

**COMPLEMENTARY FEEDING PRACTICES AND NUTRITION STATUS
AMONG CHILDREN AGED 6-23 MONTHS IN MACHAKOS COUNTY, KENYA**

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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.

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DEDICATION

To my wife Wanjiru Chomba, children Christine Wahu and Fidelis Wanjiku- and to my parents Mr. and Mrs.Kigo, Mr Maina, and all my friends for their support.

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Firstly, the researcher thanks God for giving him courage, mercy and guidance to carry out this study. Sincerely thanks the supervisors Dr. Dorcus Mbithe of Kenyatta University, Department of Food, Nutrition and Dietetics and Dr. Irene Ogada of Mount Saint Vincent University, Canada for their professional guidance and determination in assisting the researcher during the course of this study.

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LIST OF ABBREVIATIONS AND ACRONYMS

| | | |
|-------------|---|---------------------------------------|
| AEZ | : | Agro-Ecological Zone |
| AIDS | : | Acquired Immunodeficiency Syndrome |
| ASAL | : | Arid and Semi-Arid Land |
| BFHI | : | Breast Feeding Health Initiative |
| CBOs | : | Community based Organizations |
| CF | : | Complementary Feeding |
| CHV | : | Community Health Volunteers |
| CIDP | : | County Integrated Development Program |
| DDS | : | Dietary Diversity Score |
| FBOs | : | Faith Based Organizations |
| FGDs | : | Focus Group Discussions |
| GOK | : | Government of Kenya |
| HINI | : | High Impact Nutritional Interventions |
| HIV | : | Human Immunodeficiency Virus |
| ICF | : | Infant and Child Feeding |
| IYCF | : | Infant and Young Children Feeding |
| KAP | : | Knowledge Attitude and Practices |

| | | |
|----------------|---|--|
| KDHS | : | Kenya Demographic Health Survey |
| KIIs | : | Key Informants Interviews |
| KNBS | : | Kenya National Bureau of Statistics |
| KU | : | Kenyatta University |
| MAD | : | Minimum Acceptable Diet |
| MDD | : | Minimum Dietary Diversity |
| MIS | : | Micro Indicator Survey |
| MIYCN | : | Maternal Infant and Young Child Nutrition |
| MMF | : | Minimum Meal Frequency |
| MOH | : | Ministry Of Health |
| MSPS | : | Ministry of State for Public Service |
| NACOSTI | : | National Commission for Science, Technology and Innovation |
| NGOs | : | Non-Governmental Organization |
| SBCC | : | Social and Behavior Change Communication |
| SPSS | : | Statistical Package for the Social Science |
| UNICEF | : | United Nations Children Fund |
| USAID | : | United States agency for the International Development |
| WHO | : | World Health Organization |
| WHZ | : | Weight for Height Z scores |

STANDARD DEFINITIONS OF TERMS

Breast feeding: Feeding a young child with breast milk from the breast or as expressed breast milk (WHO, 2010)

Complementary feeding practices: Continued breast feeding at one and at two years, timely introduction of food, dietary diversity, feeding frequency, and minimum acceptable diet.

Meal frequency: Number of times children are fed semi-solid or solid foods based on a 24 hour recall (WHO, 2010)

Minimum Meal Frequency: Proportion of breastfed children aged 6-8 months who received meals ≥ 2 times in a day, breastfed children 9-23 months who received meals ≥ 3 times in a day, and non-breastfed children 6-23 months who received meals ≥ 4 times in a day

Minimum dietary diversity: Proportion of children 6-23 months who received ≥ 4 out of 7 food groups based on a 24 hours recall period (WHO 2010)

Minimum acceptable diet: as the proportion of breastfed children 6-23 months who had at least minimum dietary diversity and the minimum meal frequency during the previous day, and non-breastfed children 6-23 months who received at least 2 milk feedings and had at least the minimum dietary diversity not including milk feeds and the minimum meal frequency during the previous day (WHO 2010)

Nutrition status: Height for age measuring stunting, weight for age measuring underweight and weight for height measuring wasting.

Stunting: Children whose height-for - age Z-scores is below minus 2 Z-scores from the population.

Caregiver: Caretaker of a study child

Petty trade: Insignificant occupation

Poverty: Scarceness of resources

Young: Study child aged 6-23 months

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ABSTRACT

From six months of life onwards, when breast milk alone is no longer sufficient to meet all nutritional requirements, human children enter a vulnerable period of complementary feeding during which the incidences of infections and under nutrition rises sharply in most countries. Children in households in semi-arid areas such as Yatta Sub-County in Machakos County are particularly vulnerable to under nutrition. Timely initiation of complementary feeding practices, minimum meal frequency, minimum dietary diversity and minimum acceptable diet are among the core indicators of complementary feeding practices. The purpose of this study was to determine complementary feeding practices and nutrition status of children in Yatta Sub-County of Machakos County, Kenya. A cross-sectional analytical study was conducted on a random sample of 377 caregiver-child pairs drawn from one of the five wards. Data collection tools included: a researcher-administered structured questionnaire, anthropometry, key informant interview (KIIs) schedules for nutritionists and community health volunteers (CHV) and focus group discussion guides (FGDs) for caregivers. Quantitative data was analyzed using SPSS version 20.0. Children's anthropometric data was entered and analyzed in ENA for SMART and interpreted based on the WHO 2006 growth standards. P-values of <0.05 were considered significant. Pearson correlation coefficient was used to establish relationships between continuous variables. Chi-square tests were performed to establish the relationships among the demographic and socio-economic characteristics, complementary feeding practices and nutrition status of children. Qualitative data from FGDs and KIIs were tape recorded, common views captured, coded and organized into themes for generalizations to be made. The average household income was kes 3,233 per month while the mean caregiver's age was 26 years. The caregiver's main occupation was unpaid household work, referred to as house wife (59.9%). Overall 72.9% of children were breastfeeding while 60.5% met the minimum dietary diversity and 76.1% attained the minimum meal frequency while two fifths (39.8%) attained minimum acceptable diet. About 33.7% of the children were stunted, 6.6% wasted and 16.4% were underweight. About 33.7% were sick 2 weeks before data collection. Slightly more than a tenth of the children (13.8%) had a fever, 9.6% had diarrhea while 8.5% suffered from upper respiratory infections. Chi-square test results did not demonstrate at $P<0.05$ any relationship between complementary feeding practices and nutrition status. Pearson correlation coefficient showed at $P<0.05$ a positive correlation ($r=0.105, r=0.112$) between households income and caregivers occupation with minimum acceptable diet implying that children in households with higher income and those of house wives were more likely to achieve minimum acceptable diet. Household's demographic and socio-economic characteristics did not show any correlation with nutrition status of the children. Likewise presence of illness did not show any correlation with wasting, stunting and underweight. The findings of this study recommended that the County government of Machakos domesticate the Kenya food and nutrition security policy where value addition of vegetables and fruits will be prioritized in the County integrated development program (CIDP) in order to support manufacturing and extension services to ensure decent jobs and sustainable economic development.

CHAPTER ONE: INTRODUCTION

1.1 Background to the study

In 2018 the United Nations Children Fund (UNICEF) identified under nutrition to have deprived far too many children of the energy and the nutrients they needed for optimal growth and development and was linked to slightly below a half of all deaths of children under 5 years globally (UNICEF, 2019). The transition period from exclusive breastfeeding to consuming a wide range of foods in addition to breast milk generally between (6-24 months) is considered as complementary feeding period (Dewey, 2013). Ensuring adequate nutrition during complementary feeding is a global health priority (Dewey, 2013). In developing countries, this period is marked by significant growth faltering, and high occurrence of infections which increases nutritional needs, hence, inappropriate feeding practices during this period are known to impact child nutrition, health and overall development negatively (Dewey 2013 ;Waswa 2015). Globally, inappropriate complementary feeding practices was a major cause of under nutrition in 2014 (Marriott, White, Hadden, Davies, & Wallingford, 2015). There exists scientific evidence suggesting that the relationship between complementary feeding practices and nutrition status is significant. A review by Marriott, White, Hadden, Davies and Wallingford, et al., 2014 of 14 Demographic Health Survey (DHS) data sets from poor countries found that dietary diversity and meal frequency were associated with a significantly lower risk of both stunting and underweight ($p < 0.001$). In Arimond and Ruel's (2013) review of DHS in eleven low-income countries, associations between dietary diversity and stunting were found to be significant as a main effect in seven of the 11 countries studied. Complementary feeding is the process beginning when breast milk

alone is no longer enough to meet the nutritional requirements of children and hence other foods and liquids are needed, along with breast milk (WHO, 2015).

The World Health Organization (WHO) 2010 recommended that children continue breastfeeding for two years or more, receive solid and semi-solid foods starting at six months, thus optimal feeding should be consumption of meals twice in a day for breastfed children 6-8 months of age; at least three times in a day for those aged 9-23 months and those children not breastfeeding to receive meals 4 or more times in a day; minimum dietary diversity as the number of children 6-23 months of age who consumed four or more out of the seven food groups namely: grains, roots and tubers; legumes and nuts; dairy products, flesh foods, eggs, Vitamin-A rich fruits and vegetables and other fruits and vegetables and children with minimum acceptable diet as the breastfed children aged 6-23 months who achieved minimum meal frequency and a minimum dietary diversity 24 hours to data collection as well as non-breastfed children who notwithstanding the above, got not less than 2 milk feedings amid the earlier day.

In 2018 among children aged 6-23 months optimal complementary feeding practices were known to be crucial in securing effective, long term nutrition wellbeing (Maasai, In, &South, 2018). According to UNICEF 2019 worldwide, only over two thirds of children aged six to eight months were consuming complementary foods. In 2015 lack of a diversified diet was particularly a severe problem among children in poor populations in the developing world as most diets were based predominantly on starchy staples (Sussy & Makena, 2016). In 2015 it was estimated that 6% of all deaths of children under

five years in third world countries could be avoided by complementary feeding (CF) practices that adhered to WHO recommendations (Roba, Connor, Belachew, & Brien, 2016). In 2013 in Sub Saharan Africa 65% of children aged 6-8 months consumed semi-solid, solid or soft foods, while in Kenya it was 85% (UNICEF, 2014). In 2015 in a study in rural Ethiopia 50.5%, 12.0% and 22.2%, of the children achieved minimum meal frequency, minimum acceptable diet and minimum dietary diversity respectively (Roba,2016). In Kenya, in 2010, sub-optimal complementary feeding practices contributed to more than ten thousand annual deaths of children under 5 years (MOPHS, 2007-2010). According to the Kenya demographic health survey (KNBS & ICF Macro, 2015) only about 21% of children aged 6-23 months in Kenya consumed a minimum acceptable diet. The number of children who had a minimum acceptable diet in Machakos County in 2014 was 48.1% (KNBS & ICF Macro, 2015).

In 2015 worldwide about 150 million children under five years were malnourished with 70% being in the developing world and about 27% of these children were in Africa (Sussy & Makena, 2016). Household's surveys in 2018 indicated that globally the rates of stunting and wasting were generally higher in boys than in girls (WHO, 2019). According to UNICEF 2019 wasting threatened the lives of 7.3% of the world's children under 5 years or around 50 million children globally. In 2013 wasting led to the deaths of about 13% of children under-five years worldwide representing 875,000 child deaths that could have been prevented (UNICEF,2019). In Kenya in 2014 wasting in children was inversely related to household wealth (KNBS & ICF Macro, 2015). In 2014 four-fifths of undernourished children lived in just 36 countries, including Kenya, with cross-sectional

studies showing that stunting levels were high, ranging from 30% to 50% (Amunga, 2015). In 2018 about a quarter (26%) of children in Kenya were stunted, 4% were wasted while 11% were underweight (Mwangi, 2018). According to (KNBS & ICF Macro, 2015) in Kenya among children aged 18-23 months, 47.2 % were stunted. In 2013 Kenya was listed number 12 among nations that had the highest number of stunted children globally (UNICEF, 2013). According to UNICEF, 2019 stunting was a clear sign that children in a country were not developing well and is both a symptom of past deprivation and a predictor of future poverty.

According to UNICEF, 2019, the greatest burden of all forms of malnutrition was shouldered by children from the poorest and most marginalized communities, perpetuating poverty across generations (UNICEF, 2019). In 2017 in Kenya, the arid and semi-arid land region experienced high rates of poverty, poor access to basic services and malnutrition (Vossenaar et al., 2017) .This region was also one of the most vulnerable in the world to environmental shocks like drought and climate change (Vossenaar et al., 2017). In 2019 eastern region (former Eastern Province) in Kenya had one of the country's highest stunting levels among children of 30% most of whom lived in the rural areas (Macharia, Mbithe, Kimani, & Chege, 2019). According to the (KNBS & ICF Macro, 2015), in Machakos County in the eastern region in Kenya 33.6% of children under-five years were stunted. According to WHO 2010, this level of stunting was unacceptably high. Machakos County lie in the arid & semi-arid agro ecological zone (KNBS & ICF Macro, 2015). Yatta Sub-County is a semi-arid sub-county in Machakos County and is characterized by temperatures ranging between 25°C and 29°C and low

average rainfall of 450-800mm annually (KNBS & ICF Macro, 2015). In 2014 the livelihood of the majority of the inhabitants was agriculture (KNBS & ICF Macro, 2015). In 2013 drought affected productivity of major crops and livestock (Bukania et al., 2014). This posed the greatest danger to the livelihoods of the inhabitants. With this information, it is logical to expect high prevalence of under nutrition among children in the semi-arid region in Yatta Sub County as semi-aridity affects complementary feeding practices. Minimal information exists on the complementary feeding practices and nutrition status of children in rural areas (Kimiye et al., 2017).

1.2 Problem Statement

The 1000 days of life is considered a “critical window” for the promotion of optimal growth, health and development of children which are directly dependent on nutrition (Berhanu, Alemu, & Argaw, 2019). During this period, the nutrition status of the child can be corrected as it gives an excellent opportunity to affect this child’s nutritional status (WHO, 2010). However, after this period, little may be done to change the outcome of the nutrition status (Kimiye & Chege, 2015). Inappropriate complementary feeding (CF) practices such as untimely introduction of complementary foods, improper frequency for feeding, low diet diversity of complementary foods have been shown to increase the risk of under nutrition among children under-five years (Ceaton et al., 2010; Arimond et al., 2008; Chelimo, 2008; Nyangweso et al., 2007). In a study in Kitui County the dietary diversity score (DDS), number of meals taken per day and frequency of food consumption, correlated significantly ($P<0.05$) with nutrition status of the children (Kimiye & Chege, 2015). Thus, it is important to relate complementary

feeding practices and nutrition status of children especially in arid and semi-arid land (ASAL) like in Yatta Sub County, where agricultural livelihood is frequently affected by drought. Whereas a lot has been put in place to promote, support and increase the rates of breastfeeding, there are some gaps on the relationship between CF practices and the nutritional status of under five years children (Dewey, 2005).

According to the (KNBS & ICF Macro, 2015), only about 21% of children aged 6-23 months in Kenya consumed a minimum acceptable diet (MAD). In a study in Tharaka Nthi County Kenya, located in the ASAL ,introduction of children to solid and semi solid foods was as early as three months while the children aged 6–23 months who met minimum dietary diversity (MDD) was only 47.3% (Ambia, 2019). In the same study the children who met MAD was only 21.2% and 25.0% for breastfed and non-breastfed children respectively. In a study in Machakos County, only 27.7% of children aged 6–23 months had MDD (Bukania et al., 2014). Yatta Sub-County in Machakos County, Kenya is located in ASAL that receives irregular rainfall with repeated episodes of famine that increases the risk of under-nutrition among its children (KNBS & ICF Macro, 2015).

Globally at least one third of children under 5 years were not growing well in 2018, due to malnutrition in its more visible forms; stunting and wasting (UNICEF, 2019). Wasting can be fatal for children particularly in its most severe forms (WHO, 2019). Despite the global efforts and initiatives placed in ensuring that children meet their nutrient requirement and attain optimal growth and development (Ruel et al., 2013), developing countries still loom with inadequate feeding practices among the infant and young

children. In 2018 about a quarter (26%) of children in Kenya were stunted, 4% were wasted while 11% were underweight (Mwangi, 2018). In 2016 residents living in ASAL regions had higher prevalence of under nutrition (Pereira, 2016). In a study in Tharaka Nthi County, the proportion of children who were underweight was 20.2%, those stunted 32.1% and those wasted were 7.3% (Ambia, 2019). In Kitui County the levels of acute malnutrition for wasting were relatively high (3.9%), the levels of acute stunting were 28.3% and those of underweight were at 11.4%. In 2014 in Machakos County located in the eastern region, 33.6% of children younger than five years were stunted (KNBS & ICF Macro, 2015). This high burden of under nutrition is a threat to achieving the Kenyan vision 2030 and sustainable development goals (MPHS, 2012). This study aimed at generating information on the factors that determine the CF practices and the nutritional status of children 6-23 months as there is restricted evidence on the CF practices and nutrition status in rural areas.

1.3 Purpose of the Study

The purpose of this study was to determine complementary feeding practices and nutrition status among children aged 6-23 months in Yatta Sub County, Machakos County.

1.4 Objectives

The specific objectives of this study were to;

1. Determine the demographic and socio-economic characteristics of households with children aged 6-23 months in Yatta Sub-County.

2. Determine the complementary feeding practices of children aged 6-23 months in Yatta Sub-County.
3. Establish the nutrition status of children aged 6-23 months in Yatta Sub-County.
4. Determine the prevalence of morbidity among children aged 6-23 months in Yatta Sub-County.
5. Establish the relationships between the socio-economic and demographic characteristics of households, complementary feeding practices, and the nutrition status of children aged 6-23 months in Yatta Sub-County.

1.5 Hypotheses of the Study

H0₁: There is no significant relationship between complementary feeding practices and nutrition status of children aged 6-23 months in Yatta Sub County.

H0₂: There is no significant relationship between demographic and socio-economic characteristics of households and complementary feeding practices among children aged 6-23 months in Yatta Sub County.

1.6 Significance of the Study

This study provided an updated status of complementary feeding practices, prevalence of morbidity and nutrition status among children aged 6-23 months and the demographic and socio-economic characteristics of households of these children in ASAL setting. The study has led to an improved understanding of the significant relationships between the socio-economic and demographic characteristics of households, complementary feeding

practices and the nutrition status among children in ASAL communities hence useful to the ministries of health, agriculture, water, planning, social protection, the development partners, private sector, civil society and other livelihood support related agencies for policy, practice and further research.

