9 -16.8
Normal	37	48	85	84.2	79.9-88.5
Moderately wasted	1	1	2	2.0	0.35-3.65
Severely wasted	0	1	1	1.0	0.17-2.17
Global Acute Malnutrition	1	2	3	3.0	**0.99-5.01**
18-23 months N=79					
Overweight and obese	5	8	13	19.1	14.4-23.7
Normal	24	29	63	76.5	71.5-81.4
Moderately wasted	1	1	2	2.9	0.92-4.88
Severely wasted	1	0	1	1.5	0.07-2.93
Global Acute Malnutrition	2	1	3	4.4	**1.98-6.82**

4.5.2 Stunting (height-for-age) based on Z scores

Height-for-Age index is an indicator of linear growth retardation and cumulative growth deficits. Stunting reflects failure to receive adequate nutrition over a long period of time and is also affected by recurrent chronic illness. Global stunting prevalence in children aged 6-23 months old was 25.3% (95% CI 20.18-30.45). In the same age category, almost three-quarters (74.7%) of the children aged 6-23 months were normal while 18.8% and 6.5% were moderately and severely stunted. The total

percentage of stunted children by the age categories was: 19.5% (CI 14.83-24.17) in 6-11 months old; 24.8% (CI 19.71-29.89) in 12-17 months old and 35.3% (CI 29.67-40.93) in 18-23 months old (Table 4.14).

Table 4. 14: Distribution of study children by Nutritional Status: Stunting

Child nutritional status: Stunting	N=277				
	male	female	N	%	95% CI
Length for Age Z scores:					
6-23 months N=277					
Normal	80	127	207	74.7	69.5-79.8
Moderately stunted	32	20	52	18.8	14.2-23.4
Severely stunted	12	6	18	6.5	3.6- 09.4
Global stunting	44	26	70	25.3	**20.1-30.4**
6-11 months N=108					
Normal	35	52	87	80.9	76.2-85.5
Moderately stunted	12	3	15	13.9	9.8 -17.9
Severely stunted	4	2	6	5.6	2.89-8.31
Global stunting	16	5	21	19.5	**14.8-24.1**
12-17 months N=101					
Normal	28	48	76	75.3	70.2-80.3
Moderately stunted	10	10	20	19.8	15.1-24.4
Severely stunted	4	1	5	5.0	2.43-7.57
Global stunting	14	11	25	24.8	**19.7-29.8**
18-23 months N=68					
Normal	17	27	44	64.7	59.1-70.3
Moderately stunted	10	7	17	25.0	19.9-30.1
Severely stunted	4	3	7	10.3	6.7 -13.8
Global stunting	14	10	24	35.3	**29.6-40.9**

4.5.3 Underweight (weight-for-age) based on Z-scores

Weight for age is a composite index of height- for-age and weight- for- height. It takes into account both acute and chronic malnutrition. Slightly less than one-tenth (8.6%, CI 5.3-11.9) of children aged 6-23 months old were underweight. In the same age category, more than three-quarters (88.1%) of the children were normal. Total percentage of underweight children in the age categories was: 9.3% (CI 5.88-12.72) in

6-11 months old; 10.9% (CI 7.23-14.57) in 12-17 months old and 11.7% (CI 7.91-15.49) in 18-23 months old (Table 4.15).

Table 4. 15: Distribution of study children by Nutritional Status: Underweight

Child nutritional status: Underweight	**N=277**				
	Male	Female	N	%	CI
Weight for Age Z scores					
6-23 months N=277					
Overweight and obese	5	4	9	3.2	1.31-5.27
Normal	105	139	244	88.1	84.2-91-9
Moderately underweight	11	9	20	7.2	4.1 - 10.2
Severely underweight	3	1	4	1.4	0.02- 2.7
Global underweight	14	10	24	8.6	**5.3- 11.9**
6-11 months N=108					
Overweight and obese	2	2	4	3.7	1.48- 5.9
Normal	44	50	94	87.0	83.0-90.9
Moderately underweight	4	4	8	7.4	4.3 - 10.4
Severely underweight	1	1	2	1.9	0.29- 3.5
Global underweight	5	5	10	9.3	**5.8 - 12.7**
12-17 months N=101					
Overweight and obese	0	0	0	0	0
Normal	36	54	90	89.1	85.4-92.7
Moderately underweight	5	4	9	8.9	5.5 - 12.2
Severely underweight	1	1	2	2.0	0.35- 3.6
Global underweight	6	5	11	10.9	**7.2 - 14.5**
18-23 months N=68					
Overweight and obese	0	0	0	0	0
Normal	25	35	60	88.2	84.4- 92.0
Moderately underweight	2	2	4	8.8	5.4 - 12.1
Severely underweight	2	0	2	2.9	0.92- 4.8
Global underweight	4	2	6	11.7	**7.9 - 15.4**

4.6. Relationship between socio- economic and demographic factors and child nutritional status, dietary diversity, morbidity prevalence

4.6.1 Relationship between socioeconomic and demographic factors and dietary diversity

The study established the relationship between child's age and gender, caregiver's age, education level and occupation and the minimum dietary diversity. The study results showed that there was a significance relationship between education level of the caregiver and the DDS (p=0.003). The results also revealed that there was a significant relationship between the kind of household source of income and the DDS (P = 0.003) (table 4.16).

There was also a significant relationship between age of a child and dietary diversity score p= 0.002. Older children consumed more food groups than the younger children. Significant relationship existed between dietary diversity score and the number of times a child is fed. The more times a child is fed, the more likely that the diet will be diversified.

4.6.2 Relationship between socio- economic and demographic factors and child nutritional status

Socio-demographic factors: sex and age of the child, mother's age, mother's education level, mother's occupation, main source of income for the household and their association with child nutritional status (wasting, stunting and underweight) were investigated.

Significant relationships were found between sex of the child and stunting (p=0.003, chi square=13.84). The male child was more likely to be stunted than the female

child. Age of the child also was significantly associated with stunting among the children (p=0.009 Chi-square test= 16.97). A significant relationship was found for those who had some level of education had better nourished children whereas more children were wasted for those who had no education (p=<0.001 Chi-square test= 101.37).

Occupation of the mother had a significant relationship with underweight and stunting (p=0.006 Chi-square test= 40.64, p=0.009 Chi-square test= 39.51 respectively). Households whose mothers were unemployed or housewives had more children who were underweight and stunted.