1.6 Delimitation of the Study

The study was conducted among caregivers with children aged 6-23 months living in Yatta Sub County in arid and semi-arid areas in Machakos County, Kenya. The findings could therefore only be generalized to populations with similar characteristics.

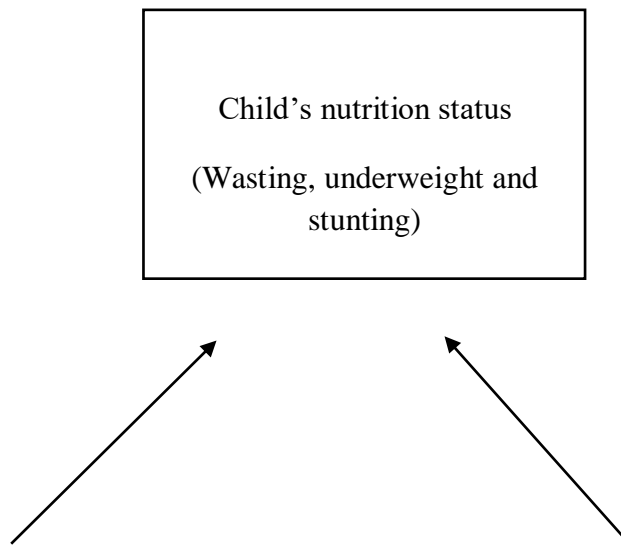
1.8 Limitations of the Study

This was a cross-sectional study and thus did not reveal the complementary feeding practices and nutrition status of the children aged 6-23 months in the different times of the year.

1.9 Conceptual Framework

According to UNICEF (2014) several factors exhibit complex interaction to determine the nutrition status of children. Figure 1.1 shows an adapted version of the UNICEF'S conceptual framework on CF practices and nutrition status of children. There is a synergistic relationship between the prevalence of morbidity and CF practices which are the primary determinants of children nutrition status where they influence each other. Sub optimal CF practices increases the prevalence of morbidity among the children as there is decreased immunity and increased chances of developing diseases (UNICEF, 2014).

Then presence of diseases influences CF practices because of lack of appetite which affect children nutrition status (Bukusuba, Kikafunda & Whitehead, 2009).



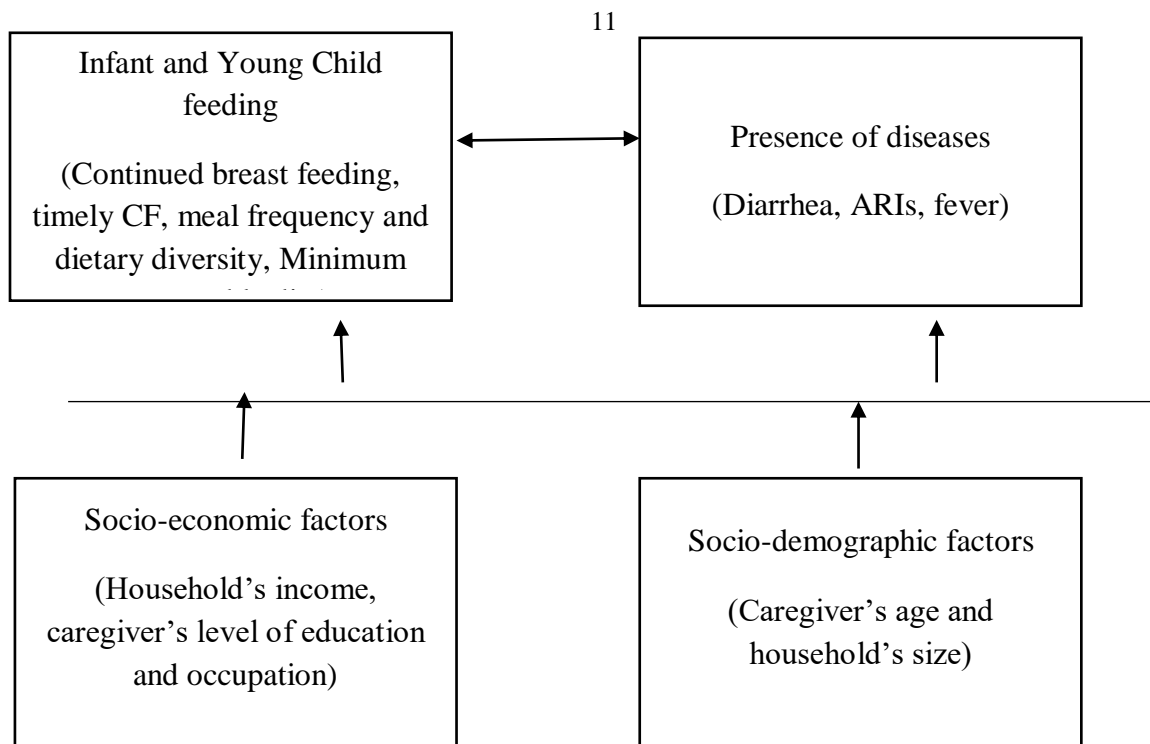


Figure 1.1: Conceptual framework on complementary feeding practices and nutrition status by UNICEF (2013). *Adapted from: UNICEF & Engle (1990, 1998, 1999 and 2013).*

Complementary feeding practices affect the dietary intake and the nutrition status of children aged 6-23 months by influencing the nutrients available to the child (Mwangi, 2018). The socio-economic status (income, occupation and level of education), socio-demographic status (household size and caregivers age), are conceptualized as factors that influence CF practices and consequently the nutrition status of children (Mwangi, 2018). The study adopted and modified the conceptual framework on complementary feeding practices and nutrition status by UNICEF (2013). Semi-arid conditions in Yatta Sub County can predispose children to sub-optimal CF practices, infectious illnesses and consequently affect their nutrition status.

CHAPTER TWO: LITERATURE REVIEW

2.0 Households Demographic and Socio-economic Characteristics

The demographic and socio-economic characteristics of households affect child's nutrition status and these factors can be found within a household (Kabubo-Mariara et al, 2011). It affects their complementary feeding practices and consequently their morbidity status. Some of these characteristics include the household's income, household's size, caregiver's occupation, level of education and age.

2.1.1 Household's Income

Household's physical assets, human capital and natural resources determine its ability to produce sufficient food for its members and to generate enough income to purchase food (Ambia, 2019). Regional variation in weight-for-age z-score has been explained through differences in household socio-economic characteristics (King'olla, Ohiokpehai, & David, 2009). In ASAL, low household's income against elevated prices of staple foods and depleted household's stock restrict consumption of adequate and recommended diet (Ambia, 2019). In contrast in a study in Mbeere South District, there were no direct significant associations between household's income and nutritional indicators (Badake et al., 2014). However, there was a significant association ($P < 0.05$) between household's income and the number of food groups consumed (Badake et al., 2014). In a study in Machakos County Kenya, increased household's income was a major contributor to

improved nutrition, although on its own it was not enough; it may have been inefficient or ineffective if women had no level of control (Bukania et al., 2014).

In 2011 globally, household's expenditure influenced CF practices which in turn affected children nutrition status (WHO, 2011). Using data from national cross-sectional survey, Masiye et al. (2010) examined the determinants of nutritional status of under-fives in Zambia. The results showed that household expenditure was the main determinant of nutritional status of a child. In a study that used demographic health survey data to explore the distribution of feeding practices and examine relationships among CF and socio-demographic and health behavior indicators in Kenya, Uganda and Tanzania, children living in households within higher wealth index quintiles were associated with significantly higher chances of achieving adequate DDS compared to those living in households within the lowest wealth index quintile. In Kenya, significance was shown among households in the second, fourth and fifth wealth index quintiles (Gewa & Leslie, 2015). In 2016 wasting was most pronounced within the lowest wealth quintile group (7.3 percent) (Pereira, 2016). In 2014 the proportion of underweight children decreased as household's income increased (KNBS & ICF Macro, 2015). In 2016 there was some association between stunting and poverty in Kenya (Pereira, 2016). When stratified by household's income, the prevalence of stunting in the poorest quintile was two and a half times higher than it was for the richest quintile in Kenya in 2016 (Pereira, 2016). In 2016 although stunting rates in the two wealthiest quintiles were lower than that for the poorest quintile, they remained unacceptably high, at 14% and 21%, demonstrating that poverty alone did not cause malnutrition in 2016 (Pereira, 2016). At the geographic level, most

(but not all) of the counties with very high stunting rates also had the highest poverty rates but not all the counties with highest poverty rates had the highest stunting rates, indicating a less than perfect association which necessitated other studies (Pereira, 2016).

In a study on the determinants of malnutrition among children in the ASAL Tharaka Nthi County Kenya, the mean household's income was only Kes. 7,279 where most (43.6%) of it was spent on food purchases (Ambia, 2019). In a similar study in Isiolo County, Kenya many families depended on small-scale businesses (47.0%) and on casual labor (46.1%) for their source of income (Macharia et al., 2019). In a study in Mbeere South District, the mean monthly household income was US\$ 61.3 where the majority (52.2%) of the households earned less than US\$ 0.7 a day (Badake et al., 2014). In 2015 in a similar study in Kitui County by Kimiywe and Chege , 69.2% of caregivers had low levels of income (Kimiywe & Chege, 2015).The study noted that household's income correlated significantly ($P < 0.05$) with the dietary practices adopted among the children. There is scarce information on the relationship between household's income and complementary feeding practices and the nutrition status of children aged 6-23 months in Yatta Sub County.

2.1.2 Household Size

In 2016 increase in household's size had a detrimental effect on children's probability of meeting minimum meal frequency among single mothers ($p < 0.05$) in a study in Benin (Mitchodigni, Hounkpatin, & Ntandou-bouzitou, 2017). In the same study children from large household's sizes and those whose caregivers were involved in income-generating

activities, were less likely to meet MMF ($p < 0.05$) (Mitchodigni et al., 2017). Household demographic characteristics among them, household size, were identified as some of the key determinants of chronic malnutrition in Kenya (Ambia, 2019). Large household's size has been shown to relate negatively with the nutrition status of the members due to the increased need for food with the increase in the number of members (Kopi, 2012), there is an increased likelihood of an inadequate intake of food due to low food supply since the dependency ratio in the large households limits the source of income in the household.

A study conducted in Kwale County, Kenya by Adeladza (2009) revealed that large household's size predisposed children to wasting. In a similar study in Tharaka Nthi County Kenya, significant associations between household's size and underweight ($p = 0.009$) and stunting ($p = 0.029$) were shown but no significant associations were shown with wasting ($p = 0.548$) (Ambia, 2019). In a similar study in Mbeere south District, negative significant relationships were observed between the household's size and nutritional status based on stunting and wasting (Badake et al., 2014). In 2014 in a study in Machakos County, large household size which was a common characteristic of households in the ASAL was likely to compromise quantity and the quality of the dietary intake by children (Bukania et al., 2014). In a similar study in Mandela County Kenya, the mean household's size was 5.3 members which was higher than the national level of 3.9 (KNBS & ICF Macro, 2015). In a study in Narok County Kenya, in 2018 the mean and median household's size of the sampled population was 5.87 (± 2.2) and 5 respectively (stella et al., 2018). In a similar study in Marsabit County, Kenya the mean

household's size was 5 members (Galgallo, 2017). In a study in the neighboring Isiolo County Kenya, the mean household size was 6 (± 1.95) (Amunga, 2015) and the same was found in Isiolo and Tharaka Nthi Counties in other similar studies (Macharia et al., 2019;) (Ambia, 2019). According to KNBS & ICF Macro, 2015 the mean household's size in a survey in Kitui County was 5.1 members which was higher than the national level of 3.9% .The overall mean household size of 7 in Machakos and Makueni Counties in 2009, was found to be much higher than the national mean of 4.2 (KNBS, 2009). There is limited literature on the relationships among household's size, CF practices and the nutrition status of children in the ASAL.

2.1.3 Caregivers Occupation

In 2017 in a study done in southern Benin, children whose caregivers were involved in income-generating activities, were less likely to meet MMF ($p < 0.05$) (Mitchodigni et al., 2017).The occupation of caregivers appeared in 2009 to be the major factor in influencing the level of wasting of children in a study in Kwale (Adeladza & Adeladza, 2009). In 2009 the children of farming caregivers had a higher prevalence of wasting than those of housewives (Adeladza & Adeladza, 2009). On the other hand in 2015, the caregivers working status was shown to be a significant factor in Kenya, where children whose caregivers were working at the time of data collection were correlated with 47% increased chances of attaining the minimum dietary diversity score compared to those caregivers not working (Konyole, 2014). In a study on feeding practices and nutrition status of children in Kenyan prisons, the main occupation practiced by (31.1%) of the caregiver's while out of prison was petty trade (Ndanu, 2013). In a study in Mandela

County Kenya, majority of the participants were housewives (53.6%) and 15.9% were pastoralists (GOK, 2017). In a study in Kwale in 2009, 59% of the caregivers were housewives (Adeladza & Adeladza, 2009). In Isiolo County Kenya, the occupation of the household head was small scale trader (44.6%) and casual labor (36.8%) (Macharia et al., 2019). In a similar study in the ASAL Tharaka Nthi County, Kenya 28.9% of caregivers were casual laborers and only 8.2% were in formal employment (Ambia, 2019). In a similar study in Mbeere South District the main caregiver's occupation was farming (43.1%) and 14.1% were casual laborers (Badake et al., 2014). In a survey in Kitui County, in 2017, 38.9% of caregivers were mainly housewives with a number of them practicing farming (18.6%) and owning business (14%) as their main source of livelihood (GOK, 2017). There is scarce information on the relationships between caregiver's occupation, CF practices and the nutrition status of children.

2.1.4 Caregivers Level of Education

Maternal education influences maternal decisions and is a predictor of child nutrition status (Waswa, 2015). According to Herforth, Jones, & Pinstrup-Andersen, (2012) knowledge allows women who are the primary caregivers to have greater access to household's resources that are important for nutrition. Caregivers who lack knowledge are not able to make best use of available food resources (Inayati et al., 2012). Analysis of Cambodia Demographic and Health Survey for 2005, found out that the prevalence of stunting and wasting decreased significantly with high levels of maternal education (Zhang et al., 2010; Miller & Rodgers, 2009). A study by Ojiako, Manyong, & Ikpi (2009) in Nigeria suggested that educated caregivers were better equipped to enhance

childcare practices and thus better outcomes. At the Kenyan national level in 2014 the proportion of underweight children decreased as caregiver's level of education increased while children whose caregivers had no education had a higher chance of wasting (10%) than children whose caregivers had some education (4% or less) (KNBS & ICF Macro, 2015). In the KNBS and ICF Macro (2010), stunting was least common among children of more educated mothers and those from wealthier families.

A number of studies also depicted a significant relationship between maternal education and nutrition status of children (Adeladza, 2009; Ojiako, 2009; KNBS and ICF Macro, 2010; Janevic, Petrovic, Bjelic, & Kubera, 2010; Islam et al., 2013; Ndanu, 2013). A study conducted in Kwale by Adeladza (2009) revealed that maternal education reduced the levels of underweight in children. In contrast a study in the Kenyan prisons showed that children whose mothers had some form of formal schooling were more likely to be underweight. In the same study, wasting was significantly associated with maternal level of education (Chi-square test; $p= 0.019$) (Ndanu, 2013). Similarly, in a study on the factors associated with nutrition status of children in the ASAL Marsabit County Kenya, there was no significant association between maternal level of education and the nutrition status of children (Galgallo, 2017). The findings were also similar to those of a study in Tharaka Nthi County Kenya, which showed that there was no association between maternal education attainment and the nutritional status of children aged 6–59 months (all $p\text{-value} > 0.05$) (Ambia, 2019). Nevertheless in 2015 in a similar study in Kitui County by Kimiywe and Chege the caregiver's level of education correlated significantly ($P<0.05$) with the dietary practices adopted among the children. Similarly, in 2013 the

level of education of the caregivers strongly correlated with the nutrition status of the children in a study by Bukania in Machakos County (Bukania et al., 2014).

In 2013 in a marginalization outlook of the communities living in the ASALs, caregivers were not in a position to acquire education to reach above average level that accorded nutrition knowledge (W, 2013). In 2007 about four in every ten children had illiterate mothers, and 38% had mothers with secondary or more education in a study in Ghana (Hong, 2007). In study on factors associated with feeding practices and nutrition status of children in the ASAL Marsabit County, more than four fifths (85.8%) of caregiver's had not attained any formal education with only 8.8% having attended primary school (Galgallo, 2017). In 2015 in a study in Isiolo County Kenya, by Amunga, out of the 120 caregivers who had attended school, nearly all (96%) had only reached primary school level, whereas 3% had reached secondary school level and only 1% had reached tertiary level (Amunga, 2015). In another similar study in Isiolo County, almost half (47.5%) of the household's heads had not been through formal education (Macharia et al., 2019). In another study on determinants of malnutrition among children below five years in Tharaka Nthi County, Kenya, 67% of primary caregivers had not completed primary education while only 12.3% had attained secondary or higher education (Ambia, 2019). In 2015 in a study in Kitui County on CF practices and the nutrition status among children by Kimiywe and Chege about three quarters (70.6%) of caregivers had only attained primary level of education (Kimiye & Chege, 2015). There is restricted writing on the relationship between caregiver's level of education in the ASAL and CF practices and nutrition status of children.

2.1.5 Caregivers Age

Ojiako et al. (2009), underscored a negative relationship between the age of the caregiver and nutrition status of a child. This is because children with younger caregivers portrayed better nutrition status than those of older caregivers in 2009. However, in a study in Isiolo County Kenya, caregivers who were older, were more likely to breastfeed than did their counterparts who were younger. In the same study a higher percentage of caregivers who were older, as compared to the younger mothers, provided a minimum meal frequency for their children and had children with a better anthropometric status in terms of WAZ (Amunga, 2015). However in a related study in the same Isiolo County, the older the mother, the lower the Z scores ($r = -0.352$; $p = 0.030$) where children from older mothers were more likely to be acutely malnourished necessitating other studies (Macharia et al., 2019). Likewise in a study in Tharaka Nthi County on the determinants of malnutrition in children the test results indicated that wasting was associated with the age of the mother ($p = 0.008$) (Ambia, 2019). In a study by Kimiywe and Chege in Kitui County, in 2015 children whose caregivers were older (31-46 years), a significantly higher proportion was stunted compared to children whose caregivers were relatively young (15-30 years). Binary logistic regression revealed older age in caregiver and severe food insecurity to be strongly associated with stunting in children (Kimiywe & Chege, 2015). The same trend was observed where children whose caregivers were older (31-46 years) a significantly higher proportion was stunted compared to children whose caregivers were relatively young (15-30 years) in a study by Bukania in Machakos and Makueni Counties (Bukania

et al., 2014). In a study in Tharaka Nthi however there was no relationship between stunting and underweight and the age of the mother ($p = 0.074$) (Ambia, 2019).

In a related study on CF practices and nutrition status among children in the Kenyan prisons, the caregiver's mean (SD) age was 27.7 years (Ndanu, 2013) and this was close to the one obtained in a study on factors associated with nutrition status of children in Marsabit County Kenya, where the maternal mean age was 29 years (Galgallo, 2017). In a related study in Isiolo County Kenya, the mean caregiver age in years was 27 (± 7.64) (Amunga, 2015) and was therefore almost similar to the one obtained in another study in the same Isiolo County where the mean age of mothers was 28 years (Macharia et al., 2019). In 2009 about 53% of the caregivers surveyed in a study in Kwale were aged between 16 and 25 years (Adeladza & Adeladza, 2009). In a study on the determinants of malnutrition in children in Tharaka Nthi County, the mean age of the mothers was 27 years (Ambia, 2019). Despite these diverse effects of caregiver demographic and socio-economic characteristics on children's nutrition status, studies documenting the effects among children aged 6-23 months in ASAL are scarce.

2.2 Breastfeeding Practices

Children should continue breastfeeding at least up to their second birthday because breast milk remains an important part of their diet (Eggersdorfer et al., 2013; Dewey & Adu-Afarwuah, 2008; UNICEF, 2013). Increased incidences of diarrhea, pneumonia and high mortality among children have been linked with sub optimal breastfeeding (Galgallo, 2017). UNICEF (2011) [as cited by Ndanu, 2013] accentuated continued-breastfeeding after the first 12 months as one of the indicators of optimal breastfeeding. However, the

prevalence of breastfeeding in almost all countries in the world continues to fall significantly compared to what WHO and other infant nutrition experts have recommended (Roberts, et al., 2013). In 2014 continued breast feeding at one year was significantly negatively associated with stunting of children in Zimbabwe and in Ethiopia (WHO, 2015). In a study in Marsabit County, there was a significant ($p = 0.023$) association between current breast feeding status and nutrition status of children based on underweight. In that study children who were not breastfed were twice likely to be underweight compared to those who were breastfed (Galgallo, 2017).

In contrast to the evidence linking continued-breastfeeding with better nutrition outcomes, a study in Ethiopia by Teshome et al. (2009) showed higher stunting levels in children who were breastfed beyond one year than those below one year. Nevertheless, in a study in Isiolo County, a significant relationship was found between the child's gender and continued breastfeeding at one year ($p = 0.018$; 95% CI) where more female children breastfed at one year than did their male counterparts (Amunga, 2015). In the same study caregivers who were married, as compared to those who were not married were found to breastfeed their children for a longer period, while education had no relationship with the duration of breastfeeding.

According to KNBS & ICF Macro (2010) results, the average prevalence of continued breastfeeding at 2 years or beyond among the general population in Kenya was 57%. The national rate of continued breastfeeding at one year was 90% and 53% at two years in 2014 indicating a decline (KNBS & ICF Macro, 2015). In a study on MIYCN in Mandela

County, continued breastfeeding at 1 year (68.7%) and at 2 years (19.5%) had markedly decreased compared to KNBS & ICF Macro, 2015 (GOK, 2017). In a study in Marsabit County the prevalence of continued breast feeding up to 1 year was 85.7% while 75% of children continued breastfeeding at 2 years (18-23 months) (Galgallo, 2017). In a study conducted in the neighboring ASAL Isiolo County, continued breastfeeding at two years declined to 64%, from 94% at one year where more female children (55%) than male children (45%) were breastfed at two years and almost twice the number of female children continued breastfeeding at one year (63%) than did the male children (37%) (Amunga,2015). In a similar study in the same Isiolo County, continued breastfeeding at 1 year (12-17 months) was at 76.6% which declined to 40.2% at the age of 2 years (18-23 months) (Macharia et al., 2019). In a study on the determinants of malnutrition in children in Tharaka Nthi County, continued breastfeeding at one year stood at 92.3% while continued breastfeeding for two years and beyond was 66.7% (Ambia, 2019). In 2017 in a survey in Kitui County, continued breastfeeding pointer results were higher compared with the public normal as demonstrated by the KNBS & ICF Macro,2015 outcomes; continued breastfeeding at 1 year (91.2%) and continued breastfeeding at 2 years (70.8%) (Infant et al., 2017). Once more, little was known of the status of breastfeeding among children aged 6-23 months in Yatta Sub-County, Machakos County which is in ASAL.

2.2.1 Complementary Feeding Practices Among Children aged 6-23 Months

Complementary feeding practices refers to feeding solid or semi-solid foods in addition to and not in replacement of breast milk to meet child's increased requirements (WHO

2016). Ensuring adequate nutrition during CF period is a global health priority (Dewey, 2013). Studies have shown a correlation between under-five malnutrition and complementary feeding practices. Teshome et al., (2009) showed that complementary feeding practices were a contributing factor of stunting for children in West Gojam in Ethiopia. The effect of complementary feeding practices was also evidenced by progressive stunting among older children (Mulugeta et al., 2010). A study in Malawi showed that children who were given foods according to the timing set by the WHO were well-nourished as compared to children who were introduced to solids too early (Motuma et al., 2016).

In 2014 worldwide, CF practices began too early or too late, and foods were often inadequate nutritionally or unsafe (UNICEF/WHO, 2014). Again, instances of food shortage such as in droughts mainly in ASAL areas may have aggravated the inability of caregivers to provide diets that could be considered sufficient for their children (WHO, 2012). In developing countries, the CF period has been marked by significant growth faltering, high occurrence of infections which increased nutritional needs, hence, inappropriate feeding practices during this period is known to impact child nutrition, health and overall development negatively (Dewey 2013 ;Waswa 2015). In 2015 data existed in Ethiopia demonstrating the issue of lack of healthy sustenance started after birth, principally among neonates, when optimal development was interfered with by imperfect child care practices (Agedew & Chane, 2015). In Kenya, according to the Kenya Demographic Health Survey (KDHS) 2008–2009, only 39% of children aged 6-23 months were fed in accordance with the WHO 2010 recommended CF practices. In Kenya

in 2015, it was estimated that poor IYCF practices contributed to more than 10,000 deaths each year from malnutrition (Amunga, 2015). In 2017 poor breastfeeding and CF practices coupled with high rates of infectious diseases were the principal proximate causes of under nutrition during the first two years of life (Kimiye et al., 2017).

According to Tharaka Multiple Cluster Survey 2008, the percentage of children aged 6-8 months who fed adequately was 61% while those aged 9-11 months who fed adequately was 54% ((KNBS), 2009). In 2008 one way of sustainably reducing under nutrition was by using available indigenous plant and animal foods to prepare complementary foods that were nutritionally adequate to meet the needs of young children (WHO, 2008). According to the (KNBS & ICF Macro, 2015), maternal education and household's wealth tended to influence the ability of a child to receive appropriate feeding. In 2011 household expenditure influenced CF practices which in turn affected the nutrition status of children (WHO, 2011). Studies that focus on CF practices and nutrition status among the children aged 6-23 months in ASAL are quite scarce and thus inconclusive. Moreover, the revealed inconsistency portrays the need for more information regarding the complementary feeding practices and nutrition status. The complementary feeding practices that were reviewed in this study included breastfeeding practices, timely introduction of solid and semi-solid foods, minimum meal frequency, minimum dietary diversity, and minimum acceptable diet.

2.2.2 Timely Introduction of Solids, Soft or Semi-Solids Foods

The introduction of solid, soft or semi-solid meals (complementary feeding practices) should be timely, that is, at six months of age, to ensure that children meet their nutrients needs (Marriott et al., 2015). In 2011 inappropriate timing of introduction of CF practices deprived the child of optimum nutrition, leading to under nutrition, and increased morbidity (Hazir et al., 2011). However in a study on CF practices and nutrition status of children aged 6-23 months accompanying mothers in the Kenyan prisons, there was no significant correlation between timely introduction of solid and semi-solid foods with children's nutrition status (Ndanu, 2013). In similar study in Isiolo County, no significant relationship was found between the socio-demographic and economic characteristics and the timely introduction of solid, semi-solid and soft foods ($p > 0.05$) (Amunga, 2015). In 2013 the introduction to semi-solid or soft and solid foods for the children aged 6-8 months globally was at 65%, 65% in Sub Saharan Africa and 85% in Kenya (UNICEF, 2014). In 2003 a report in Pakistan showed that only 31% of children aged 7-9 months received solid or semi solid foods with breastfeeding from 1995 to 2003(Memon, 2001). In a study that was conducted in northern Senegal by Gupta, Gehhri and Stettler to assess the early introduction of water, as well as the CF practices and the nutrition status of children, the results showed that water was introduced to about 85% of the children during the first three months of life and that 62% of the children were fed complementary foods before they were six months old. In Uganda, the information available in 2005 suggested that there was inappropriate timing of introduction of complementary foods (Peterson & Tylleska, 2005).

The KDHS report (2009) showed that 84.9% of children aged 6-8 months were introduced to solids, semi-solid or soft foods in accordance with the WHO recommendations compared to 79.6% in 2014 indicating a decline (KNBS & ICF Macro, 2015). In the KDHS 2008-2009, 32% and 60% of children were introduced to solid, semi-solid or soft foods by two or three months and by four to five months respectively. The findings of a study on CF practices and nutrition status among children of mothers in the Kenya prisons showed that most of the children between 6-8 months old, (92.3%) had been introduced to solids, semi-solids or soft foods and the main food to which children had been introduced was porridge (Ndanu, 2013). In 2010 the KDHS survey showed that 36% of children in Rift valley below 6 months received complementary foods and only 39% aged 6-23 months were fed in accordance with infant and young child feeding (IYCF) Practices (KNBS and ICF Macro, 2010). In a related study in Mandela County, appropriate introduction of CF practices (6-8 months) was practiced by about half of the participants (53.2%) (GOK, 2017). However, this was low in comparison to the national level (80%) according to (KNBS & ICF Macro, 2015). In that study 46.6% of caregiver's believed that foods should be introduced at 7 months and above.

In contrast, all the children aged 6-8 months in a study by Kipruto, (2013) had appropriately been introduced to solids, semi-solids or soft foods. In a similar study in Isiolo County ,nearly two-thirds (69%), of the children aged 6-8 months had received solid, semi-solid and soft (complementary) foods at the time of study, with slightly more females (53%) than males (47%) having achieved this indicator (Amunga, 2015). In study carried out in Tharaka Nthi County, the introduction of children to solid and semi

solid foods according to focus group discussion was as early as three months and the common semi solid food was porridge while the common solid foods were *Ugali* and *Githeri* (Ambia, 2019). A study that was conducted by Macharia-Mutie, Brouwer, Mwangi and Koki in the former Mwingi District, Kenya indicated that 74% of the caregivers introduced complementary foods too early, meaning between one and three months. A survey in Kitui in 2017 illustrated that appropriate introduction of CF practices was practiced by majority of the caregivers (87.4%) (Infant et al., 2017). All of these studies showed that CF practices were often started before the child attained the recommended six months of age. Single mothers experienced a 23% higher level of hazards involved with the introduction of CF practices before six months of age than did their counterparts who were in unions (Amunga, 2015).

2.2.3 Minimum Meal Frequency

The WHO 2010 recommended that children's frequency of complementary feeding practices be ≥ 2 times per day for age 6-8 month; ≥ 3 times per day for age 9-23 months and 4 or more times per day for non-breastfed children aged 6-23 months (WHO, 2010). In 2016 it was forecasted that 6% of total deaths of children could be prevented by attainment of minimum meal frequency and minimum dietary diversity (Roba et al, 2016). In a study on feeding practices and nutrition status of children accompanying mothers in Kenyan prisons, nutrition status (underweight) showed a significant relationship with meal frequency ($p = 0.030$) where those children who had adequate meal frequency were more likely to be underweight. In that study three quarters (75%) of the children who were underweight, met the WHO recommendation for frequency of feeding. Stunting and wasting however, did not show any significant relationship with

this indicator (Ndanu, 2013). In a study on CF practices and nutrition status of children in Isiolo County, a significant relationship was identified between caregiver age and MMF ($p \leq 0.026$; 95% CI). A higher percentage of caregivers who were older, as compared to the younger mothers, provided a MMF for their children (Amunga, 2015). In a related study in the same Isiolo County, meal frequency (number of meals), was one of the significant feeding practices, in relation to nutrition status (wasting). The higher the number of meals a child was given, the higher the Z scores ($r=0.53$; $p=0.038$). However, stunting and underweight did not exhibit significant relationships with meal frequency (Macharia et al., 2019). In a study in Tharaka Nthi County on the determinants of childhood malnutrition in marginal areas, there was no significant relationship between MMF and wasting, stunting and underweight among the children (Ambia, 2019).

Romulus-Nieuwelink et al., (2011) in a study conducted among breastfed children aged 9 months in Brazil found out that feeding frequency of 3 meals per day was common. An educational intervention to promote appropriate CF practices and physical growth in 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 (Makena, 2016). In 2009 in many countries however CF practices were characterized by cases of low MMF causing children faltering (WHO, 2009). In a survey in Bangladesh in 2016 almost half of children under five years, did not consume the MMF (Makena, 2016). The frequency of complementary foods were inadequate in 76.4% of children in a study in Pakistan (Memon et al., 2001). Similarly, in a study conducted by Sawadogo, Yves, Claire, Alain, Alfred and Serge, et al., it was found that under half of the children aged

less than two years received the recommended MMF. In a study conducted in northern Ethiopia, only 44.7% of children received the MMF (Roba et al., 2016).

The Kenya demographic and health survey indicated that only 51% of children aged 6-23 months in Kenya had been fed the minimum number of times appropriate for their age (KNBS & ICF Macro 2015). In another survey in Kenya, the MMF for breastfeeding children aged 6-8 months was 62% in 2014 (KNBS & ICF Macro, 2015) and 60.7% for Tharaka Nthi County (KNBS, 2009). Those who met the MMF among breastfeeding children aged 6-23 months in rural Kenya was 45.6% and 49.5% for non-breastfeeding children (KNBS & ICF Macro 2015). In a survey conducted in the Kenyan prisons 100% of breastfed children aged 6-8 months met the recommended MMF. Of the breastfed children aged 9-23 months old, 82.9% met the recommended meal frequency. About two fifths (38.9%) of the non-breastfed children aged 6-23 months met the recommended MMF. This was found to have put a larger percentage (61.1%) at an increased risk of malnutrition occasioned by inadequate dietary intake among other factors (Ndanu, 2013). Surveys conducted in the pastoralist regions of Kenya, have indicated a low percentage of children aged 6- 23 months being fed according to the complementary feeding guideline (Amunga, 2015).

In a study on MIYCN in Mandela County, among all age groups (only 6-23 months) only 14.9% received a minimum meal frequency (GOK, 2017). In the 2013 Integrated Health and Nutrition survey that was conducted in Merti, Kenya, the results indicated that among children aged 6-23 months, 49% achieved the MMF (Amunga, 2015). In a related study in Isiolo County, over half of the children (60%) had achieved the MMF (with non-

breastfed and breastfed children achieving 65% and 60%, respectively). The MMF was higher among children aged 18-23 months (67%) than it was in the other age categories (6–11 months and 12–17 months at 58% and 54%, respectively). In contrast in another similar study in the same Isiolo County, the number of children who had received their recommended age group MMF declined steadily with their age. Additionally, few of the non-breastfeeding children met their MMF (Macharia et al., 2019). In a study on the determinants of childhood malnutrition in Tharaka Nthi County, the proportion of breastfeeding children aged 6–8 months who met the recommended MMF was 100% while those aged 9–23 months were 77.1%. The proportion of non-breastfeeding children aged 6-23 months who met the MMF requirement were 75% (Ambia, 2019). In a survey in Kitui County which is in the ASAL in 2017 the MMF was high except for the non-breastfed group (Infant et al., 2017). There is therefore inconsistency in the findings of the various studies on the prevalence of a minimum meal frequency and its relationship with other demographic & socio-economic characteristics and nutrition status variables necessitating other studies.

2.2.4 Dietary Diversity

Children aged 6-23 months should be fed a variety of nutrient- rich foods so as to meet their nutrients needs (WHO, 2010). The WHO 2010 recommended foods from grains, roots and tubers, legumes and nuts, dairy products, flesh foods, eggs, vitamin A rich fruits and vegetables and other fruits and vegetables. Consumption of foods from animals or fish by the children would provide proteins, iron, zinc and vitamin A (WHO, 2010).

2.2.5 Minimum Dietary Diversity

In 2010 a minimum of 4 out of 7 food groups was viewed as sufficient to meet the child's nutrition requirements (WHO, 2010). In 2019 a more diversified diet was highly correlated with such factors as caloric and protein adequacy (Macharia et al., 2019). A worldwide study by UNICEF, (2009) revealed that some 5.6 million children died every year in part because they were not getting enough of the right nutrients (Makena, 2016). Various studies have shown linkages between dietary diversity and malnutrition of under-fives (Bandoh & Kenu, 2017; Berra & Yang, 2017; Frempong & Annim, 2017; Senbanjo, Olayiwola, & Afolabi, 2016). Studies in Bangladesh (Zongrone, Winskell, & Menon, 2012; Rah et al., 2010) demonstrated a significant relationship between dietary diversity and stunting levels amongst children, as reiterated by Lutter et al. (2011). Other studies in Ghana by Nti & Lartey (2008) as well as Nti (2011) associated dietary diversity with all the three anthropometric indicators of nutrition status (WAZ, LAZ and WLZ).