Table 4.16: Significant relationship between socio-economic and demographic factors and child nutritional status

	N= 277		
Socio- economic and demographic factors	Child nutrition status		Chi square tests P value
Sex of the child	Stunting		
	Stunted	normal	
Male (124)	44 (35.5%)	80 (64.5%)	0.003*
Female (153)	26 (17.0 %)	127 (87.0%)	
Age of the child	Stunting		
	Stunted	normal	
6- 11months (108)	21 (19.4%)	87 (80.6%)	
12-17 months (101)	25 (24.7 %)	76 (75.3%)	0.009*
18-23 months (68)	24 (35.3%)	44 (64.7%)	
Mothers level of education	Wasting		
	Wasted	normal	
No formal education (9)	6 (66.7%)	3 (33.3%)	<0.001*
Primary school level (158)	3 (1.9 %)	155 (98.1%)	
Secondary school level (96)	2 (2.1%)	94 (97.9%)	
Tertiary level (10)	0	0	
Occupation	Wasting		
	Wasted	normal	
Casual labour (39)	3 (7.7%)	36 (92.3%)	0.006*
Formal employment (9)	1 (1.1 %)	8 (98.9%)	
Small scale traders (34)	3 (8.8%)	31 (91.2%)	
Housewives (193)	17(8.8)	176 (91.2)	

*Significant relationship at p-value <0.05

4.6.3: Relationship between socioeconomic and demographic factors and morbidity prevalence

The study revealed that more than half of the children (64.1%) suffered from a certain illness in the past 2 weeks prior to the data collection. A large number of the caregivers sought some medical consultation from different sources which included health facility, traditional healer, mobile clinics, pharmacy, ordinary shops and self-medication but this was after 24hrs by most of them (74.0%), so it was not prompt. Reasons given for not seeking medical consultation by the caregivers was: illness being viewed as mild, lack of money for consultation and the caregiver being too busy or has experienced long waiting time at the health facility.

Table 4.17 Relationship between morbidity prevalence and dietary diversity

Characteristic N=277	Morbidity prevalence	Chi-square test; p value,
Child's age	morbidity	0.683
Ethnic group of caregiver	morbidity	0.975
Education level of caregiver	morbidity	0.972
Dietary Diversity	morbidity	0.139
Underweight	morbidity	0.996
Wasting	morbidity	0.999
Main occupation of caregiver	morbidity	0.103
Ethnic group of caregiver	morbidity	0.898

*significant relationship<0.05

4.6.4 Relationship between dietary diversity and nutritional status

At p>0.05, there was no statistically significant relationship observed between dietary diversity and the three indices of malnutrition in Kibera slum. However children who were fed more number of times were likely to meet their dietary diversity (p= 0.023).

The study therefore accepts the null hypothesis. There was no significant relationship between dietary diversity and nutrition status of children 6 to 23 months of age in Kibera slum, Nairobi.

Table 4.18. Factors not significantly associated with dietary diversity

Characteristic N=277	Dietary Diversity	Chi-square test; p value,
Education level of caregiver	Dietary diversity	0.707
Income	Dietary diversity	0.753
Underweight	Dietary diversity	0.801
Stunting	Dietary diversity	0.651
Wasting	Dietary diversity	0.271

*significant relationship<0.05

4.6.5 Relationship between morbidity prevalence and nutritional status

There was a significant relationship between children who were ill and those who were stunted, with those who were ill being more likely to be stunted p= <0.001 (chi square = 24.35). However, there was no statistical significance (p = 0.05) between child morbidity and nutrition status (Table 4.19).

Table 4.19. Factors not significantly associated with child nutritional status

Characteristic N=277	Nutrition status	Chi-square test; p value,
Child's age	wasting	0.694
Child's age	underweight	0.437
Child's sex	underweight	0.237
Child's sex	wasting	0.873
Age of caregiver	underweight	0.471
Age of caregiver	stunting	0.822
Age of caregiver	wasting	0.237
Sex of caregiver	underweight	0.785
Sex of caregiver	stunting	0.392
Sex of caregiver	wasting	0.237
Education level of caregiver	underweight	0.171
Education level of caregiver	stunting	0.945
Main occupation of caregiver	wasting	0.103
Ethnic group of caregiver	underweight	0.898
Ethnic group of caregiver	stunting	0.849
Ethnic group of caregiver	wasting	1.000
Income	underweight	0.862
Income	stunting	0.598
Income	wasting	0.171
Frequency of feeding	underweight	0.891
Frequency of feeding	stunting	0.614
Frequency of feeding	wasting	0.966

*significant relationship<0.05

CHAPTER FIVE: DISCUSSION

5.1 Introduction

The first two years of life are a critical window for ensuring optimal child growth and development (World Health Organization [WHO], 2008a). An appropriate diet is a critical component for proper growth and development of children (Aggarwal *et al.,* 2008, Butte *et al.,* 2000). Malnutrition is a major underlying cause of the child morbidity and mortality in Kenya. As diets become less diversified all forms of child malnutrition and poor health increases. Therefore, improving infant and young child feeding patterns specifically with reference to dietary diversification is critical towards achieving improved nutrition, health and development (WHO, 2007). Dietary diversity has been included as a specific recommendation in the revised global set of indicators of Infant and Young Child Feeding (IYCF) of the children aged 6-23 months (WHO, 2007).

5.2 Socio-demographic and economic characteristics of mothers/caregivers of children 6-23 month

As a whole, the participants were young, married and of primary level of education. The high poverty levels in Kibera slum as reported by mothers during FGDs may have resulted to early school dropout by most of the girls and subsequently leading to early marriages. High levels of poverty may also lead to students discontinuing their studies because of lack of money to finance their education thus the reason why most of the caregivers had not attained secondary education. Studies have shown that education level is important as it contributes to nutrition knowledge that influences choice and consumption of variety of foods.

The average urban household size in this study was higher than the Kenya national size of 3.1 (KNBS and ICF Macro, 2010). This is because the Kenyan urban statistics reflects both slum and non-slum settlements in urban areas while the study was restricted to an urban informal settlement. On the whole, most of the husbands were casual labourers while most of the mothers were unemployed and depended on their spouses for provision of food and other necessities. Other studies conducted in informal settlements in Nairobi have found similar findings (Kimani-Murage *et al.*, 2011; Ochola, 2008; Adere, 2007).