In study on CF practices and nutrition status of children accompanying mothers in Kenyan prisons children who were underweight were more likely to consume a diet not meeting the MDD score (chi-square test; $p = 0.012$). However, stunting and wasting did not show any significant relationship with dietary diversity in that study (Ndanu, 2013). In a study on factors associated with nutrition status in Marsabit County, there was a significant relationship between DDS and underweight. Children who consumed less than 4 food groups were more likely to be underweight compared to those who consumed higher number of food groups. However, wasting and stunting did not show any significance (Galgallo, 2017). In a study on CF practices and nutrition status of children

in Isiolo County, a significant relationship was found between child age and MDD ($\rho = 0.000$; 95% CI). A significantly higher percentage of older children (18–23 months) attained a MDD than the percentage of younger children (6–11 and 12–17 months). On the other hand in the same study, no significant relationship was found between stunting and MDD ($\rho \geq 0.05$) (Amunga,2015).

Likewise in a related study in the same Isiolo County, stunting and underweight did not exhibit significant relationships with dietary diversity but nevertheless the children who were fed from more food groups had less wasting levels ($r=0.47$; $p=0.045$) (Macharia et al., 2019). However in a study on the determinants of nutrition status among children in the ASAL Tharaka Nthi County, the results indicated a significant relationship between dietary diversity and underweight ($p\text{-value} = 0.022$) (Ambia, 2019). Likewise in a study on nutrition status of children and associated factors in the former Mbeere District, there was a significant association ($P<0.05$) between household income and the number of food groups consumed (Badake et al., 2014).

In 2015 studies conducted in most developing countries showed that the recommended MDD was often not achieved (Amunga, 2015). In 2009 in a survey in Bangladesh two thirds of the children under five years of age did not meet the MDD (Makena, 2016). In 2013 in eleven of the twenty seven sub Saharan African countries analyzed, fewer than 30% of children aged 6-23 months achieved a MDD (Jones et al., 2014). According to Aemro et al., (2013) in the neighboring Ethiopia, only 10.8% of children were fed with the minimum recommended number of food groups. In 2019 evidence of poor dietary

diversity had also been found in rural Tanzania by Mamiro, Kolsteren, Roberfroid, Opsomer and Van Camp, with the findings concerned showing that most complementary foods provided were mainly cereal-based (Macharia et al., 2019). Similarly, in a study conducted by Sawadogo, Yves, Claire, Alain, Alfred and Serge, et al., it was found that the main complementary food given was porridge and that foods were of low dietary diversity. In Kenya 58% of children 6-23 months old met the recommended dietary diversity, (KNBS & ICF Macro, 2010) compared to 45% in 2003 which was a significant improvement (KDHS, 2003). However in 2014 the Kenya demographic and health survey indicated that only 41% of children aged 6-23 months in Kenya, had a MDD indicating a sharp decline (KNBS & ICF Macro, 2015). This prevalence varied among regions. Among the rural residents, the proportion of breastfeeding and non-breastfeeding children who met the dietary diversity requirement was 29.9% and 44.2% respectively. The overall rate was 32.1% in rural areas (KNBS & ICF Macro 2015).

In a study on feeding practices and nutrition status among children in the Kenyan prisons, slightly more than a half (53.3%) of children 6-23 months consumed a MDD where the dietary diversity score was 3.52 ± 1.04 (Ndanu, 2013). The findings of surveys conducted in the pastoralist regions of Kenya, have indicated a low percentage of children aged 6-23 months being fed according to the CF guidelines (Amunga, 2015). In a study on MIYCN in Mandela County, among all age groups (only 6-23 months) only 24.0% received a MDD. Further their diets mainly consisted of grains & tubers (76.5%), dairy products (86.9%) and their consumption of the fortified foods was equally poor (19.1%) (GOK, 2017). In the 2013 Integrated Health and Nutrition survey that was conducted in Merti,

Kenya, the results indicated that among children aged 6-23 months, only 16% achieved the MDD. In a related study in Isiolo County, under half of the study children (35%) were found to have achieved the MDD (34% and 41% for breastfed and non-breastfed children, respectively). The MDD was highest at 18 to 23 months (47%), followed by 41% in the case of children aged 12 to 17 months and lowest for the children aged 6-11 months (19%) (Amunga, 2015).

However in a similar study in the same Isiolo County, the mean DDS among the study children was high at 5 food groups out of the recommended 7. The most popular foods consumed by all of the children came from grains, roots and tubers (96.1%), dairy products (80.4%) and other fruits and vegetables (73.5%). Children who were fed using foods that were rich in iron or iron fortified were only 48.6% (Macharia et al., 2019). Nevertheless in a study in Marsabit County, slightly more than two thirds (67.2%) of the children had low dietary diversity and the mean DDS was 3.07 food groups. The most frequently consumed foods were cereals (97.1%), legumes and nuts (77.9%), and dairy products (69.6%). Only 1.5% consumed eggs while consumption of Vitamin A rich fruits and vegetables was rare (13.2%) (Galgallo, 2017). In a study on the determinants of nutrition status among children in the ASAL Tharaka Nthi County, the proportion of children aged 6–23 months who met WHO recommended MDD was 47.3%. The women's focus group discussion confirmed that there was no variety of the foods to feed their children from, other than the foods they had in their households (Ambia, 2019). In a study in the former Mbere District on the nutrition status of children and associated factors, many of the children (41.9%) had low dietary diversity (<4 food groups). Cereals

was the most popular food group consumed by children, followed by legumes, nuts and seeds at 97% and 76.8%, respectively. The eggs and meat food groups were the least consumed, at 36 and 19.2%, respectively (Badake et al., 2014). In a study in Kitui County in the ASAL, fewer than 25% of children achieved the MDD of 4 food groups or more for children 6-23 months of age (WHO 2008). In 2013 only 27.7% of children aged 6-23 months had adequate dietary diversity in a study in Machakos County (Bukania et al., 2014). Factors associated with diversified food intake in the ASAL setting should be investigated to provide information necessary for focused and appropriate interventions as studies on the same are scarce and results inadequate and inconsistent.

2.2.6 Minimum Acceptable Diet

Complementary feeding practices commencing at age 6-8 months while fulfilling minimum acceptable diet (MAD) as per the recommendations of the WHO 2010 indicators of CF, are considered appropriate CF practices (Berhanu et al., 2019). The MAD is defined by the proportion of children 6-23 months of age who received MDD and MMF 24 hours preceding data collection and for the non-breastfed children who in addition to the above consumed at least 2 milk feedings during the same period (WHO, 2010). In a study in selected women prisons in Kenya, children not meeting the recommended MAD were more likely to be underweight. However in the same study the MAD did not show any significant relationship with stunting and wasting among the children (Ndanu, 2013). Similarly in a study on CF practices and nutrition status of children in Isiolo County, no significant relationship was found between the MAD and underweight, stunting and wasting (Amunga, 2015). In contrast, in a related study in the

same Isiolo County, the children who met their MAD were 1.32 times less likely to be wasted than those who did not meet the indicator (OR=1.32; p=0.035). The feeding practices between the boys and the girls was further tested in that study with regard to meeting the MAD which, showed no significance ($\chi^2=0.084$; p=0.848). Consequently, the occurrence of malnutrition amongst more boys was then attributed to high activity level as reported by the mothers in the FGDs (Macharia et al., 2019). Similarly in a study on the determinants of malnutrition in children in Tharaka Nthi County, no significant relationship was shown between MAD and wasting, stunting and underweight among the children despite the fact that the study area lie in the ASAL (Ambia, 2019). Nevertheless in the study by Amunga (2015) in Isiolo County, a higher percentage of caregivers who had had some formal education provided a MAD, as compared to the percentage of caregivers who had never attended school (Amunga,2015).

In 2019 globally only 1 in 6 children were receiving MAD (Berhanu et al., 2019). The consumption of MAD appeared in 2012 to be a challenging aspect as the percentages attained by many developing countries were low (Aemro et al., 2013). In 2013 the percentage of children aged 6-23 months who consumed MAD in Sub Saharan Africa was 10% (UNICEF, 2014). In 2015, the national assessments available in west African countries reported that the prevalence of MAD was low as it ranged from 11.0% in Nigeria (2003) to 29.9% in Ghana (2007) (Issaka, Agho, Burns, Andrew, &Dibley, 2014; Ogbo, Page, Idoko, Fernanda, &Agho, 2015). In the neighboring Ethiopia in 2013, it was only 11.9% of children who received the MAD of which the low level was attributed to low maternal literacy, different cultures and lower economy (Ergib, Ashenafi, Semaw,

Fisaha, 2014). In 2019 in southern and eastern Africa it was only 10% of children aged 6-23 months who consumed a MAD (Berhanu et al., 2019).

The prevalence of MAD in Kenya for breastfed children was 44% in 2009 (KNBS & ICF Macro, 2010) compared to 30% in 2003 showing a significant improvement. The Infant and Young Child Feeding (IYCF) indicators in Kenya showed improvement in the decade 2001-2010. However according to the (KNBS & ICF Macro, 2015), only about 21% of children aged 6-23 months in Kenya consumed a MAD in 2014. The proportion of infants and young children who met the MAD among rural residents in Kenya by the year 2014 were 17.4% and 11.6% for breastfeeding and non-breastfeeding children respectively (KNBS & ICF Macro 2015). In a study on CF practices and nutrition status among children accompanying mothers in the Kenyan prisons, the breastfed children who met MAD was high as were close to half (48.6%) (Ndanu, 2013). In survey on MIYCN in Mandela County, among all age groups (only 6-23 months) barely 6.2% of the children realized the MAD (GOK, 2017). In a related study in Isiolo County, children who attained the MAD were relatively high at 48.5%. This ability to achieve the indicator decreased with the children's age whereas more breastfed children met their MAD than their non-breastfed counterparts did meet at 62.5% and 28.6% respectively (Macharia et al., 2019).

In the 2013 Integrated Health and Nutrition survey that was conducted in Merti, Kenya, the results indicated that among children aged 6-23 months, only 31% achieved the MAD (Amunga ,2015). In a study on CF practices and nutrition status of children in Isiolo

County, only 25% of the children achieved the MAD. The percentage of children attaining MAD was higher among the older children (18–23 months) (39%) than among the younger children, who attained 21% and 16% in the 12-17 months and the 6-11 months age groups, respectively (Amunga, 2015). In similar study in Tharaka Nthi County, the proportion of children who met the requirements for MAD was 21.2% and 25.0% for breastfeeding and non-breastfeeding children respectively (Ambia, 2019). In 2014 in Machakos County the percentage of children aged 6-23 months who had the MAD was relatively high at 48.1% (KNBS & ICF Macro, 2015). There is therefore wide variations and inconsistencies on the prevalence of MAD among the studies conducted so far as they range from a low of about 10% to a high of 48%.

2.3.0 Nutrition Status of Children Aged 6-23 Months in Relation to Feeding

Practices

The period of complementary feeding (CF) practices is the key window for preventing under nutrition and its long-term adverse implications; marked by significant growth faltering, high occurrence of infections leading to increased nutrition needs hence adequate nutrition during this critical period is prioritized (Dewey, 2013). Lack of proper nutrition and exposure to illness and infection during these early years can have lifelong consequences on educational attainment and health and economic outcomes, especially for children from the poorest and most marginalized communities (UNICEF, 2019). Under-nutrition is viewed as a consequence and predisposing factor of infection whereby; further deterioration of nutrition status lead to more bouts of infection that feed back to the undernourished status forming a vicious cycle (UNICEF, 2013). In a study on feeding

practices and nutrition status of children in the Kenyan prisons the majority (91.7%) of the children who were sick were also underweight. However, wasting and stunting did not show any significant relationship with the episode of illness (Ndanu, 2013). In contrast, in a similar study in Marsabit County, there was no association between morbidity prevalence and nutrition status of the children (Galgallo, 2017). Likewise in a related study in the neighboring Isiolo County, there was no significant relationship between morbidity and wasting, stunting or underweight shown among the children (Macharia et al., 2019).

Nevertheless in a study in Tharaka Nthi County, sick children were more underweight and more wasted than those who were well (Ambia, 2019). Wasting and stunting have been studied to present together in the populace even as those indices are not routinely monitored (Bergeron & Castleman, 2012). In a related study in the Kenyan prisons, significant correlation existed within the forms of malnutrition, where underweight was significantly associated with stunting and wasting. This implied that the index child was likely to suffer more than one form of malnutrition, putting them at an increased risk of morbidity and subsequent mortality (Ndanu, 2013). As highlighted by Black et al. (2013) measurement of children's wasting and stunting prevalence is not assessed regularly in routine clinical practice. This may delay early detection of dwindling trends especially among the children 6-23 months living in household's in ASAL for acute malnutrition.

On the other hand, according to (Dewey, 2005; KNBS and ICF, 2015; Waswa, 2015) poor feeding practices had been recorded among the key causes of infant and young child

malnutrition. A study by Anganwari (2007) on association between feeding practices and under-nutrition in areas of urban Allahabad established that; improper CF practices were significant risk factors for under-nutrition among under-fives, (Kumar et al., 2007). In 2014 in Kenya alone, it was estimated that poor IYCF practices contributed to more than 10,000 child deaths each year from malnutrition (Amunga, 2015). In a study on feeding practices and nutrition status of children accompanying mothers in the Kenyan prisons, children who were underweight were more likely to consume a diet not meeting the minimum dietary diversity (MDD) score (Ndanu, 2013). However, stunting and wasting did not show any significant relationship with dietary diversity. In the same study children not meeting the recommended minimum acceptable diet (MAD) were more likely to be underweight. Similarly, this IYCF indicator did not show any significant relationship with stunting and wasting.

In contrast in the above study, those children who had adequate meal frequency were more likely to be underweight. However, stunting and wasting did not show any significant relationship with minimum meal frequency (MMF) (Ndanu, 2013). In a study in Mandela County on MIYCN, the high prevalence of wasting observed among children aged 6-23 months could be attributed to high pre-lacteal feeding, low consumption of fortified foods, and low continued breastfeeding at one year (GOK, 2017). In a related study in Marsabit County, there was a positive and significant relationship between frequency of consumption of Vitamin A rich fruits and vegetables with underweight. Similarly a significant relationship was observed between consumption of other fruits and vegetables and stunting (Galgallo, 2017). In the same study three quarters (75.4%) of the

wasted children were not consuming a MDD. Likewise, majority of the children who were underweight did not consume a MDD. In a similar study in Isiolo County child-feeding practices were linked to nutrition status as revealed through the participants of FGDs. Meal frequency, dietary diversity and attainment of MAD were the significant feeding practices, in relation to nutrition status (wasting). The children who met their recommended MAD were 1.32 times less likely to be wasted than those who did not meet the indicator (Macharia et al., 2019). Likewise in a study on the determinants of childhood malnutrition in Tharaka Nthi County, the test results indicated a significant relationship between dietary diversity and underweight (Ambia, 2019). In a study on CF practices and nutrition status of children aged 6-23 months in Kitui County, the DDS and MMF, correlated significantly ($P < 0.05$) with nutritional status of the children (Kimiye & Chege, 2015). Appropriate feeding practices is therefore an area of concern among children living in households in difficult circumstances such as in the ASAL. This is due to its significant impact on nutritional status (UNICEF, 2019).

On the other hand, an analysis of Cambodia Demographic and Health Survey for 2005, found out that the prevalence of stunting and wasting decreased significantly with high levels of maternal education (Zhang et al., 2010; Miller & Rodgers, 2009). In the KNBS and ICF Macro (2010), stunting was least common among children of more educated mothers and those from wealthier families. In a related study among children in the Kenya prisons maternal nutrition knowledge and marital status contributed significantly to the nutritional status outcome in children (Ndanu, 2013). In a study in Marsabit County caregiver's nutrition knowledge was positively and significantly correlated to wasting

and underweight but no association was found between child's age and wasting, stunting and underweight. In the same study on the other hand there was no significant association between maternal level of education and the nutrition status of children (Galgallo, 2017). In a similar study in the neighboring Isiolo County, children from older caregivers were more likely to be acutely malnourished while the more the children in the household, the lower the Z scores of the concerned child (Macharia et al., 2019). In a related study in the same Isiolo County, the caregivers who were older and who had a higher education level than the other groups studied had children with a better anthropometric status in terms of WAZ. In the same study the children of caregivers who had had formal education had a better anthropometric status (normal WLZ) as compared to the children of caregivers who hadn't had formal education (Amunga, 2015). In a study on the determinants of childhood malnutrition in Tharaka Nthi County, there was a significant association between household sizes and underweight and stunting among children. However no significant relationship was shown between household size and wasting and maternal education attainment and the nutritional status of children aged 6–59 months. Wasting was nevertheless associated with the age of the mother while data did not show any significant relationship between underweight and stunting and the age of the mother (Ambia, 2019). In a study in the former Mbere District negative and significant correlations were observed between children's age and nutritional status based on wasting and underweight. Similarly negative significant relationships were also observed between the household size and nutritional status based on stunting and wasting. In the same study there were no direct significant associations between household income and nutritional indicators (Badake et al., 2014). In a related study in Machakos and Makueni

Counties, for children whose caregivers were older (31–46 years) a significantly higher proportion was stunted compared to children whose caregivers were relatively young (15–30 years). Binary logistic regression revealed older age in caregiver and severe food insecurity to be strongly associated with stunting in children (Bukania et al., 2014).

On the other hand, in a study on feeding practices and nutrition status of children accompanying mothers in the Kenyan prisons boys were more stunted, wasted and underweight compared to the girls (Ndanu, 2013). Similarly in a study on factors associated with nutrition status of children below five years in Marsabit County, the prevalence of wasting and underweight were higher in boys than in girls. However the prevalence of stunting was higher in girls (18.9%) than in boys (17.3) (Galgallo, 2017). Nevertheless, in a study on CF practices and nutrition status of children aged 6-23 months in Isiolo County, female children were found to be better nourished i.e. had a normal WAZ) than the male children. Significantly more male, than female, children were stunted (Amunga, 2015). In a related study in the same Isiolo County more boys (17.6%) were wasted than girls (10.6%). More boys (41.2%) were also significantly stunted than girls (23.5%) were while; stunting was highest in the age group 12-17 months. There were significantly more boys (23.5%) who were underweight than girls (12.9%) were. In addition, the age group 18-23 months had the majority of severely undernourished children (6.5%) of the featured groups (Macharia et al., 2019). In a similar study in the same Isiolo County, generally, the percentage of children with poor anthropometric status increased with an increase in age, in months. The age group with the highest level of under nutrition consisted of those who were aged 18-23 months. This

group had a higher prevalence of underweight, stunting and wasting (Amunga, 2015). In a study in the former Mbere District a similar trend was observed where there were more underweight boys than girls, but a Chi-square test on the difference in the prevalence of underweight between the different sex found no significant difference ($P > .05$) (Badake et al., 2014). In the same study there were significant differences in prevalence of malnutrition between age groups. Stunting was lowest in the first year of life and highest in second year of life; while underweight and wasting was highest in the second year. However, there was no incidence of wasting observed in the first year of life in that study (Badake et al., 2014). In a related study in Tharaka Nthi County male children were more malnourished than female children for the three indicators; 21.1% compared to 19.2% for underweight, 33.3% compared to 30.8% for stunting and 8.8% compared to 5.8% for wasting respectively. On the other hand, female children were severely malnourished than male children (Ambia, 2019). In a similar study in Kitui County, more children were found to be malnourished in ages 13-23 months than in ages 6-12 months (Kimiye & Chege, 2015).

The effects of under nutrition among children are enormous ranging from loss of life to increased household disease burden. Stunting in 2014 was associated with an elevated risk of child mortality, increased susceptibility to infections, and poor cognitive and psychomotor development (Roba et al., 2016). Out of the 10.9 million children under-five years deaths that occurred worldwide annually, in 2015 under nutrition was, indirectly or directly ,responsible for 60.0% of them (Roba, 2016). In poor countries, more than one-third of under-five deaths are as a result of under nutrition. Under nutrition accounts for

35% of the disease burden among under-fives (Masiye et al., 2010; International Food Policy Research Institute (IFPRI), 2016). Despite the envisaged decline in global trends of acute under nutrition, the figures remained alarmingly high with about 25% of children under five years still stunted in 2012 (WHO, 2012). Between 1990 and 2013, the number of children affected by stunting declined globally from 257 million to 161 million (WHO, 2015). Globally at least one third of children under 5 years were not growing well in 2018, due to malnutrition in its more visible forms; stunting and wasting (UNICEF,2019). According to UNICEF 2019 wasting threatened the lives of 7.3% of the world's children under 5 years or around 50 million children globally.

The WHO stated that childhood stunting was one of the most important impediments to human development (Rocha et al., 2021). Globally, the proportion and number of stunted children under 5 has been declining. It fell by a quarter between 2000 and 2018 to 149 million children (UNICEF,2019). About 30% of all stunted children lived in only 36 countries mostly located in South-Central Asia and Sub-Saharan Africa (Vesel et al., 2010). Childhood stunting continued to be a public health issue in many African countries in 2014 (Agedew & Chane, 2015). In 2009 the prevalence of stunting among children aged less than five years in Sub-Saharan Africa, was estimated at 41% (WHO, 2010). In Ethiopian national level in 2014, 44% of children under age of five years were stunted and 21% of children were severely stunted (Agedew & Chane, 2015) . In 2013 Kenya was listed number 12 among nations that had the highest number of stunted children globally (UNICEF, 2013). In Kenya, an unacceptably high number of children, (1.8 million) were classified as chronically undernourished in 2009 (MOPHS, 2010).

Chronic and acute malnutrition are prevalent, particularly among the rural populations and the urban poor (MOPHS, 2010). However overall, the nutritional status of under-fives in Kenya has improved in the previous two decades. In 2014 the prevalence of stunting was 26% compared to 38% in 1998. During the same period wasting in the country dropped from 7% to 4% while underweight improved from 18% to 11% (KNBS and ICF Macro, 2010; KNBS and ICF Macro, 2015). This improvement was associated with general social economic development as well as improvement in health care that the country witnessed after the year 2000.

Nevertheless, in Kenya, trends over the past 15 years have shown no significant change in the nutritional status of children less than five years of age (MOPHS, 2010). In 2014 the percentage of children who were stunted in Kenya among age 12-17 months was 35% and 47.2% among age 18-23 months (KNBS & ICF Macro, 2015). In Kenya, great malnutrition disparities for under-fives existed across Counties. Difference in underweight ranged between 2.5% (Nyeri) to 38.5% (West Pokot) and stunting varied from 15.1% (Nyeri) and 45.9% (West Pokot) while wasting was from 0.2% (Turkana) to 7.9% (Kiambu). In Tharaka Nithi County, underweight was 10.8%, stunting was 32.9% and wasting was 3.3%. Malnutrition also varied by rural and urban residence. Underweight for rural areas was 12.9% compared to 7.0% in urban areas. Similarly stunting in rural areas was 29.1% and 19.8% in urban areas while wasting in rural was 4.4% and 3.4% in urban (KNBS and ICF Macro, 2015). In a study on feeding practices and nutrition status of children accompanying mothers in the Kenyan prisons the wasting rate was 3.8%, underweight 7.5%, and stunting rates of 21.4% (Ndanu, 2013). In 2010 in

the ASAL where food insufficiency and natural calamities had affected the communities, rates of acute malnutrition were 15-20% of children below five years, and sometimes substantially higher (MOH/UNICEF, 2011). According to survey results, only half of the children (49.9%) in Mandela County aged 6-23 months were well nourished overall based on MUAC as a child nutritional status indicator (GOK,2017).

In 2018 eastern region (former province) had one of the country's highest stunting levels of 30% most of whom lived in the rural areas (Macharia et al., 2019). In a study on factors associated with nutrition status of children below five years in Marsabit County, the prevalence of wasting, stunting and underweight were 29.9%,18.1% and 27.9% in that order (Galgallo, 2017). In a related study in the neighboring Isiolo County, the prevalence of wasting (GAM), stunting and underweight were 14.7%, 33.8% and 19.1% in that order (Macharia et al., 2019). In a study on CF practices and nutrition status of children aged 6-23 months in the same Isiolo County, the percentage of children with malnutrition, as determined by the relevant anthropometric indicators, stunting was found to be the most prevalent form of malnutrition, at 19%. Those with underweight were 7%, while those who suffered from wasting were 5% (Amunga, 2015). In a related study in Tharaka Nthi County the prevalence of malnutrition among children were 20.2%, 32.1% and 7.3% for underweight, stunting and wasting in that order (Ambia, 2019). In a study in the former Mbere District, among children aged 6-59 months, the prevalence of underweight was 18.1% (Badake et al., 2014). Overall, in Kitui County the levels of acute malnutrition for wasting were relatively high (3.9%), the levels of acute stunting were 28.3% and those of underweight were at 11.4% (Kimiye & Chege, 2015). In

Machakos County in 2014 the percentage of children under-5 years who were stunted was 33.6% (KNBS & ICF Macro, 2015). In a related study in Machakos and Makueni Counties, overall 33.8%, 11.6%, and 2.5% of the children aged 6–36 months were stunted, underweight, and wasted, respectively (Bukania et al., 2014). Factors that affect children's nutrition status in ASAL settings such as the CF practices and the demographic and socio-economic characteristics should be investigated and their relationship or lack of the same for an intervention. The studies that focus on CF practices and nutrition status among children aged 6-23 months in ASAL are quite scarce and have wide variations and inconsistencies on prevalence and thus inconclusive.

2.3.1 Socio-economic Characteristics of Household's and Nutrition Status of Children aged 6-23 Months

In Africa, rural, remote villages are often synonymous with poverty and malnutrition (UNICEF,2019). Within countries, there can be major disparities on the socio-economic characteristics between regions (UNICEF,2019). Socio-economic characteristics affect child's nutritional status and these factors can be found within a household (Kabubo-Mariara et al, 2011). Household's physical assets, human capital and natural resources determine its ability to produce sufficient food for its members and to generate enough income to purchase food (Ambia, 2019). According to FEWSNET (2017) food security situation in Kenya remained wanting due to frequent drought. In Marginal Mixed Farming zones, low household income against elevated prices of staple foods and depleted household stock restricted consumption of adequate and recommended diet (Ambia, 2019). Understanding the determinants of children under nutrition would help

contribute to knowledge needed to improve child nutrition in the ASAL regions (Gewa & Leslie, 2015). To our knowledge, documented studies on socio-economic and nutrition status of children are generally scarce in ASAL areas in Kenya. There is therefore need to update the literature in this region using household's surveys. The study's objectives were to assess and examine the relationship between select socio-economic characteristics and nutrition status among children aged 6-23 months in Yatta Sub County, Machakos County in the ASAL region in Kenya. The socio-economic characteristics that were reviewed in this study were the caregiver's level of education, household's income and caregiver's occupation. In a study by Ambia (2019) in Tharaka Nthi, the mean household income was Kes. 7279 ± 1446 .

2.3.2 Caregiver's Level of Education and Nutrition Status of Children

A study conducted in Nigeria, showed that there was a positive association between maternal levels of education and nutrition indices (Lawal & Samuel, 2010). Maternal education influenced maternal decisions and was a predictor of child nutrition status in a study in 2014 (Waswa, 2015). Maternal education was cited by Kanjilal et al. (2010) as an important determinant of child's nutrition status in sub-Saharan Africa. Their study showed that maternal education was associated with underweight across the region. In another study most educated mothers were not only economically empowered, but they were also able to access information and make decisions (Herforth et al., 2012). In contrast in a study in Ghana, maternal education was found to have only a small effect on childhood stunting (Hong, 2007). Nevertheless, in 2014 children whose caregiver's had no education had a higher chance of wasting (10%) than children whose caregiver's had

some education (4% or less) (KNBS & ICF Macro, 2015). In the same study the proportion of underweight children decreased as caregiver's education level increased (KNBS & ICF Macro, 2015). A study conducted in Kwale Kenya, by Adladza (2009) also revealed that maternal education reduced the levels of underweight in children.

However, in a study by Galgalo (2017) in Marsabit County in Kenya on factors associated with nutrition status of children, there was no significant association between maternal level of education and nutrition status of children. The lack of a relationship between caregiver's level of education and child's nutrition status could have meant that higher education levels did not necessarily positively influence the nutrition status of the children and nutrition knowledge could have had a more direct relationship (Galgalo, 2017). Likewise unlike the study by Kanjilal et al. (2010), a study by Ambia (2019) in Tharaka Nthi County did not establish any association between mothers' education and their children's nutrition status. The explanation was the fact that mothers in that study had nearly the same education attainment. On the other hand nevertheless, in 2014 the caregivers' level of education strongly correlated with the nutrition status of the children in a study by Bukania in Machakos County (Bukania et al., 2014). In 2013 in a marginalization outlook of the communities living in the ASALs, caregiver's were not in a position to acquire education to reach above average level that accorded nutrition knowledge (W, 2013). In a study in Mandela County, Kenya, located in the ASAL, household characteristics indicated high illiteracy levels among the caregivers, 82.3% had no education and a majority were housewives (53.6%) (UNICEF, 2017). Understanding the role of various factors in determining children nutrition status contributes to

knowledge needed in achieving improved child nutrition in ASAL regions (J Kimiywe & Chege, 2015).

2.3.3 Household's Income and Nutrition Status of Children

The causes of child malnutrition are more complex and far-reaching today than they were in 1990. Sweeping changes, seen in globalization, unplanned urbanization and climate change, are exacerbating already unfair outcomes for the poorest and most excluded children and their families (UNICEF,2019). In 2010 malnutrition was an important public health issue in arid and semi-arid land (ASAL) particularly among children aged 6-23 months (MOH/UNICEF, 2011). The ASAL areas were characterized by limited resources, low income among the inhabitants, drought, low level of social and human capital and conflicts among others (Harison et al., 2017). In Africa, rural, remote villages were often synonymous with poverty and malnutrition (UNICEF,2019). In 2015 higher household's economic status was associated with improved access to informational, financial, and material resources (Darmon & Drewnowski, 2015). In 2006 household's economic status was an important determinant of childhood under nutrition in developing countries (Hong, 2007). The chances of stunting among children declined monotonically with increase in household's economic status in a study in Ghana (Hong, 2007). Using data from national cross-sectional survey, Masiye et al. (2010) examined the determinants of nutrition status of under-fives in Zambia. The results showed that household expenditure was the main determinant of nutrition status of a child (Ambia, 2019). In contrast a study by Ambia (2019) in Tharaka Nthi County on the determinants of children malnutrition found no evidence of association between household expenditure

on food and children's nutritional status (Ambia, 2019). A study in Mexico found that household poverty was not a necessary condition for children to be undernourished (Hong, 2007).

Nevertheless, in a study in 2014 the proportion of underweight children decreased as household wealth increased (KNBS & ICF Macro, 2015). In 2016 wasting was most pronounced within the lowest wealth quintile group (7.3 percent) (Pereira, 2016). In 2016 there was some association between stunting and poverty in Kenya (Pereira, 2016). In 2016 although stunting rates in the two wealthiest quintiles were lower than that for the poorest quintile in Kenya, they remained unacceptably high, at 14% and 21%, demonstrating that poverty alone did not cause malnutrition in 2016 (Pereira, 2016). At the geographic level, most (but not all) of the counties with very high stunting rates also had the highest poverty rates but not all the counties with highest poverty rates had the highest stunting rates, indicating a less than perfect association which necessitated other studies . On the other hand there were no direct significant associations between household income and nutritional indicators in a study by Badake in Mbeere Sub County in Kenya in 2013 (Badake et al., 2014). In a study in Machakos and Makueni Counties, increased household's income was a major contributor to improved nutrition, although on its own it was not enough; it may have been inefficient or ineffective if women had no level of control (Bukania et al., 2014). Women were more likely to spend the income they controlled on health, food, and education of their children (Bukania et al., 2014).

2.3.4 Caregiver's Occupation and Nutrition Status of Children

Mothers in the workforce need a supportive environment, including paid maternity and parental leave and breastfeeding breaks (UNICEF,2019). Attention paid at a national level to supporting working mothers in the workplace can have significant effects on the nutrition status of children. Unfortunately, working mothers worldwide face barriers to breastfeeding (UNICEF,2019). A study by Mitchodigni (2017) in southern Benin showed that children whose caregivers were involved in income-generating activities, were less likely to meet MMF consequently affecting the nutrition status of children ($p < 0.05$). Working outside the home was associated with early CF practices and cessation of breast feeding (Abbi et al., 1991). A caregiver who spends most of the time at home with her child may be available to practice optimal feeding practices on her child (Leslie, 1998). The occupation of caregiver's appeared in 2009 to be the major factor in influencing the level of wasting of children in a study in Kwale (Adeladza & Adeladza, 2009). In that study, the children of farming caregiver's had a higher prevalence of wasting than those of housewives (Adeladza & Adeladza, 2009).

On the contrary, the findings of a study by Gewa & Leslie (2015), showed that the caregiver's working status was a significant factor in Kenya, where children whose caregivers were working at the time of the survey were associated with 47% increase in odds of achieving adequate dietary diversity score compared to those with non-working caregivers. In a study in Mandela County, Kenya, household's characteristics indicated a majority of caregiver's were housewives (53.6%) (GOK, 2017). In a study in Kwale in 2009, 59% of the caregiver's were housewives (Adeladza & Adeladza, 2009). In a

survey in Kitui County Kenya, in 2017, 38.9% of caregiver's were mainly housewives with a number of them practicing farming (18.6%) and owning business (14%) as their main source of livelihood (Infant et al., 2017). Studies on the caregiver's occupation and children's nutrition status in ASALs are quite scarce and inconclusive necessitating further investigations.

2.4 Prevalence of Morbidity Among Children 6-23 months of Age

Under-nutrition is viewed as a consequence and predisposing factor of infection whereby; further deterioration of nutrition status lead to more bouts of infection that feed back to the undernourished status forming a vicious cycle (UNICEF, 2013). In 2017 malnutrition contributed indirectly or directly to mortality and morbidity particularly in developing countries (Children et al., 2018). The renowned leading cause of malnutrition related deaths in early life in 2012 was acute respiratory infections (Rodriguez et al., 2011; Walker et al., 2013). The most prevalent diseases in Isiolo County in Kenya that were associated with childhood malnutrition included acute respiratory infections, diarrhea and malaria (Matheka et al., 2013). Presence of malnutrition further increases their occurrence with higher frequency and more longevity (Mutakaa, 2014). Nutritious food is necessary to ensure children grow well, but it's not sufficient. Around the world, diarrheal and other diseases undermine the nutrition of tens of millions of children, as do less well understood conditions such as chronic inflammations of the gut (UNICEF,2019). Diarrhea is particularly deadly when children are undernourished, killing over 700 children under 5 every day in 2016 (UNICEF,2019). Dewey & Mayers (2011); Drake (2012) and UNICEF (2013) revealed that the children who experienced

repeated episodes of diarrhea before the age of 24 months had; poor absorption of nutrients and poor appetite with a higher likelihood of stunted growth as well as other malnutrition forms.

Recent research suggests that much higher levels of hygiene and sanitation are needed to safeguard children from stunting than was previously thought. In 2014 children in developing countries had high rates of infectious and parasitic diseases (Amunga, 2015). Nonetheless, there have been inconsistencies concerning the association between malaria and malnutrition as revealed in some studies (Deribew et al., 2010; Mitangala et al., 2013). In a study in Isiolo County, Kenya, on feeding practices and nutrition status among children aged 6-23 months following discharge from supplementary feeding program however, there was no significant relationship between morbidity and wasting, stunting or underweight (Macharia et al., 2019). Nevertheless despite the fact that diseases are among the important causes of malnutrition, the lack of a relationship between morbidity and nutrition status of children in a study by (Kulwa et al, 2006) in Urban Dar-es-salaam, in Tanzania, and the study in Isiolo County, could imply that inadequate food intake could be a more contributing factor to malnutrition as opposed to diseases in those areas.

In 2016 inappropriate CF practices during the first two years of childhood drastically increased morbidity, mortality and risks of chronic diseases (Mitchodigni et al., 2017). According to KNBS and ICF Macro 2010 based on a two-week recall, 8% of children under five had symptoms of acute respiratory infections, 24% of Kenyan children under five years had a fever while 17% had diarrhea in the 2 weeks before the survey. In 2014

most diarrheal episodes seemed to manifest in the age groups 12-23 months (24.2%) and 6-11 months (26.6%) as reported 2 weeks preceding the KDHS (KNBS & ICF Macro, 2015). Little was known of morbidity prevalence among the children aged 6-23 months and its relationship with nutrition status in Yatta Sub County in the ASAL setting. This study used retrospective approach to gather information on morbidity and health seeking by means of a two-week recall period.