The majority of the households allocated most of their income to food expenditure indicating high levels of poverty in the study area. High levels of poverty, low purchasing power and lack of own production of food may have had a negative effect on the attainment of minimum dietary diversity by children aged 6-23 months old in majority of the households. As food makes up the largest expense in the household budget of the urban poor, food access due to a lack of sufficient income to meet these needs rather than the availability of food itself is the main cause of food insecurity. Mothers in a focus group discussion (FGD) pointed out a number of challenges they experienced in feeding of their children; These included; food shortages due to inadequate income to purchase enough food, high food prices, poverty, occupations that keep mothers away from home most of the time and lack of reliable jobs that can provide steady income.

5.3 Dietary diversity

Appropriate complementary diet must include a variety composition of foods containing adequate amount of macro and micronutrients (with special attention to

iron, zinc, calcium, vitamin A, vitamin C and folic acid) to ensure optimal growth after the age of 6 months. Scientific studies have established that appropriate dietary diversity is associated with improved child nutritional status (Arimond & Ruel, 2004). Adherence to the quality of the diet is especially important in low-income set-ups where poor hygiene and early introduction presents an additional burden (Popkin *et al.*, 1990).

Most of the children aged 6-23 months old had consumed foods made from grains, roots and tubers mainly in form of porridge. This is similar to studies by KNBS and ICF Macro, (2010) in Kenya, Rao *et al.,* (2011) in India, Xu *et al.,* (2007) in China, Owino *et al.,* (2008) in Zambia and Hussein, (2005) in Tanzania. The consumption of vitamin-A rich fruits and vegetables and other fruits and vegetables was low. These findings compare with those of studies conducted in Kenya by Chelimo, 2008, Kipruto, 2013 & Mueni, 2014) and in Nepal by Joshi *et al.*, (2011). The low consumption of vitamin A-rich foods may have been contributed by the high poverty level in the area and therefore limited income to purchase these foods. According to studies by Hatloy *et al.*, (2000) and (Allison *et al.*, 2015)) foods such as milk, meat, fruits, nuts and pulses were consumed more frequently among the higher socio economic status groups and this study findings are in line with that.

The low intake of iron rich and iron fortified foods in the current study was consistent with past observations in Tanzania (Mamario *et al.,* 2005) and Zambia (Serlmitsos & Fusco, 2001) which established that the foods consumed were inadequate in iron. Scientific evidence from studies demonstrates that consumption of animal origin foods is consistently low in both rural and urban informal set-ups (Joshi *et al.*, 2012 and Owino *et al.*, 2008), findings that concur with that of the present study. Again, the

low consumption of animal origin foods may be contributed to the high poverty level in the informal settlement and therefore limited income to purchase foods.

The findings of this study showed that 79.4% children consumed a diversified diet. The mean dietary diversity was (3.66± 1.03), implying that most children fed on the recommended groups (WHO, 2008b) with the number of food groups consumed increasing with the age of the child. In an FGD session, caregivers reported that all food items are available in the market and their main problem is lack of money to buy them. The season of data collection would also had an influence (short rains period) on this outcome in food intake since most foods were readily available and at a cheaper prices as reported in the discussion. Moreover, this relatively compares with a study in Malawi by Leonie (2012), which reported that the indicator minimum dietary diversity was achieved by 60.9 % of children, while 74.2 % had the minimum meal frequency and 48.5 % met criteria for minimum acceptable diet. A study by Mueni (2014) indicated that 79.0 % of children having met dietary diversity and this was attributed to proper knowledge on complementary feeding. A study by Sapkota and Shrestha (2013) in Kathmandu reported children having minimum meal frequency were 64.6%, minimum dietary diversity at 72.3% and minimum acceptable diet at 52.3%. In that study also caretakers had adequate knowledge hence good practices of complementary feeding (Sapkota *et al.*, 2013).

A notable finding of this study was a major change in diets across the various age groups that improved with age. This finding suggested that the youngest age group 6–11 months received the lowest proportion of food from all seven categories of food. This age group was least likely to meet the recommended meal frequency, meal

diversity and acceptable diet standard than the older (12–23) children. It shows that 6–11 months children were even more at risk of under nutrition and micronutrient deficiency.

The findings on dietary diversity in this study showed a higher rate of children achieving the minimum dietary diversity compared to the Nairobi Province rate at 58.7% (KNBS & ICF Macro 2010).

5.4 Food consumption patterns

The 7 day food consumption patterns however which gives information on habitual intake of food, there was an indication of low diversity of foods consumed by the children. Generally, the dietary diversity was lower among younger children. Results from this study revealed that food consumption patterns were poor with most of the children relying on foods made from maize on daily basis. Other foods such as meat, eggs and vegetables were hardly consumed and this was attributed to high costs. These findings corroborate other studies. Nimrod and Neumann (2003) reported that Kenyan children have diets that are mainly cereal-based, with tubers and a few of vegetables and fruits when available. This leads to inadequate intakes of micronutrients such as zinc, iron, vitamins A and vitamin C. Another study in South Africa by Nontobeko et al., (2008) reported similar observation that in more than one half of the children observed for weeks, no fruit or vegetable was consumed due to poor access and availability.

Variety of foods is needed to ensure nutrient requirements are met. Unfortified complementary foods that are predominantly plant based generally provide insufficient amount of nutrients which are recommended during the age of 6-23

months. Majority of the household interviewed also had irregular sources of income most of them being casual labourers. This unreliable source of income impacts negatively to household food security leading to consumption of fewer meals per day by the children (Chelimo, 2008). The nature and cadre of jobs that the urban poor are engaged in contributes hugely to how food secure/insecure this group is. The urban poor are engaged in casual low-paying jobs mostly in the informal sector and the availability of these jobs are very much dependent on economic fluctuations hence making them very competitive hence widening the degree of inequality more than it is in the rural areas (Abdullah, 2011).

5.5 Morbidity prevalence among the children

Morbidity burden was high with acute respiratory infections (ARIs), diarrhoea, vomiting, fever and skin infections being common in the study area respectively. Acute respiratory infection is one of the leading causes of childhood morbidity and mortality throughout the world (KNBS & ICF Macro 2010). Malaria is the major contributor to the burden of disease in all the provinces except in Central Province and Nairobi Province where the leading cause of morbidity is diseases of the respiratory system of which the findings concur with. This could be attributed to the general demographic changes and different geographical, environmental and climatic patterns as well as socio economic trends (GOK, 2010). However morbidity records from one hospital (Kibera Health Centre) indicated that the most prevalent illness among the children was diarrhoea followed by respiratory system disease, moderate malnutrition, skin infections and other diseases respectively. This finding would be attributed to climatic season of the current study whose data was collected during a period of short rains hence the weather was cold increasing illnesses related to cold

weather. These other illnesses are associated with poor environmental sanitation. Confirmed malaria was however reported to be seasonal since Nairobi Province is rated as a non-malaria zone. These findings are comparable to studies by Moursi *et al.,* (2008) and Bhandari *et al.*, (2004) in urban areas in Madagascar and India respectively. High prevalence of morbidity especially diarrhoea and vomiting may be due to the unhygienic environment in the slum. The findings by Gichana (2013) in Kawangware had similar finding where majority of children were suffering from different illnesses prior to two weeks before the study and common cold was the most reported. This was a result of poor housing conditions leading to congestion, poor sanitation and low social economic status, making it difficult for the parents to afford warm clothing for their children.

The study results revealed that more than half of the children suffered from a certain illness in the past 2 weeks prior to the data collection. Literature has shown that undernourished children have lowered resistance to infection and are more likely to die from common childhood ailments especially diarrhoeal diseases and respiratory infections (Caballero, 2002). Ndugwa and Zulu (2008) in a study in Nairobi on child morbidity and care-seeking in Nairobi slum settlements reported that morbidity in young children is enhanced by the child's age; children under 2 years of age have increased vulnerability to infections because this is the time when most children begin to walk and play around the contaminated environment. This observation is in line with another study by Ekesa, Blomme and Garming (2011) which indicated that the prevalence of illnesses in children was reported to be higher among the younger group. Therefore in this study, age would have been another possible factor that influenced illnesses among the children as the target population was 6-23 months old.

Poor health seeking behaviour leads to inadequate health care contributing to poor disease diagnosis and management that could worsen dietary intake, hence affecting the child nutritional status. However, although health care seeking intervention has been known to have the potential to substantially reduce child mortality, in developing countries large number of children die without ever reaching a health facility and due to delays in seeking health care (Terra *et al*,. 2000). A big number of caregivers sought medical consultation from different sources which included health facility, traditional healers, mobile clinics, pharmacy, ordinary shops and self-medication but this was after 24hrs so it was not prompt.

5.6 Nutritional status of children

All the parameters of nutritional status, that is; stunting (25.3%), wasting (4 %) and underweight (8.6%) compared relatively with the national figures (stunting 26%, wasting 4 %, underweight 11%). Under nutrition is a persistent and deepening problem within the informal settlements ; data from a 2011 study by Olack *et al.* in Kibera, revealed comparable rates of undernourishment though in this study stunting was more pronounced (47%). The high (47%) prevalence of stunting in that survey of children from a Nairobi slum highlighted the risk of not counting those who live in impoverished settings in assessing the urban health and nutritional needs.

This study finding also revealed that malnutrition based on wasting, stunting and underweight was more pronounced in boys than girls. Stunting represents the long-term effects of malnutrition in a population and is not sensitive to recent, short-term changes in dietary intake. Findings in this study are not in agreement with those

reported by Ndiku *et al.,* (2011) which showed that boys in overall had higher energy intakes than girls, and the prevalence of stunting was higher in the girls than the boys.

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

These study findings compare favourably with those reported by Ergib *et al*, (2014) which showed that underweight was more prevalent in boys than girls. Another study in Vietnam also reported higher prevalence of underweight in boys than girls (Nguyen *et al*., 2009). However the findings differs from those reported in a study in India which reported 55.9% of the girls were underweight compared with 46.6 % of the boys (Dey & Chaudhuri, 2008). The prevalence of stunting and underweight increases significantly from the first to second year of life, there after it remains fairly constant (Smuts *et al*., 2004). This study finding disagree with those reported by Ndiku *et al*., (2011) in a study on gender inequality in food intake and nutritional status of children in rural Eastern Kenya which found that girls had higher prevalence rates of malnutrition.

In an FGD, the participants reported that under nutrition was mainly caused by feeding only one type of food that did not provide the child with sufficient nutrients and energy, or by consuming little or no food at all because of food insecurity. The female participants also felt that children did not eat enough food because of food shortages. One mother said: *"We, the mothers, often lack peace of mind due to lack of sufficient income to pay rent and buy enough food which makes us fail to eat and feed the baby hence we suffer and ultimately get undernourished".*

Results carried out on the 7 day food consumption patterns showed undiversified diets which could be low in nutrient density as most respondents gave their children meals derived from cereals. This was a pattern that was influenced by cereals being the staple food thus resulting in decreased nutritive value of diets leading to poor nutritional status of the children. The period 6 to 23 months in particular carries a great risk of growth faltering and malnutrition because of the inadequate nutritional quality of complementary foods and the increased risk of infections due to the decline in breastfeeding (Smuts *et al.*, 2004).

The findings of the study highlight that chronic malnutrition is a consistent problem within this informal urban settlement in Kenya. Infants aged 6-11 months were less stunted than children in older age-groups. After the first year of life, there was a rapid increase in the prevalence of stunting. In the second year of life, with introduction to the family diet, children become more responsible for feeding themselves but often do not have access to adequate amounts of solid food. These findings are similar to those from a study in India in which stunting was most commonly found in the older children. This finding could be attributed to poor weaning and complementary feeding

practices, which contribute to inadequate energy and protein intake (Mittal, Singh & Ahluwalia, 2007). This is consistent with the findings by Olack, (2011) in the same area.

This study found a higher prevalence of stunting among boys than among girls. The relationship of chronic malnutrition to age and gender may be linked to the timing and type of complimentary foods introduced in infants' and toddlers' diets. These findings are similar to a study of 16 demographic and health surveys in sub-Saharan Africa that revealed that, in 10 countries in sub-Saharan Africa, under-five male children are more likely to become stunted than their female counterparts (Wamani *et al.*, 2007). One report suggested that boys were more influenced by environmental stress than girls (Wells, 2007). A higher prevalence of stunting among boys than among girls was also reported by Olack, (2011) in the same area. Boys may be more likely to display impact of chronic under nutrition, especially in environments like informal settlements where various other stresses are at play, like repeated infections and exposure to toxins and air pollutants (Wells, 2000).