2.5 Summary of Literature Review

Children aged 6-23 months are at a very critical period (Butte et al., 2004; Ceatan et al., 2010). During this period, the nutritional status of the child can be corrected as it gives an excellent opportunity to effect this child's nutrition status (WHO, 2010). However, after this period, little may be done to change the aftermath of the nutrition status. In Kenya in 2015, the trend in nutrition status of children aged 6-23 months was worsening thus posing a challenge to the achievement of sustainable development goals (Kimiye & Chege, 2015). In 2018 about a quarter (26%) of children in Kenya were stunted, 4% were wasted while 11% were underweight (Mwangi, 2018). In 2019 eastern region (former province) in Kenya had one of the country's highest stunting levels among children of 30% most of whom lived in the rural areas (Macharia et al., 2019). This study aimed at generating information on the factors that determine the complementary feeding practices and the nutritional status of children 6-23 months in Yatta Sub County, Machakos County.

Households in ASAL are prone to frequent droughts and hardly meet their daily food requirement (Ambia, 2019). Food deficit results into poor CF practices which coupled

with other characteristics make the children aged 6-23 months vulnerable to malnutrition (Ambia, 2019). The ASAL in Kenya cover the majority of the land and most of the inhabitants are a nutritionally vulnerable group (KNBS & ICF Macro, 2015). Much of the available information on nutritional status of children aged 6-23 months in Yatta Sub County, in Machakos County such as that from (KNBS & ICF Macro, 2015) and local household survey's show malnutrition prevalence and not the contributing factors to such prevalence. There was need, therefore, to establish factors behind the malnutrition of children in the area. Further literature review shows association between demographic & socio-economic characteristics, complementary feeding practices, child's morbidity and nutritional status of children aged 6-23 months (Ambia, 2019). Unfortunately, little was known of the demographic and socio-economic characteristics of households, complementary feeding practices, morbidity prevalence and nutrition status of the children aged 6-23 months living in Yatta Sub-County in the ASAL. These characteristics can be manifested at household level. Household allocates its resources to its individual members including nutritional goods and services. There has been agreement among researchers on several factors associated with under nutrition. However, among the studies that have been conducted so far, the risk factors differ with countries or even regions around the world and child feeding practices but data on how these factors impact on nutrition status of children is limited. Therefore, this study was set to fill this gap by determining CF practices and nutrition status of children at household level in Yatta Sub County, Machakos County, Kenya. This study added more knowledge on the relationships between socio-economic and demographic characteristics

of households, complementary feeding practices and nutrition status of children aged 6-23 months in ASAL setting.

CHAPTER THREE: METHODOLOGY

3.1 Research Design

The study adopted a cross sectional analytical design to investigate complementary feeding practices and nutrition status of children aged 6-23 months in Yatta Sub-County. This design was justified as it described the status and established if there were relationships among demographic and socio-economic characteristics of households, complementary feeding practices, and nutrition status of children aged 6-23 months living in Yatta Sub-County in ASAL at the time of data collection. The design was also selected because it facilitated both quantitative and qualitative research methods and enabled identification of relationships between the independent and dependent variables of the study. Data was collected at only one point in time (Mugenda & Mugenda, 2003).

3.2 Study Variables

3.2.1 Dependent Variable

The dependent variable was nutrition status of children aged 6-23 months in Yatta Sub County in terms of weight for height/length, length for age indices, weight for age and furthermore presence or absence of oedema.

3.2.2 Independent Variables

The independent variables were the IYCF practices, based on the WHO, 2010 indicators of complementary feeding practices: continued breastfeeding at 1 and at 2 years, timely introduction of complementary foods, minimum acceptable diet, minimum meal frequency, and minimum dietary diversity. Other independent variables were the demographic & socio-economic characteristics, household income, household size, caregiver's occupation, level of education and age. The prevalence of morbidity among children aged 6-23 months based on illness in the previous two weeks was used as a control variable.

3.3 Study Area

The study was carried out in Yatta Sub-County Machakos County Kenya, and covers an approximate area of 1057.3 sq.km. The region is semi-arid and is characterized by temperatures ranging between 25 °C and 29 °C and low average rainfall of 450-800 mm annually. Majority of the Sub County's inhabitants rely on agriculture as the major means of livelihood (KNBS & ICF Macro, 2015). Drought affects productivity of major crops and livestock (Bukania, 2014). This poses the greatest danger to the livelihood of the inhabitants.

3.4 Study Population

3.4.1 Target Population

This study targeted caregiver-child pairs. The children were aged 6-23 months and they had lived in Yatta Sub-County for one year or more as they experienced all conditions in Yatta that would affect their complementary feeding practices and nutrition status.

3.5. Inclusion Criteria

The study included caregiver-child pairs where the child was aged 6-23 months who had lived in Yatta Sub County for one year or more and who had voluntarily consented to the study.

3.5.1 Exclusion Criteria

Those caregivers who met the inclusion criteria but, did not consent and those whose children had documented chronic illness like diabetes or HIV/AIDS or cancer were excluded as their condition may affect nutrition status regardless of their CF practices.

3.6 Sample Size

The calculated sample size was 377 caregiver-child pairs. This was calculated based on (Cochran, 1963) formula as cited by Fisher, (1998) ($n = Z^2 pq \div d^2$) where;

n = is the desired sample size

Z = is the standard normal deviation at the desired confidence interval 95 (probability error equal to 1.96)

P = proportion of the estimated proposed population to give estimated characteristics being measured; 33.6 % prevalence of stunting in Machakos County (KNBS & ICF Macro, 2015) = 0.336.

q = populace without the attributes being measured $(1-0.336) = 0.664$

d = degree required for accuracy which is 0.05

The formulae $(n = Z^2pq \div d^2)$ substituted as $n = 1.96^2 \times 0.336(1-0.336)/0.05^2 = 343$

Hence, the sample size was 343 caregiver-child pairs. A 10% of 343 non-response rate was added to the estimated sample. The final sample was 377 caregiver-child pairs where children were aged 6-23 months.

3.7 Sampling Techniques

Yatta Sub County which comprises 5 wards was purposively selected as one of the ASAL Sub-Counties in Machakos County, Kenya. Kithimani ward was purposively sampled because it had the highest number of households in Yatta Sub County (KNBS, 2009). Kithimani Ward comprises four sub locations namely; Kithimani, Kithendu, Kambi Ya Ndeke and Mamba. Simple random sampling was used to select two sub locations (Kithimani and Kambi ya Ndeke) out of the four sub locations in Kithimani Ward. The researcher visited the medical superintendent of Matuu level 4 Hospital for familiarization with the study site and to obtain authority to work with health staff, nutritionists and community health volunteers. The researcher was introduced to a health officer at Kithimani Health center where contact was made to CHVs who carried out a household's census to enumerate those with children aged 6-23 months. Simple random sampling was used to select 377 caregiver-child pairs (203 and 174 from Kithimani and

Kambi ya Ndeke Sub locations respectively) where children were aged 6-23 months and meeting the inclusion criteria from the census data to form the study sample.

3.8 Data Collection Tools

3.8.1 A researcher- Administered Questionnaire

The validated WHO 2010, IYCF questionnaire was used to collect data on complementary feeding practices of the children aged 6-23 months (Appendix B). It was used to collect data on household's income, household size, caregiver's age, occupation and level of education, prevalence of morbidity and anthropometry among children. The data on complementary feeding practices was gathered using a 7 day food frequency and 24 hour dietary recall.

3.8.2 Focus Group Discussion Guide

A focus group discussion guide (Appendix C) was utilized to gather data on usual complementary feeding practices of the children aged 6-23 months in the area, the major livelihood, cultural, demographic and socio-economic characteristics of households, climatic factors and challenges that influence dietary practices and nutrition status among children. The participants were caregiver-child pairs where the children were aged 6-23 months who had consented and participated in the quantitative data collection.

3.8.3 Key Informant and Interview Schedules

The key informant and interview schedule (Appendix D) was used to solicit information on encounters and difficulties on complementary feeding practices, and other significant concerns attributable to this investigation about children in arid and semi-arid areas.

Interviews were conducted with the Sub-County, and Matuu level 4 Hospital nutritionists, and CHVs.

3.8.4 Anthropometric Data and Equipment

The anthropometric equipment's used in data collection were the No identifier length mat which was used to measure the length of the children. The salter scale was used to measure the weight of the children where the child was put on a weighing pant and gently lowered on the standardized salter scale with the strap of the pant in front. The age of the child was established by the caregivers recall and verified with the child's health card.

3.9 Pre testing of Data Collection Tools

Questionnaire was pre tested, on 10% of the sample size, 38 caregiver-child pairs where children were aged 6-23 months in Kithendu sub location which was not part of the main study. After pre-testing the essential changes were done to upgrade the reliability and validity of the data collection tools. The information gathered during pre-test was not incorporated into the main study.

3.10 Validity and Reliability of Data Collection Tools

3.10.1 Validity

The validated WHO 2010, IYCF questionnaire was used to collect data on complementary feeding practices of the children aged 6-23 months. To ensure validity, the content and phrasing of questions was adjusted and checked to ensure the result of intended data was correct and avoid ambiguity.

3.10.2 Reliability

The same questionnaire was administered to the same group of participants in Kithendu sub-location after a period of three days during the pretest in the test-retest technique which was utilized to test consistency in creating similar outcomes. A correlation coefficient was determined using Cronbach correlation formula. A comparison was drawn between the responses obtained in the two occasions (Kothari, 2004), and was accepted because it had more than 0.7. For the anthropometric instruments, calibration of the salter scale was done on a daily basis before commencing data collection.

3.11 Recruitment and Training of Research Assistants

Three research assistants one with B.Sc. in human nutrition and two diploma holders in human nutrition who understood the Kikamba language were trained for about four days on the aim, objectives, and data collection procedures, taking of anthropometric measurements, research ethics and recording of the responses. They were trained through role plays, demonstrations and lectures. On the fifth day, they conducted a pre-test.

3.12 Data Collection Techniques

3.12.1 Administration of the Questionnaire

During data collection, the researcher visited each of the selected caregiver-child pair during the main study. The researcher administered the questionnaire directly after the caregivers gave consent and signed the consent form. This was done by first explaining to the caregiver the objectives and procedures for the study and any clarifications on the questions from respondent solved. Only those who gave consent were interviewed. After

administering the questionnaire, anthropometric measurements of the child were taken using a salter scale and a length mat.

3.12.2 Dietary Data Collection

The researcher used the validated WHO 2010 questionnaire for complementary feeding practices. The 24 hour dietary intake recall assessment on children aged 6-23 months was done based on the WHO 2010 indicators of complementary feeding practices. The caregivers were requested to state what they had fed their children within 24 hours before data collection on the seven recommended food groups comprising grains, roots & tubers, legumes and nuts, dairy products, flesh foods, eggs, vegetables and fruits rich in Vitamin A, and other fruits and vegetables and continued breast feeding. The dietary intake of all the foods, fluids taken and any other condiments added to the child's food was recorded. The recall time frame catered the previous 24 hours before data collection.

3.12.3 A Seven Day Food Frequency Questionnaire

The 7- day food frequency was used to assess usual food consumption, food availability and access. The 7 food groups which included grains, roots and tubers, legumes and nuts, dairy products, flesh foods, eggs, Vitamin A rich vegetables and fruits, and other vegetables and fruits were considered. The caregivers were asked to explain the frequency that a child was fed on foods from the seven food groups in the previous seven days before data collection.

3.12.4 Anthropometric measurements

Determination of the child's age was by use of mother- child booklet or calendar of events. Weight and height measurements for the child were taken to determine the nutrition level. The weight measurement was taken using a salter scale, repeated thrice and averaged to the nearest 100g and recorded. The weight was always taken when the child was minimally dressed to the acceptance of the caregiver. The length of child was measured using a length mat , repeated twice and an average taken and recorded to the nearest 0.1 cm (WHO, 2010).

3.12.5 Collection of Qualitative Data

3.12.5.1 Focus Group Discussion

Two researcher facilitated FGDs with 11 and 12 caregiver-child pairs where children were aged 6-23 months were conducted in suitable settings for 45 minutes. The first one was conducted in Kamweani Catholic Church in Kithimani sub-location where 11 caregiver-child pairs were in attendance. The second one was held in a hall adjacent to a shop owned by one of the caregivers in Kalukuni shopping Centre, Kambi Ya Ndeke sub-location where 12 caregiver-child pairs were in attendance. These were the two sub-locations where quantitative data was collected in this study. The discussions were started with a word of prayer led by one of the caregivers followed by self-introduction by all participants. The participants were caregiver-child pairs where the children were aged 6-23 months who had consented and participated in the quantitative data collection.

The enumerator with BSC in human nutrition from Egerton University took the proceedings during the FGDs. He was among the three enumerators who were trained before data collection and had actively participated in quantitative data collection in this study. The researcher used the focus group discussion guide (Appendix C) to facilitate the discussions on caregiver's main livelihood, sources of food for the children, continued breast feeding practices, complementary feeding practices, the factors that affect these variables and coping mechanisms adopted by the caregivers. The investigator led the participants on the topics of discussions one by one allowing and ensuring participation by all participants. Then a conclusion was made after the discussion. The responses were tape recorded.

3.12.5.2 Key Informant Interviews

Interviews were conducted with the Sub-County, and Matuu level 4 Hospital nutritionists, and CHVs. The nutritionists were interviewed in their respective offices in Matuu Level 4 Hospital while CHVs were interviewed in their homes. The health centers/facilities had no deployed nutritionists. In the interviews the areas covered included; designation of the nutritionist/CHV, period of service, population they were serving, their main duties, availability of food to children aged 6-23 months, status of breastfeeding and complementary feeding practices, understanding and adherence to continued breastfeeding and CF practices among caregivers and the challenges that caregivers faced in feeding the study children and the policies guiding feeding of the same. The interviews also covered the nutrition status among study children and factors

affecting the same. They also described the common illness among the children and their possible causes. The responses were tape recorded.

3.12 Data Analysis and Presentation

Quantitative data was analyzed using (SPSS) version 20.0. Anthropometry data was analyzed using ENA for SMART 2008 and was analyzed as weight-for-age, weight-for-length and length-for-age z-scores using the WHO growth standards (WHO, 2006a), where children with Z score of >-1 were considered normal, <-1 to >-2 were considered mildly undernourished, ≤ -2 to >-3 were considered moderately undernourished and those ≤ -3 considered severely undernourished in the three indices of wasting, underweight and stunting.

The complementary feeding practices were analyzed based on WHO, 2010 indicators continued breast feeding at 1 and at 2 years, timely complementary feeding at age 6-8 months, minimum dietary diversity, minimum meal frequency, and minimum acceptable diet. Dietary diversity was computed into seven food groups namely; eggs, vitamin A rich fruits and vegetables, grains/roots/tubers, legumes and nuts, flesh foods, dairy products, and other fruits and vegetables as recommended by WHO, (2010) where the minimum dietary diversity score was 4 out of 7. Minimum meal frequency of two times or more for the breastfed children aged 6-8 months; 3 times for breastfed children 9-23 months old and 4 or more times for non-breastfed children aged 6-23 months was considered adequate. Minimum acceptable diet was attained if a child had a minimum dietary diversity, the minimum meal frequency and in addition 2 milk feedings for the

non-breastfed children. Descriptive statistics such as percentages, frequency distribution and measures of central tendencies (mean, range and standard deviation) were used to describe variables such as socio-economic and demographic characteristics of households. Pearson Product Moment Correlation coefficient was used to determine relationships between continuous variables such as dietary practices in terms of diet diversity and nutrition status z- scores of children aged 6-23 months.

Chi-square was used to determine the relationships between categorical variables such as nutrition status. Significance level was set at $p < 0.05$. Qualitative data from FGDs and KIIs were first transcribed, responses arranged in predetermined general categories identified from the study objectives in the discussion guide and then coded. Common themes were identified, inferences were made from each theme and the conclusions drawn and then the findings used to then triangulate the data from the questionnaire. Data was presented by use of graphs and tables in the next chapter. Table 3.1 shows the data analysis matrix.

Table 3.1 Data analysis matrix

| Objectives | Variable | Nature of variable | Method of data collection | Statistical test and data presentation |
|---|---|-------------------------------|---------------------------------------|--|
| Determine the demographic and socio-economic characteristics of households with children 6-23 months of age | Household size, income, sources of income, caregivers age, level of education , occupation and source of dominant food consumed | Categorical Continuous | 24 hour recall | Frequencies Percentages |
| Determine the complementary feeding practices of children 6-23 months of age. | Dietary diversity, meal frequency and minimum acceptable diet in 24 hours prior to data collection | Categorical Continuous | 24 hour recall | Frequencies Percentages |
| Establish the nutrition status of children 6-23 months of age. | Wasting, stunting and underweight | Categorical | Anthropometric measurements | Percentages Frequencies |
| Determine the prevalence of morbidity among children 6-23 months of age. | Illnesses: diarrhea, cough with difficult breathing, fever, fever with chills, others in the 2 weeks prior to data collection | Categorical Continuous | 24 hour recall | Frequencies Percentages |
| Establish the relationships among socio-economic and demographic characteristics of households, complementary feeding practices and nutrition status of study | Nutrition status of children; wasting, stunting, underweight Complementary feeding practices and Socio-economic and | Categorical | Researcher administered questionnaire | Multiple regression analysis, Bi-variate analysis |

| | | | | |
|----------|-----------------------------|--|--|------------|
| children | demographic characteristics | | | Chi-square |
|----------|-----------------------------|--|--|------------|

3.13 Logical and ethical considerations

The approval to carry out the research was received from Kenyatta University (KU) graduate school. The ethical clearance was requested and approved by the KU ethical review committee while a research permit was issued by the National commission for Science, Technology and Innovation (NACOSTI). Further, authority was given by the area administration. Voluntary informed consent was sought from the caregivers and granted. The researcher administered the questionnaire directly only after the caregivers gave consent and signed the consent form. This was done by first explaining to the caregiver the objectives and procedures for the study and any clarifications on the questions from respondent solved. Caregivers were guaranteed that their names and those of their children would not be published or revealed to other people as it was exclusively for this study. Only those who gave consent were interviewed. Children found malnourished were referred to health facilities for management.

CHAPTER FOUR: FINDINGS

4.0 Introduction

The mean household size was 7. Three hundred seventy-seven (377) caregiver-child pairs where the child was aged 6-23 months were eligible for the study, and all of them consented to participate and were therefore recruited into the study. A total of 377 questionnaires were completed resulting in a response rate of 100%.

4.1 Demographic and Socio-Economic Characteristic of Households with Children aged 6-23 Months in Yatta Sub-County

This section was sub-categorized as child characteristics, caregiver's characteristics and then household's characteristics.

4.1.1 Characteristics of Children Aged 6-23 months

There wasn't much difference between the number of male children (50.4%) compared to females (49.6%). The mean age of children was 14.05 ± 4.38 months with 31.8% of children being between ages 12-17 months. Those within the age brackets of 18-23 months and 6-8 months comprised 28.9% and 22.0% respectively, while those aged 9-11 months made up 17.3% of the participating children (Table 4.1).

Table 4.1: Demographic characteristics of children 6-23 months of age

| Characteristics | N = 377 | | |
|------------------------|----------------|----------|---------------------------------|
| | n | % | Mean \pm SD |

| | | |
|-------------------------|-----|------------------|
| Sex | | |
| Male | 190 | 50.4 |
| Female | 187 | 49.6 |
| Age in completed months | | |
| 6-8 | 83 | 22.0 |
| 9-11 | 65 | 17.3 |
| 12-17 | 120 | 31.8 |
| 18-23 | 109 | 28.9 |
| Mean \pm SD | | 14.05 \pm 4.38 |

4.1.2 Characteristics of the Caregivers

The youngest caregiver in this study was 15 years old while the oldest was 61 years. About three quarters of the caregivers were young (19-32 years) (78%), more than two thirds of them were married (70%), while about two fifths were of primary level of education (44.0%). More than a half of the caregivers (59.9%) were house wives, while about a third were casual workers (28.1%) (Table 4.2).

Table 4.2 Demographic and socio-economic characteristics of caregivers

| Characteristics | | N = 37 | |
|--------------------------------------|-----------------|--------|------|
| | | n | % |
| Caregivers age in years | | | |
| | ≤ 18 | 8 | 2.1 |
| | 19-32 | 294 | 78.0 |
| | 33-40 | 52 | 13.8 |
| | 41-49 | 20 | 5.3 |
| | ≥ 50 | 3 | 0.8 |
| Marital status | | | |
| | Married | 264 | 70.0 |
| | Single mother | 104 | 28.4 |
| | Divorced | 2 | 0.5 |
| | Windowed | 4 | 1.1 |
| Caregivers level of education | | | |
| | Primary level | 166 | 44.0 |
| | Secondary level | 153 | 40.6 |

| | | | |
|------------------------------|---------------------|-----|------|
| | College certificate | 28 | 7.4 |
| | College diploma | 23 | 6.1 |
| | University degree | 7 | 1.9 |
| Caregivers occupation | | | |
| | Pastoralist | 7 | 1.9 |
| | Business | 17 | 4.5 |
| | Casual worker | 106 | 28.1 |
| | House wife | 226 | 59.9 |
| | Civil servant | 16 | 4.2 |
| | Private sector | 5 | 1.4 |

4.1.3 Households Demographic and Socio-economic Characteristics

The main source of household's income was petty trade (negligible exchange) practiced by about two thirds of households (60.2%) followed by casual worker at about a third (28.1%). When asked to describe their income per month, about half of households (54.1%) reported to earn \leq Kes 2000. The average household income was Kes 3,233 per month. Majority of the households owned land (82.6%), about half of them owned cattle (56.5%) and goats (50.9%), while less than half of them owned chicken (46.9%) and barely less than a fifth (14.6%) owned sheep (Table 4.3). One key informant said “*Most household heads who are the providers for their families are unemployed and have low income and cannot afford the high costs of nutritious foods such as liver and fish (KII 2 2018)*”. Another one said “*Many households are large and hence more needs and frequent droughts affect availability of casual jobs making caregivers to travel far living their children with their grandmothers or younger siblings*” (KII 1 2018).

Table 4.3 Demographic and socio-economic characteristics of study households

| Characteristics | N = 377 | |
|----------------------------|---------|---|
| | n | % |
| Household source of income | | |

| | | |
|--|-------|------|
| Sale of livestock | 7 | 1.9 |
| Sale of animal milk | 14 | 3.7 |
| Petty trade | 227 | 60.2 |
| Casual work | 106 | 28.1 |
| Business | 16 | 4.2 |
| Formal employment | 7 | 1.9 |
| Household income range per month (Kes) | | |
| ≤ 2000 | 204 | 54.1 |
| = 2001-4000 | 20 | 5.3 |
| = 4001-6000 | 77 | 20.4 |
| = 8001-10,000 | 61 | 16.2 |
| > 10,000 | 15 | 4.0 |
| Average households income (Kes) | 3,233 | |
| Household wealth (ownership of household assets) | | |
| Own car | 1 | 0.3 |
| Own TV | 224 | 59.4 |
| Own mobile telephone | 370 | 98.1 |
| Own land | 312 | 82.6 |
| Own cattle | 213 | 56.5 |
| Own goats | 192 | 50.9 |
| Own sheep | 55 | 14.6 |
| Own chicken | 177 | 46.9 |

*1USD=102.41 Kes

4.2 Complementary Feeding Practices among Children Aged 6-23 Months

4.2.1 Breastfeeding Patterns

In this study about three quarters of children aged 6-23 months (72.9%) were breastfeeding at the time of data collection. This was expected since about a third were older (aged 18-23 months) (28.9%). Caregivers who had discontinued breastfeeding among children aged 6-23 months were about a quarter (27.1%). Continued breastfeeding at the age of 1 year (12-15 months) was practiced by about three quarters of caregiver's (73.3%) while at two years (20-23 months) was practiced by about two thirds of the caregivers (69.2%). There was only a slight difference in continued breastfeeding of

children at one and two years old. From FGDs findings one caregiver said “*I stopped breastfeeding my child at the age of one year because I became pregnant (FGD 2 2018).*” Another caregiver said “*I stopped breastfeeding my child at the age of one year as she refused to breastfeed (FGD 1 2018)*”.

4.2.2 Initiation of Complementary Feeding Practices

The majority of caregivers (89.2%) had introduced solids and semi-solid foods to their children aged 6-8 months at the time of data collection (Table 4.4). The main food which children had been introduced to was porridge. About a fifth of caregivers (22%) used pre lacteal foods, 72.7 % - gave other milk, 72.1% fed tea/coffee, and 70.6% fed flavored juices. From FGDs findings, complementary foods were introduced earlier (i.e., before 6 months) therefore this inappropriate feeding was associated with risk of child developing infections like diarrhea. “*My child had diarrhea and the nurse said it was because I gave her porridge before six months (FGD1 2018.)*”. Caregivers who practiced timely introduction of complementary feeding reported to have received information from medical staff during their prenatal clinic visits. Some caregivers who did not practice timely complementary feeding said “*the child became sick and was treated frequently*”. Another caregiver said she fed the child because the mother had gone away for long and hence the child was hungry. “*I fed the child with porridge the mother was away for long and the child was crying,*” (FGD2 2018.).

Table 4.4: Complementary feeding practices among children aged 6-23 months

| | |
|--|---------------|
| Complementary feeding practices among children aged 6-23 months | N =377 |
|--|---------------|

| | n | % |
|--|----------|----------|
| Introduction of solid , semi-solid or soft foods for children aged 6-8 months (n = 83) | 74 | 89.2 |
| Met minimum meal frequency | | |
| All children aged 6-23 months | 287 | 76.1 |
| Breastfed children aged 6-8 months (n=69) | 60 | 86.9 |
| Breastfed children aged 9-23 months (n=207) | 163 | 78.7 |
| Non-breastfed children aged 6-23 months (n=101) | 64 | 63.6 |
| Minimum dietary diversity | | |
| Met minimum dietary diversity \geq 4 food groups | 228 | 60.5 |
| Did not meet minimum dietary diversity | 149 | 39.5 |
| Minimum acceptable diet | | |
| Met MAD All study children | 150 | 39.8 |
| Not met MAD all study children | 227 | 60.2 |
| Met MAD Breastfed (n=276) | 127 | 46.0 |
| Met MAD non-breastfed (n=101) | 23 | 22.8 |
| Consumption of iron- rich foods for children aged 6-23 months | | |
| Consumed iron rich foods | 111 | 29.4 |

4.2.3. Minimum Meal Frequency

Minimum meal frequency (MMF) was established from the number of meals consumed 24 hours to data collection and breastfeeding patterns. Minimum meal frequency was achieved by about three quarters of the children aged 6-23 months (76.1%). For age 6-8 months, a cut off of a minimum 2 meal times per day for breastfed children; 3 or more times per day for breastfed children aged 9-23 months and a minimum 4 meals per day for non-breastfed children aged 6-23 months was used. Among the breastfed children aged 6-8 months old, the majority (86.9%) met the recommended MMF of 2 or more meals in a day. Among breastfed children aged 9-23 months, about three quarters (78.7%) met the recommended MMF of three or more meals in a day. It was only about

two thirds of the non-breastfed children aged 6-23 months old (63.3%) who met the recommended MMF of 4 or more meal times in a day (Table 4.4.).

4.2.4 Minimum Dietary Diversity

Minimum dietary diversity (MDD) was established based on the number of food groups a child consumed in the previous 24 hours prior to data collection for both breastfed and non-breastfed children aged 6-23 months. Less than two thirds of the children (60.5%) had consumed the recommended MDD of four or more among the 7 food groups recommended by WHO, (2010). Those who did not meet WHO recommendations were about two fifths (39.5%) (Table 4.4). The extent of consuming diverse food groups in the 24 hours was lower at only about half (50.6%) among those aged 6-8 months than among other age groups. Only few consumed flesh foods, eggs and legumes. The food groups assessed were: grains, roots and tubers; legumes and nuts; dairy products; meat and meat products; eggs; vitamin A rich fruits and vegetables and other fruits and vegetables. One key informant reported how unemployment affected the dietary diversity of children as, *“Most of the households lacked adequate access to food for the family due to poverty; the children lack diverse diet “(KII 2, 2018).* Another key informant supported it by saying *“Many of the caregivers were casual workers and petty traders and had no reliable source of income to purchase diverse foods” (KII 1, 2018).*

With regard to 24-hour food consumption by the study children, about three quarters of them (75.6%) consumed foods made from grains, roots and tubers. Other fruits and vegetables were consumed by more than two thirds (70.3%), and legumes and nuts

(40.8%) by about two fifths respectively. Consumption of vitamin A rich fruits and vegetables was high at about three quarters (74.0%), while consumption of food from animal origin was low. Only about two fifths of children consumed eggs (44.8%), while about three quarters consumed dairy products (76.9%); and barely about a third of them consumed flesh food (29.4%). Vitamin A rich foods consumed in the 24 hour period prior to the data collection were mainly mangoes, pawpaw, watermelons, spinach, kales, pumpkin and amaranth leaves .Only about a third of the study children (29.4%) consumed iron rich foods such as liver, fish, meat, poultry, and organ meats (Table 4.5). As observed by the researcher and reported by the caregivers in FGDs and key informants in KIIs, the most common foods consumed by the children included maize porridge, *Ugali*, rice, Irish potatoes, green bananas, beans, pigeon peas, green grams and cowpeas. The diets were relatively high in starchy staples and vegetables and fruits.

Table 4.5 Dietary diversity among children aged 6-23 months

| Dietary diversity in 24 hours to data collection | | N = 377 |
|---|----------|----------------|
| Food | n | % |
| Grains, roots and tubers: Porridge, thick porridge, rice, green bananas/potatoes (n= 377) | 285 | 75.6 |
| Legumes and nuts: Beans /green grams/pigeon peas /cowpeas (n = 377) | 154 | 40.8 |
| Dairy products: Fresh milk, cheese, butter, yoghurt (n = 377) | 290 | 76.9 |
| Flesh foods: Beef /fish/poultry (n = 377) | 111 | 29.4 |
| Eggs (n = 377) | 169 | 44.8 |
| Vitamin A rich fruits and vegetables: Ripe bananas/ Mangoes/pawpaw/kales/spinach (n = 377) | 279 | 74.0 |
| Other fruits and vegetables: Tomatoes, oranges, tangerines, cabbages (n=377) | 265 | 70.3 |

4.2.5 Minimum Acceptable Diet

The minimum acceptable diet (MAD) was determined by calculating the proportion of all breastfed children who attained both minimum meal frequency and a minimum dietary diversity 24 hours before data collection and non-breastfed children who notwithstanding the above received at least 2 milk feedings in the same period. Overall MAD was achieved by only about two fifths of the children aged 6-23 months (39.8%). Among the breastfed children slightly below half (46.0%) met the MAD while among the non-breastfed children about a fifth met the MAD (22.8%) (Table 4.4). One key informant said *“Many caregivers had poor food preferences and choices for their children causing low adherence to proper complementary feeding practices due to their low level of education (KII 2 2018)”*.

4.2.6. 7-Day Food Frequency

With regard to 7- day food frequency, the most popular food groups consumed daily by children aged 6-23 months in the last seven days to data collection were grains, roots and tubers (98.8%) and other fruits and vegetables (94.2%) respectively. Vitamin A rich fruits and vegetables (89.1%), dairy products (84.9%), eggs (55.2%) and flesh foods (44.0%) were consumed 3 times in seven days by the study children. No nuts were provided in either of the households visited. (Table 4.6) shows the results.

Table 4.6: Frequency of consumption of various foods by children

| Food | 7-day food consumption patterns | | |
|------|-----------------------------------|-------------------------------|----------------------------|
| | Eaten daily in 7 days n (%) | 3 times in 7 days n (%) | Once in 7 days n (%) |
| | | | |

| | |
|--|-------------|
| Grains, roots and tubers: Porridge, thick porridge, rice, green bananas/potatoes | 365 (98.8%) |
| Legumes and nuts: Beans/green grams/pigeon peas /cowpeas | 302 (80.1%) |
| Dairy products: Fresh milk, cheese, butter, yoghurt | 320 (84.9%) |
| Flesh foods: Beef /fish/poultry | 166 (44%) |
| Eggs | 208 (55.5%) |
| Vitamin A rich fruits and vegetables: Ripe bananas/Mangoes/pawpaw/kales/spinach | 336 (89%) |
| Other fruits and vegetables: Tomatoes, oranges, tangerines, cabbages | 355(94.2%) |

4.3 Nutrition Status of the Children 6-23 Months Old

The mean (SD) of the z-scores for wasting, underweight and stunting were 0.611 ± 1.02 , -1.014 ± 0.7 and -1.258 ± 1.03 respectively. The prevalence of wasting (global acute malnutrition) GAM, stunting and underweight were 6.6%, 33.7% and 16.4% in that order. At the time of data collection, no bilaterally pitting oedema cases were found among the assessed children.

4.3.1 Weight for Length Z-scores

The mean weight for length z-scores was 0.611 ± 1.02 . Up to 93.4% of the children had normal weight for their length. Prevalence of wasting was 6.6%; about 4.5% moderately, while 2.1% were severely wasted. Another 12.0% were mildly wasted. One key informant reported how lack of income affected the nutrition status of children as, “*Most of the households lacked adequate access to food for the family; the children lack diverse diet*” (KII 1, 2018). Another key informant supported it by saying “*Most of the caregivers*

were casual workers and had irregular income means” (KII 2, 2018). More boys (7.9%) than girls (5.3%) had low weight for their length (wasting). There were significant differences in prevalence of wasting between age groups. Wasting was highest among the children aged 6-11 months (8.0%) and lowest (5.6%) among those aged 18-23 months (Table 4.7).

Table 4.7: Study children’s nutrition status (Weight for length Z-scores) by sex and by age

| Child nutrition status | Boys | Girls | Total |
|----------------------------------|---------------------------|---------------------|---------------------|
| | n = 190 | n = 187 | N = 377 |
| Weight for Length Z- scores | n % | n % | n % |
| Normal (> -1 SD) | 151 (79.5%) | 156 (83.4%) | 307 (81.4%) |
| Acute malnutrition (wasting) | | | |
| Mild (< -1 to > -2 SD) | 24 (12.6%) | 21 (11.3%) | 45 (12.0%) |
| Moderate (MAM) (≤ -2 to > -3 SD) | 11 (5.8%) | 6 (3.2%) | 17 (4.5%) |
| Severe (SAM) (≤ -3 SD) | 4 (2.1%) | 4 (2.1%) | 8 (2.1%) |
| Global (GAM) (≤ -2SD) | 15 (7.9%) | 10 (5.3%) | 25 (6.6%) |
| Weight for length Z- scores | Mean ± SD 0.611 ± 1.02 | | |
| By age | 6-11 months | 12-17 months | 18-23 months |

| Weight for length Z- scores | n % | n % | n % |
|---|-----------|-------------|-------------|
| Normal (GAM) ≥ -2 SD | 136 (92%) | 113 (94.1%) | 103 (94.4%) |
| Acute malnutrition (wasting) Severely wasted (SAM) < -3SD WLZ | 3 (2.0%) | 2 (1.7%) | 3 (2.8%) |
| Moderately wasted (MAM) ≥ -3SD to <- 2SD WLZ | 9 (6.0%) | 5 (4.2%) | 3 (2.8%) |
| Total wasted (GAM) <-2SD | 12 (8.0%) | 7 (5.9%) | 6 (5.6%) |

Nutrition status based on WHO 2006 growth standards Z- scores

4.3.2 Length for Age Z-scores

Length-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. In this study about two thirds of children aged 6-23 months (66.3%) were normal while 33.7% were stunted. About a tenth of them were mildly stunted (11.4%), 8.7% moderately stunted while a quarter of them (25.0%) was severely stunted. The mean length for age z-score was -1.258 ± 1.03 . More boys (41.6%) than girls (25.7%) were significantly ($p > 0.05$) short for their age. There were significant differences in prevalence of stunting between age groups ($p < 0.05$). Stunting was lowest (14.2%) among children aged 6-11 months and highest (61.5%) among children aged 18-23 months (Table 4.8).