Wasting is usually due to recent illness and/or insufficient dietary intake caused by food shortages, feeding practices, or other events. Provided there is no severe food shortage, the prevalence of wasting is below 5% in most impoverished settings in developing countries, consistent with the findings of this survey. This study found a linear relationship of the ill children most likely to be stunted indicating that this would be a vicious cycle of chronic malnutrition experienced in the study area.

5.7 Socioeconomic and demographic factors and dietary diversity

Dietary diversity is important for health growth in children. Studies have shown that under nutrition causes growth retardation, a physiologically and economically costly

human condition ((Mamario *et al.*, 2005). It also retards children's physical and cognitive development and increases susceptibility to disease (World Bank, 2006). It is therefore important to enhance diversity in complementary foods, especially in young children who are dependent on these complementary foods for their nutrient intakes. Hoddinott and Yahannes (2002) highlighted that increase in dietary diversity is associated with socio-economic status and household food security. Hatloy *et al.*, (2000) in a study on food variety, socioeconomic status and nutritional status in urban and rural areas in Koutiala (Mali) reported that children with the lowest dietary diversity scores had a double risk of being malnourished (stunted and underweight). Similar results have been reported in a study by Bukusuba, Kikafunda and Whitehead, (2009) in an urban setting in Uganda that found that children in households that reported consumption of less diversified diets were more vulnerable to being stunted and underweight. The prolonged and high levels of food insecurity could explain the high levels of malnutrition and especially stunting observed in this study.

5.8. Socio- economic and demographic factors and child nutritional status

Socio-demographic factors: sex and age of the child, mother's age, mother's education level, mother's occupation, main source of income for the household and their association with child nutritional status (wasting, stunting and underweight) were investigated. Significant relationships were found between sex of the child and stunting. The male child was more likely to be stunted than the female child. Age of the child also was significantly associated with stunting among the children where older children tended to be more malnourished than the younger ones.

This study, caregivers who had at least primary level of education had better nourished children whereas more children were wasted for those who had no

education. This is similar to findings by Mahotra, (2012) in India. The caregivers' level of education significantly influences dietary diversity through increased understanding of the need to provide a varied diet and sustainable use of the environment. Education has been associated with nutrition status of preschool children, arguing that educated women are the gatekeepers of economic development, in understanding the nutrition and health needs of their household and in provisioning duties (Ekesa *et al.,* 2011).

Occupation of the mother had a significant relationship with underweight and stunting. Households whose mothers were unemployed or housewives had more children who were underweight and stunted. A study in India by Malhotra, (2012) indicated that, the mother plays the central role in childrearing. Thus, the mother's employment was found to be a significant determinant of nutrition status. A working mother was more likely to follow good feeding practices than a mother who does not have formal employment. The result suggests that a working mother might be more aware because of her social interactions or might be more proactive in obtaining information and she has access to income. There was no significant association between nutritional status of children and the other demographic and socio -economic factors.

5.9 Morbidity prevalence and dietary diversity

Study results showed that there was no significant relationship between consuming high or low diversified diet and the morbidity prevalence. However they would have been influenced by age of the children. The study also found that health seeking behaviour of the parents/caregivers for their children illness had no significance

relationship with the number of food groups consumed by the children, but it was determined by factors such as lack of money, health facility being far and illness not being severe.

5.10 Dietary diversity and nutritional status

In western Kenya, a study carried by Ekesa, Walingo and Onyango (2008) reported that a positive relationship was observed between dietary diversity and underweight, stunting and wasting. Although other studies have shown that dietary diversity is significantly associated with nutritional status indicators especially in children, the lack of relationship observed between dietary diversity and stunting/underweight/wasting in this study indicates that there is more to malnutrition than just diet. Other factors of significance to look at would be maternal factors, health care services and sanitation. A study by Ekesa, (2011) in Burundi and DR-Congo had similar findings. In Kenya's urban areas, food is available in both formal and informal marketing sectors, and acquired through cash transactions. Because the market supplies most of the food to Nairobi's slum population, low purchasing power may be a major impediment to procuring a variety of foods (Allison and guy 2015). Though dietary diversity was achieved by most children in this study, this was done in a 24 hour recall which does not show the habitual food intake. Limited access to nutritious foods which is a more pronounced and sustained problem may account for the high stunting levels within this informal settlement.

5.11 Morbidity prevalence and nutritional status

Study findings showed that children who were ill were more likely to be stunted. Households in the urban informal settlements suffer chronic food insecurity, which is a sustained problem instead of an acute, self-limited problem. Nutritional deficiencies

increase the susceptibility of the child to infectious diseases .Stunting is a predominant nutritional problem, and the elevated prevalence in older children indicates failure in growth and development during the first two years of life.There was no significant relationship between Morbidity prevalence and wasting/underweight. A study by Ndiku, (2011) had similar findings.

CHAPTER SIX: SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

6.1 Introduction

This was a cross-sectional analytical study whose purpose was to assess dietary diversity, morbidity prevalence and the nutritional status of children aged 6-23 months.

6.2 Summary of findings

Almost all the respondents were mothers to the children in the study. The average size of a household was 3.94 people. The major occupation for the husbands was small scale trading while more than half of the mothers were housewives. In most of the families husbands provided the households with food. Challenges experienced in feeding the children included; food shortages due to inadequate income to purchase enough food, high food prices, poverty, occupations that keep mothers away from home most of the time and lack of reliable jobs that can provide steady income. The study established the relationship between child's age and gender, education level and occupation and the dietary diversity score and nutritional status. The results revealed that all these factors had significance with nutrition status.

The study has shown that education and source of household income influence consumption of diversified of diets. The mean dietary diversity was (3.6 ± 1.03), implying that many children ate foods from at 2.6– 4.6 food groups out of the seven recommended groups (WHO, 2008b) with the number of food groups consumed increasing with the age of the child. With regards to achieving the minimum dietary diversity, more than three quarters of the children had received food from the four food groups and above as per the WHO recommendations.

Morbidity burden was high with acute respiratory infections (ARIs), diarrhoea, vomiting, fever and skin infections being common in the study area respectively. A big number of the caregivers sought some medical consultation from different sources but this was after 24 hours by most of them, so it was not prompt. These illnesses are associated with poor environmental sanitation, consumption of dirty water and poor personal hygiene. Study results showed that there was no significant relationship between consuming high or low diversified diet and the morbidity patterns.

Findings from the study showed prevalence of stunting was highest, followed by underweight, and then wasting. The study findings also revealed that malnutrition based on stunting was significantly higher in boys than girls and increased with age. This poor nutritional status was attributed to lack of sufficient nutrients to meet the nutritional requirements. The findings of the study highlight that chronic malnutrition is a consistent problem within this informal urban settlement in Kenya. This is consistent with the findings of Abdulla (2011), Kipruto (2013) and Olack *et al.*, (2011). The relationship of chronic malnutrition to age and gender may be linked to poor complimentary practice insufficient in energy and protein intake and undiversified and boys were more influenced by environmental stress than girls.

Although other studies have shown that dietary diversity is significantly associated with nutritional status indicators especially in children, the insignificant relationship observed between dietary diversity and stunting/underweight/wasting in this study indicates that there is more to malnutrition than just diet which would include basic and other underlying factors influencing malnutrition such as public health,social welfare or political influences.

6.3 Conclusions

Most of the respondents were young, married and with primary education with the majority of them being housewives and dependent on their husbands for upkeep. The majority of the households allocated over half of their income to food expenditure indicating high levels of poverty in the study area.

Findings reveal that the consumption of flesh products was poor for the last 7 days preceding the study. Foods made from maize and millet were consumed by majority of the children daily. The caregivers reported that the milk was consumed by majority of children mostly in sweetened tea or added to porridge and baby foods to have them in a smooth consistency.

Most of the infants were reported to have been sick. Majority of mothers sought assistance when their children were sick mainly from public health facilities mainly after twenty four hours. The reasons given by those who did not seek for any assistance is that majority considered the illness as mild, lacked money to pay at the facility and the caregiver either being too busy or felt that they will wait for too long time at health facility before receiving the service.

Malnutrition among 6 – 23 months old children in the Kibera slums appears to be a sustained problem. Stunting is the predominant nutritional problem, and the elevated prevalence in older children indicates failure in growth and development during the first two years of life.

The factors related to dietary diversity and nutrition status included maternal education and occupation, hence the importance of maternal education as a strategy to

improve health and nutrition of children. Education may empower women to acquire health and nutrition knowledge which can benefit children's well-being.

The illnesses were significantly related to nutritional status of the children based on stunting implying that prolonged nutritional deficiencies increase the susceptibility of the child to infectious diseases.

6.4 Recommendations

6.4.1 Recommendations for policy

The researcher recommends Ministry of Public health to promote awareness to parents/caregivers such that they are educated on feeding their children on diversified diets with emphasis on vegetables and animal products and also seeking prompt treatments for their children illnesses.

Projects aiming to improve family income for households in Kibera informal settlement could be put in place to improve access to nutritious foods.

To improve on diet diversity the Ministry of Education should improve on maternal knowledge especially on nutrition, proper child feeding and choice of foods for their children. Messages on the promotion of appropriate IYCF practices by the Ministry of Health and other organizations dealing with child health should emphasize the importance of dietary diversity and frequency of feeding children, to improve child's growth and health.

6.4.2 Recommendations for programmes

There is need to promote awareness in the community and especially among the child caregivers on health seeking behaviours that medical assistance is sought within 24

hours to ensure prompt treatment for their children illnesses and avoid child health deterioration leading to malnutrition or even death.

Caregivers should be educated on cheaper sources of proteins e.g. eggs, milk and milk proteins and plant sources of protein since proteins are useful in building and repair of worn out tissues especially after an illness. Households should be sensitized on consumption of vegetables and fruits which will in turn improve micronutrient intake and dietary diversity of the children hence improved nutritional status.

6.4.3 Recommendations for research

The following suggestions are made for further research:

There is need to conduct a longitudinal study which would put into consideration food intake variations with the seasons of the year and establish the whole array of factors that influence child nutritional status.

This study was done in an urban poor-resource setting it is therefore recommended that a similar study in a different setting be conducted.

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APPENDICES

APPENDIX I: LETTER OF INTRODUCTION

Title of Research Study: DIETARY DIVERSITY, MORBIDITY PREVALENCE AND NUTRITIONAL STATUS OF CHILDREN (6 – 23 MONTHS) IN KIBERA INFORMAL SETTLEMENT, NAIROBI

Principal Investigator: MIRITI SUSSYANN MAKENA

Consent

I am asking you to participate in a research study. Before agreeing to participate in the research, it is important that you read the information below. This statement describes the purpose, procedures, benefits, risks, discomforts, and precautions of the study. Also described are the alternative procedures, if any, available to you, as well as your right to withdraw from the study at any time. You should feel free to ask any questions that you may have.

A. Purpose of the Research Study: This study aims to establish dietary diversity, morbidity patterns and nutritional status of children 6 - 23 months of age in Kibera slums, Nairobi. The study is also being conducted as my requirement for the award of Master of Science in Foods, Nutrition and Dietetics and possibly for publication in academic journals and presentations at academic conferences.

B. Procedures Description: In this study I will be asking some questions to you the mother on your child dietary intake, illnesses experienced by the child and take measurements of your child's weight using a Salter scale and height using a height board. In this study only mother with children aged 6-23 months will be selected, a total of 300 mothers will have been sampled at the end of the study to represent the others and the Kibera community.

C. Duration: There is no limit time on how long you will take in responding to the question on child dietary intake and the taking of child weight and height. If you decide to stop participating in between, there will be no penalty to you.

D. Risks or Discomforts of this study: Your risk of participation in the study is unlikely and of low risk

- In taking child weight the undoing of clothes may exposure the child to cold weather which may have some health implications.

-on the weight and height measurements the child may fall down or get hurt by the wooden or metallic ends.

-there is the risk of skin infection especially from the lying on unsterilized beam balance.

-questions on demographic and socio-economic status (ethnicity, marital status, religion, education level, occupation, and amount of income earned) may make one upset.

Protection against the risks

-both weight and height measurements will be done in an enclosed room and by a trained personnel under the supervision of the principal researcher.

-the height boards for taking height and the beam balance and or Salter scale for taking the weight will be obtained from the nearest health centre nutrition department and should have a mark of quality from a standardization body.

-after every use of the beam balance dettol wipes will be used to clean up the lying area and the personnel will use new hand cloves on every child.

-participants are free to refuse to respond to any question which can result to any of the mentioned risks.

-confidentiality will be assured on all information provided and for that matter the participant identification form will be kept separate from the responses records and instead a unique identifier used.

E. Confidentiality: To secure the confidentiality of your responses, your name and other identifying information will never be attached to your answers. All codes and data will be kept in a locked drawer in a locker room or in a password protected computer that is kept secure. Data access will be limited to the Principal Investigator and researchers working directly on this study. All data will be destroyed responsibly after the required retention period (usually three years.) Your privacy will be

maintained in all published and written data resulting from this study. Your name or other identifying information will not be used in our reports or published papers.

F. Benefits of this study: You will receive no direct benefit from participating in this study; however your participation may help understand the community levels of child diets and common illnesses. The public health service may use the information to enhance implementation of health programs together with policy changes in health care provision.

G. Compensation/Incentive: There will be no payments for participating in this study.

H. Payment for research related injuries: There are no expected injuries as a result of participating in the study or for questions related to the study. In case of further clarification you may contact the people below (contact information)

I. Contact Information: If you have any questions, concerns and complaints contact the following people;

Sussyann Miriti
Principal Investigator
P .O Box 43844 00100 Nairobi
Tel: 0721-417815

The secretary
KEMRI
P.O Box 54840- 00200 Nairobi
Tel: 0722-205901

Participant Oral Consent:

Do you have any questions about the above information?
(YES/NO)
Do you wish to participate in this study?
(YES/NO)

Participant Written Consent:

I have read and understand the above information. I agree to participate in the research study.

Participant Name: _____ Date: _____

Participant Signature: _____

APPENDIX II: QUESTIONNARE

DIETARY DIVERSITY, MORBIDITY PREVALENCE AND NUTRITIONAL STATUS OF CHILDREN (6 – 23 MONTHS) IN KIBERA INFORMAL SETTLEMENT, NAIROBI COUNTY, KENYA

Questionnaire No. ____Date ___Name of the respondent _____ Interviewer _____

SECTION 1: HOUSEHOLD DATA: how many people live in this house together and share meals?(household size) ----------

1.1. age group	**1.2** Person ID and name	**1.3** Approximate age. Enter months for children under 5 years and years for over 5's		**1.4** Childs age. verified by **1.**health card **2.**birth certificate/notification **3.**baptism card **4.**recall	**1.5** Sex **1.**male **2.**female	**1.6.** Main occupation (enter code from list) **1.**agricultural labour **2.**livestock herding **3.**employed,salaried **4.**waged labour(casual) **5.**petty trade **6.**unemployed **7.**housewife **8.**domestic help **9.** student **10.**brewing **11.** others	**1.7** Ethnic group. **1** .luo **2.**luhya **3.**akamba **4.**kikuyu **5.**nubian **6.**kalenjin **7.**other(specify)	**1.8** Highest education attained **1.**no formal education **2.**standard 1-4 **3.**standard 5-7/8 **6.**secondary school **7.**certificate level **8.**diploma level **8.**university level **9.**adult literacy	**1.9** R/ship of the respondent to the child
Under 5		yrs	months						
	1								
5-18	2								
Over 18	3								

SECTION 2.NUTRITION STATUS OF THE CHILD

Fill for all the children in the household.

2.1 Child ID	2.2 Name of child	2.3 MUAC T0 the nearest 0.1cm	2.4 Oedema in both feet 1=yes 2=no	2.5 Height T0 the nearest 0.1cm	2.6 Weight T0 the nearest 0.1cm	2.7 Is the child currently enrolled in a feeding program?(confirm by a card if the child is currently enrolled) 1=yes (OTP) 2=yes (SFP) 3=No 4=dont know
1						
2						

SECTION 3. IMMUNISATION COVERAGE

Fill for all the children in the household

3.1 Child ID	3.2 Name of child	3.3 Has the child received BCG immunization ?(enter code) 1=yes by card 2=yes by recall 3=no 4=don't know	3.4 Has the child received pentavalent 1/OPV 1 ?(enter code) 1=yes by card 2=yes by recall 3=no 4=don't know	3.5 Has the child received pentavalent 1/OPV 3?(enter code) 1=yes by card 2=yes by recall 3=no 4=don't know	3.6 How many times did the child receive Vitamin A the last 1 year	3.7 Has the child received measles immunization ?(enter code) 1=yes by card 2=yes by recall 3=no 4=don't know	3.8 Deworming status of the child within the last 6 months
1							
2							
3							

SECTION 4. CHILD MORBIDITY PREVALENCE

Now I will ask you about illnesses that (name) has suffered from for the last 2 weeks

4.1 **Child ID**	**4.2** **Name of child**	**4. 3** During the last 2 weeks did child (Name) suffer from any illness or injury? **1**=yes **2**=no>>go to 4.10	**4.4** For how many days did (name) suffer due to illness or injury? No of days (1-30)	**4.5** Can you describe the symptoms that you primarily suffered from (record codes of the main symptoms)	**4.6** Was anyone consulted e.g a nurse or doctor,pharmacist,traditional healer e.t.cfor the major illness or injury? **1**=yes>>go to 4.8 **2**=no	**4.7** Why was no one consulted for the major illness	**4.8** How soon did you seek assistance ? **1**=within 24 hours **2**=after 24 hours	**4.9** Where did you go for the first consultation (enter code)	**4.10** FOR CHILDREN AGED 6-23 MONTHS in the last 2 weeks including today, how often has the child been taken to an informal day care centre?(1-14;0 if not taken)
1									
2									
3									

Codes for question 4.5

1. Bloody diarrhea **2.**watery diarrhea **3.** Vomiting **4.**fever with chills like malaria **5.**fever, cough, difficulty in breathing **6.**intestinal parasites **7.**measles **8.**eye infection **9.**skininfections **10.**accident **11.**malnutrition **12.**stomachache **13.** Toothache **14.**bloody diarrhea **15.**others (specify)……

Codes for question 4.7

1=illness mild **2**=no money to afford visit/medicine **3**=facility too far/inaccessible **4**=no qualified staff present **5**=staff attitude not good **6**=too busy/long waiting time **7**=drugs not available **8**=other (specify)

Codes for question 4.9

1=Traditional healer **2**=community health worker **3**=private clinic **4**=pharmacy **5**=Shop/kiosk **6**= public clinic **7**=.mobile clinic **8**=relative/friend **9**=no assistance sought **10**=local herbs **11**=.NGO/FBO

SECTION 5. ECONOMIC DATA

5.0 Main source of income for the household			ENTER CODE
1. small/own business (craftmen,salonist,artisan) farming	**6.**petty trade/vendors	**11.**	
2. Formal waged labour-private sector employment begging	**7**.shop/kiosk owner	**12.**	
3. Formal waged labour(civil servant) domestic work	**8**.remittance and gifts	**13.**	
4. Firewood collection/charcoal burning/selling Other (specify……)	**9**.spousal support	**14.**	
5.casual waged labour	**10**.borrowing		

5.1. Average amount of money earned by household per month? Enter amount in Ksh	
5.2. On average how much money does the household use on food daily? Enter amount in Ksh	

SECTION 6. DIETARY PRACTICES

Yesterday during the day and the night, did (Name) receive any of the following fluids?

List all the children 6-23 months in the household. Ask the mother/ caregiver to mention all fluids given to the child

6.1 Child ID	6.2 Name of child	6.3 Breast milk 1=yes 2=no	6.4 Infant formula 1=yes 2=no	6.5 Other milks;animal milk,reconstituted powdered milk,sour milk 1=yes 2=no	6.6 Sweetened flavoured juices,soda 1=yes 2=no	6.7 ORS 1=yes 2=no	6.8 Tea/coffee 1=yes 2=no	6.9 Plain water 1=yes 2=no	6.10 Thin porridge 1=yes 2=no
1									
2									
3									
4									

SECTION 7. INFANT DIETARY DIVERSITY

I will ask you about what solid/ semi solid foods the children between 6-23 months ate yesterday during the day and the night.
List all the children within age specified, ask the mother/ caregiver to mention all foods given to the child and record as mentioned in the appropriate category.

7.1 Child ID	**7.2** Name of child	**7.3** Eggs **1**=yes **2**=no	**7.4** Porridge **1**=yes **2**=no	**7.5** Flesh meats (chicken, beef, goat, kidney, liver, mutton, camel, fish) **1**=yes **2**=no	**7.6** Legumes and nuts (Beans, groundnuts, cowpeas, lentils ,green grams) **1**=yes **2**=no	**7.7** Dairy products (Milk, cheese, ghee) **1**=yes **2**=no	**7.8** Grains, roots and tubers Pasta, rice, bread, potatoes, biscuits, mandazi, chapatti, anjera, ugali **1**=yes **2**=no	**7.9** Vitamin Arich fruits and vegetables Pawpaw, melon, sukumawiki, carrots, cowpea leaves, spinach, avocado, pumpkin **1**=yes **2**=no	**7.10** Other fruits and vegetables Onions, tomatoes, cabbage, oranges, bananas, okra **1**=yes **2**=no	**7.11** Vitamins, mineral supplements, **1**=yes **2**=no	**7.12** Oil,fats **1**=yes **2**=no	**7.13** Yesterday during the day and night, how many times did you feed (Name) solid and semisolid foods to make the child full?
1												
2												
3												

SECTION 8. HOUSEHOLD FOOD CONSUMPTION AND DIETARY DIVERSITY]

I would like to ask you how many times in the last seven days were the following foods consumed by child(ren) 6-23 months

Food Item	Freq/ Week	Food Item	Freq /Week
Maize		Liver	
Rice		Milk	
Sorghum		Fish	
Cassava		*Omena*	
Millet		Meat	
Raw bananas		Groundnuts	
Organ meat		Eggs	
kales		Avocado	
Cabbage		Mangoes	
Spinach		Pawpaws	
Carrots		Passion fruits	
Tomatoes		Ripe bananas	
Pumpkins		Oranges	
Yellow Sweet potatoes		Guava	
Beans		Water melon	
Peas		Herbs	
Ndengu		Supplements	
Irish Potatoes		Seasoning	
chapatti			

APPENDIX III: FOCUS GROUP DISCUSSION GUIDE

1. What is your perception on about the diet diversity in Kibera slum
2. What are the factors that affect the dietary diversity in Kibera
3. What are the dietary practices adopted in Kibera.
4. what are the common illnesses among the children in Kibera

APPENDIX VII: RESEARCH PERMIT

REPUBLIC OF KENYA

NATIONAL COUNCIL FOR SCIENCE AND TECHNOLOGY

Telephone: 254-020-2213471, 2241349
254-020-310571, 2213123, 2219420
Fax: 254-020-318245, 318249
When replying please quote
secretary@ncst.go.ke

P.O. Box 30623-00100
NAIROBI-KENYA
Website: www.ncst.go.ke

Our Ref: NCST/RCD/12A/012/228

Date: 26th July 2012

Sussyann Makena Miriti
Kenyatta University
P.O.Box 43844-00100,
Nairobi.

RE: RESEARCH AUTHORIZATION

Following your application for authority to carry out research on "***Dietary diversity, morbidity patterns and nutritional status of children (6-23 months) in Kibera Slum, Nairobi County, Kenya,***" I am pleased to inform you that you have been authorized to undertake research in **Nairobi Province** for a period ending **31st December, *2012*.**

You are advised to report to **the Provincial Commissioner, the Provincial Director of Education and the Provincial Director of Medical Service, Nairobi Province** before embarking on the research project.

On completion of the research, you are expected to submit **two hard copies and one soft copy in pdf** of the research report/thesis to our office.

DR. M. K. RUGUTT, PhD, HSC.
DEPUTY COUNCIL SECRETARY

Copy to;

The Provincial Commissioner
The Provincial Director of Education
The Provincial Director of Medical Services
Nairobi Province.

APPENDIX VIII: RESEARCH PERMIT

PAGE 2

THIS IS TO CERTIFY THAT:
Prof./Dr./Mr./Mrs./Miss/Institution
Sussyann Makena Miriti
Of (Address) Kenyatta University
P.O BOX 43844-00100
NAIROBI
Has been permitted to conduct research in

Nairobi — Location
Nairobi — District
Province

On the topic: Dietary diversity, morbidity patterns and nutritional status of children (6-23months) in Kibera slum, Nairobi county, Kenya.

For a period ending: 31st December 2012

PAGE 3

Research Permit No. NCST/RCD/12A/012/228
Date of issue 27th July 2012
Fee received KSH.1000

Applicant's Signature

Secretary
National Council for Science and Technology