Table 4.8: Children's nutrition status (Length for Age Z-scores) by sex and by Age

| Child nutrition status | Boys | Girls | Total |
|--------------------------|----------------|----------------|----------------|
| | n = 190 | n = 187 | N = 377 |
| Length for Age Z- scores | n % | n % | n % |
| Normal (> -1 SD) | 85 (44.7%) | 122 (65.2%) | 207 (54.9%) |
| Stunting | | | |

| | | | |
|--|----------------------------|---------------------|---------------------|
| Mild (< -1 to > -2 SD) | 26 (13.7%) | 17 (9.1%) | 43 (11.4%) |
| Moderate (≤ -2 to > -3 SD) | 21 (11.1%) | 12 (6.4%) | 33 (8.7%) |
| Severe (≤ -3 SD) | 58 (30.5%) | 36 (19.3%) | 94 (25%) |
| Global stunting (≤ -2SD) | 79 (41.6%) | 48 (25.7%) | 127 (33.7%) |
| Length for age Z- scores | Mean ± SD – 1.25 ± 1.03 | | |
| By age | 6-11 months | 12-17 months | 18-23 months |
| | n = 148 | n = 120 | n = 109 |
| Length for age Z- scores | n % | n % | n % |
| Normal ≥ - 2 SD | 127 (85.8%) | 81 (67.5%) | 42 (38.5%) |
| Stunting | | | |
| Severely stunted < -3 SD LAZ | 9 (6.1%) | 32 (26.7%) | 53 (48.7%) |
| Moderately stunted ≥-3SD to <-2 SD LAZ | 12 (8.1%) | 7 (5.8%) | 14 (12.8%) |
| Global stunting (≤ -2SD) | 21 (14.2%) | 39 (32.5%) | 67 (61.5%) |

4.3.3 Weight for Age Z- Scores

Weight for age is a composite index of weight- for- length and length- for-age. It takes into account both chronic malnutrition and acute. In this study majority of the children aged 6-23 months (83.6%) were normal. Slightly below a fifth of the study children (16.4%) were underweight. On the whole about a tenth were mildly underweight (10.9%), 9.8% moderately underweight and 6.6% severely underweight. The mean weight for age was -1.014 ± 0.7 . One key informant said “*there is very high prevalence of underweight and wasting among children aged 6-23 months occasioned by poor breastfeeding and complementary feeding practices mainly among children of mothers who are casual workers (KII 1 2018)*”. Another key informant said “*the consumption of a minimum meal frequency and minimum dietary diversity among children aged 6-23 months is wanting as frequent droughts causes unemployment, low income and food insecurity affecting children’s nutrition status (KII 2 2018)*”. There were significantly more boys (21.6%) than girls (11.3%) who were underweight. There were significant differences in prevalence of underweight between age groups ($p < 0.05$); underweight

(32.1%) was highest among children 18-23 months of age and lowest (6.1%) among children aged 6-11 months (Table 4.9).

Table 4.9: Children's nutrition status (Weight for Age Z-scores) by sex and by Age

| Child nutrition status | Boys | Girls | Total |
|--|----------------|----------------|----------------|
| | n = 190 | n = 187 | N = 377 |
| Weight for Age Z- scores | n % | n % | n % |
| Normal (> -1 SD) | 126 (66.3%) | 148 (79.1%) | 274 (72.7%) |
| Underweight | | | |
| Mild (< -1 to > -2 SD) | 23 (12.1%) | 18 (9.6%) | 41 (10.9%) |
| Moderate (≤ -2 to > -3 SD) | 24 (12.6%) | 13 (7.0%) | 37 (9.8%) |
| Severe (≤ -3 SD) | 17 (9.0%) | 8 (4.3%) | 25 (6.6%) |
| Global underweight (≤ -2 SD) | 41 (21.6%) | 21 (11.3%) | 62 (16.4%) |
| Weight for age Z- scores | Mean \pm SD | | |
| | - 1.014 \pm | | |
| | 0.7 | | |
| By age | 6-11 | 12-17 | 18-23 |
| | months | months | months |
| | n = 148 | n = 120 | n = 109 |
| Weight for age Z- scores | n % | n % | n % |
| Normal ≥ -2 SD | 139 (93.9%) | 102 (84.7%) | 74 (67.9%) |
| Underweight | | | |
| Severe underweight | 3 (2.0%) | 4 (3.3%) | 18 (16.5%) |
| < -3 SD WAZ | | | |
| Moderate underweight ≥ -3 SD to < -2 SD | 6 (4.1%) | 14 (11.7%) | 17 (15.6%) |
| WAZ | | | |
| Global underweight (≤ -2 SD) | 9 (6.1%) | 18 (15%) | 35 (32.1%) |

4.4 Morbidity Prevalence Among Children Aged 6-23 Months

About a third of the study children (33.7%) were sick two weeks to data collection. Overall, for all study children, about a tenth of them had a fever with chills like malaria (10.1%), almost a similar percentage (9.6%) had diarrhea, 8.5% had cough with difficulty in breathing, 3.7% had fever and 1.3% had other illnesses. From FGDs findings, complementary foods were introduced earlier (i.e., before 6 months) therefore this inappropriate feeding was associated with risk of child developing infections like

diarrhea. “*My child had diarrhea and the nurse say it is because i gave her porridge before six months (FGD 1 2018.)*”. Some caregivers who did not practice timely complementary feeding said “*the child became sick and was treated frequently (FGD 2 2018)*”. One key informant said “*caregivers poor personal hygiene and sanitation, low level of education and scarcity of portable water increases diarrhea incidences among children aged 6-23 months (KII 1 2018)*”. Another key informant said “*poor child care practices mainly among caregivers who were casual workers increases the chances of their children developing diarrhea and respiratory infections*”. Almost all caregivers (99.2%) sought medical assistance for their sick children. Slightly below a half of the caregivers did so from private clinics/pharmacies (46.4%), about two fifths (42.4%) in public health facilities while 10.4% sort from elsewhere (Table 4.10).

Table 4.10: Morbidity prevalence of children 6-23 months of age

| Child morbidity | N = 377 | |
|---|---------|------|
| | n | % |
| Ill children in the previous 2 weeks | 125 | 33.7 |
| Reported common illnesses in the previous 2 weeks | | |
| Watery diarrhea | 32 | 8.5 |
| Bloody diarrhea | 4 | 1.1 |
| Cough with difficult breathing | 32 | 8.5 |
| Fever | 14 | 3.7 |
| Others | 5 | 1.3 |
| Fever with chills like Malaria | 38 | 10.1 |
| Caregivers health seeking behavior (N = 125) | | |
| Sort treatment | 124 | 99.2 |
| Did not seek treatment | 1 | 0.8 |
| Where assistance was sort when child was sick (N = 125) | | |
| Public health facility | 53 | 42.4 |
| Private clinic/pharmacy | 58 | 46.4 |
| Others | 14 | 11.2 |

4.5 Relationships between Complementary Feeding Practices and Nutrition Status of the Children aged 6-23 Months

Chi-square was the statistical test used for establishing relationships between CF practices and nutrition status. The indicators of the children's nutrition status were assessed as wasting, underweight and stunting. The test of relationship was conducted and the chi-square test results showed that at 95% confidence level, the p-value (0.198, 0.870 and 0.560) are more than 0.05 indicates that these variables are independent of each other and that there is no statistically significant relationship between minimum meal frequency and wasting, stunting and underweight (Table 4.11).

Table 4.11: Relationship between meal frequency and nutrition status of children aged 6-23 months

| Minimum meal frequency | Child nutrition status | | Chi-square (χ^2) | P- Value |
|--------------------------------|------------------------|-------------|----------------------------|----------|
| | wasted | normal | 1.658 | 0.198 |
| Met minimum meal frequency | 24 (6.4%) | 288 (76.8%) | | |
| Not met minimum meal frequency | 2 (0.5%) | 61 (16.3%) | | |
| | Stunted | normal | 0.027 | 0.870 |
| Met minimum meal frequency | 47 (12.5%) | 265 (70.7%) | | |
| Not met minimum meal frequency | 10 (2.7%) | 53 (14.1%) | | |
| | Underweight | normal | 0.340 | 0.560 |
| Met minimum meal frequency | 23 (6.1%) | 289 (77.1) | | |
| Not met minimum meal frequency | 6 (1.6%) | 57 (15.2%) | | |

Analysis of the relationship between minimum dietary diversity and nutrition status showed that the chi-square test results at 95% confidence level, the p-value (0.874, 0.944 and 0.740) are more than 0.05 indicating that these variables are independent of each other and that there is no statistically significant relationship between minimum dietary diversity and wasting, stunting and underweight (Table 4.12).

Table 4.12: Relationship between dietary diversity and nutrition status of children aged 6-23 months

| Minimum dietary diversity | Child nutrition status | | Chi-square | P-Value |
|-----------------------------------|-------------------------------|---------------------|-------------------|----------------|
| | | | (χ^2) | |
| Met minimum dietary diversity | wasted 2 (0.5%) | normal 30 (8.0%) | 0.025 | 0.874 |
| Not met minimum dietary diversity | 24 (6.4%) | 319 (85.1%) | | |
| Met minimum dietary diversity | Stunted 5 (1.3%) | normal 27 (7.2%) | 0.005 | 0.944 |
| Not met minimum dietary diversity | 52 (13.9%) | 291 (77.6%) | | |
| Met minimum dietary diversity | Underweight 2 (0.5%) | normal 30 (8.0%) | 0.108 | 0.743 |

| | | |
|-----------------------------------|-----------|-------------|
| diversity | | |
| Not met minimum dietary diversity | 27 (7.2%) | 316 (84.3%) |

Analysis of the relationship between minimum acceptable diet and nutrition status showed that the chi-square test results at 95% confidence level, the p-value (0.957, 0.453 and 0.836) are more than 0.05 indicates that these variables are independent of each other and that there is no statistically significant relationship between minimum acceptable diet and wasting, stunting and underweight (Table 4.13).

Table 4.13: Relationship between minimum acceptable diet and nutrition status of children 6-23 months of age

| Minimum acceptable diet | Child nutrition status | | Chi-square (χ^2) | P- Value |
|---------------------------------|------------------------|-----------------------|----------------------------|----------|
| | wasted | normal | | |
| Met minimum acceptable diet | 12 (3.2%) | 163 (43.5%) | 0.003 | 0.957 |
| Not met minimum acceptable diet | 14 (3.7%) | 186 (49.6%) | | |
| Met minimum | Stunted 24(6.4%) | normal 151 (40.3%) | 0.562 | 0.453 |

| | | | | |
|---------------------------------|-------------|-------------|-------|-------|
| acceptable diet | | | | |
| Not met minimum acceptable diet | 33 (8.8%) | 167 (44.5%) | | |
| | Underweight | normal | 0.043 | 0.836 |
| Met minimum acceptable diet | 13 (3.5%) | 162 (43.2%) | | |
| Not met minimum acceptable diet | 16 (4.3%) | 184 (49.1%) | | |

The null hypothesis H_0 : stated that there is no significant relationship between complementary feeding practices and the nutrition status of children aged 6-23 months in Yatta Sub-County, was therefore accepted.

4.5.1 Association between Demographic and Socio-economic Characteristics of Households and Complementary Feeding Practices

Pearson Correlation Coefficient (r) was used to test the association between household's income and minimum meal frequency, minimum dietary diversity and minimum acceptable diet. The highlighted variables were only those that exhibited significant associations. There was a significant and positive correlation between household's income and minimum acceptable ($r=0.105$). However, no significant correlation was found between household's income and minimum meal frequency and minimum dietary diversity ($r = - .020$, $r = - 0.075$) (Table 4.14).

Table 4.14: Association between household income and minimum meal frequency, minimum dietary diversity and minimum acceptable diet

| Household income and MMF, MDD and MAD | N = 377 | | |
|---|------------------------------|----------|------------------|
| | Pearson's correlation | r | P - Value |
| Households income Versus minimum meal frequency | | - 0.020 | 0.697 |

| | | |
|--|---------|-------|
| Households income Versus minimum dietary diversity | - 0.075 | 0.149 |
| Households income Versus minimum acceptable diet | 0.105 | 0.042 |

Pearson Correlation Coefficient (r) was used to test the association between caregiver's main occupation and minimum meal frequency, minimum dietary diversity and minimum acceptable diet. There was a significant and positive correlation between caregiver's main occupation and minimum acceptable diet ($r = 0.112$). However, no correlation was found between caregiver's main occupation and minimum meal frequency and minimum dietary diversity ($r = - 0.053$, $r = - 0.011$) (Table 4.15).

Table 4.15: Association between caregivers main occupation and minimum meal frequency, minimum dietary diversity and minimum acceptable diet

| Caregivers main occupation and MMF ,MDD and MAD | N = 377 | | |
|--|----------------------------------|----------|------------------|
| | Pearson's correlation | r | P - Value |
| Caregivers main occupation versus Minimum meal frequency | | - 0.053 | 0.305 |
| Caregivers main occupation versus Minimum dietary diversity | | - 0.011 | 0.837 |
| Caregivers main occupation versus Minimum acceptable diet | | 0.112 | 0.030 |

Therefore, the null hypothesis H_{02} : There is no significant relationship between the demographic and socio-economic characteristics of households and complementary feeding practices among children aged 6-23 months in Yatta Sub-County was thus rejected.

CHAPTER FIVE: DISCUSSION

5.0 Demographic and Socio-Economic Characteristics of Households of Children

Aged 6-23 Months

Overall the majority of the caregivers were young, married women. About two fifths were of primary level of education and their main occupation was house wife. The low level of education might have an effect on CF practices in terms of influencing the level of knowledge and the extent of economic power wielded. This is in line with other studies in Ethiopia (Gatahun et al, 2015), Nigeria (Akeredolu et al., 2014), Ghana (Konyole, 2014; Adokiya, 2010) and Kenya (Ngaari, 2013; Kamau,2014; Ndiku et al., 2010; Abuya 2010; Muchina & Waithaka, 2010; KNBS & ICF Macro, 2015; Amunga, 2015). The level of education among caregiver's reported in this study was in agreement with those of a study in 2007 where 38% of children had mothers with secondary or more education in Ghana (Hong, 2007). However the findings were higher than with a study by Ambia (2019) in Tharaka Nthi County where 67% of primary caregivers had not completed primary education and in a study by Ndanu (2013) where close to two thirds (63.7%) of mothers had primary level education while slightly more than one-quarter (26.9%) had secondary education. The current findings however disagreed with those of another similar study in Marsabit County where more than four fifths of caregiver's had not attained any formal education with only 8.8% having attended primary school (Galgallo, 2017). According to (KNBS & ICF Macro, 2015) children whose mothers did not complete primary schools or those who had no education were more likely to be stunted than children of mothers with secondary or higher education.

In this study the household's income was low and was therefore in agreement with the findings of a study where ASAL areas were characterized by limited resources, low income among the inhabitants, drought and low level of social and human capital (Harison et al., 2017) and another similar study in 2015 in Kitui County by Kimiywe and Chege where 69.2% of caregiver's had low levels of income (Kimiywe & Chege, 2015). The low household's income established in this study implied that the household's expenditure on food might have had an effect on CF practices and consequently the children's nutrition status and therefore in agreement with WHO (2011) where household expenditure influenced CF practices which in turn affected children's nutrition status. Another similar study by Masiye et al. (2010) in Zambia showed that household expenditure was the main determinant of nutritional status of a child and therefore in concurrence with this study. In contrast a study by Ambia (2019) in Tharaka Nthi County on the determinants of children malnutrition found no evidence of association between household expenditure on food and children's nutrition status (Ambia, 2019).

The average household size in this study was large (7 members) and higher than the national average of 4.4 for rural households (KNBS & ICF Macro, 2015). This was in agreement with a study by Bukania (2014) in Machakos and Makueni Counties where the overall mean household size was 7 members and which was found to be much higher than the national mean of 4.2 (KNBS, 2009). The findings were also similar to those that were discovered in a study by Macharia-Mutie, Brouwer, Mwangi and Koki in a rural area of Mwingi, Kenya; who found the average household size to be 6.9 (± 2.5) but was slightly higher than those of a similar study in Isiolo County, Kenya where the average

household size was 6 members (Macharia et al., 2019) .The findings were however higher than those found in Tharaka Nthi and Marsabit Counties where the mean household size was 5 members (Ambia, 2019;Galgallo, 2017). This suggests that the represented households in this study may have had more strain on their resources especially given that; the larger the household size the more food needs translating to more income required (Aidoo et al.,2013 in Ghana; Sakyi, 2012 in South Africa and Bashir et al., 2012) in Pakistan).

Education is one of the most important resources that enable caregivers who were mainly women to provide appropriate care for their children, which is an important determinant of children's growth and development (Engle *et al.*, 1996). In the present study, low levels of education may have probably contributed to having many of the caregivers being housewives (59.9%). This was similar to findings of a study in Kwale where 59% of the mothers were housewives (Adeladza & Adeladza, 2009) and another similar study in Mandela County, Kenya, where household's characteristics indicated a majority of caregiver's were housewives (53.6%) (GOK, 2017). The findings in this study that many of the caregiver's were house wives were higher compared to a survey in Kitui in 2017, where 38.9% of caregiver's were mainly housewives (GOK, 2017) and another study where the main occupation practiced by (31.1%) of the respondents while out of prison was petty trade (Ndanu, , 2013).

A study by Mitchodigni (2017) in southern Benin showed that children whose caregivers were involved in income-generating activities, were less likely to meet minimum meal

frequency consequently affecting the nutrition status of children ($p < 0.05$). In the current study more than a quarter of caregivers were casual laborers working many hours away from home living their children behind with secondary caregivers and this was in concurrence with a study in Tharaka Nthi County which indicated that other sources of income included casual labor (28.9%) (Ambia, 2019). Working outside the home was associated with early introduction of solid, semi-solids or soft foods and cessation of breast feeding (Abbi et al., 1991). A caregiver who spends most of the time at home with her child may be available to practice optimal feeding practices on her child (Leslie, 1998). On the contrary, the findings of a study by Gewa & Leslie (2015), showed that the caregiver's working status was a significant factor in Kenya, where children whose caregiver's were working at the time of the survey were associated with 47% increase in odds of achieving adequate dietary diversity score compared to those with non-working caregivers.

The major source of income for most households in this study population was petty trade and casual labor. These sources do not attract high income and this was confirmed by caregivers during the FGDs. Caregivers reported that the household income was not adequate to provide for food and other necessities. The low incomes may have therefore contributed to the household's inability to achieve MMF for the non-breastfed children and MDD and consequently MAD for the children. 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 MDD by children in many of the households. As food makes up the largest expense in the household's budget of the

rural 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. In contrast a study in Mexico found that household poverty was not a necessary condition for children to be undernourished (Hong, 2007). Nevertheless caregivers in a focus group discussion (FGD) pointed out 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 caregivers away from their children most of the time and lack of reliable jobs that could provide steady income.

The high poverty levels in Yatta Sub-County as indicated by the low mean household income established in this study, and that reported by caregivers during FGDs may have resulted to early school dropout by many 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 a variety of foods. On the whole, most of the spouses (husbands) were casual laborers while most of the caregivers were mothers and were unemployed and depended on their spouses for provision of food and other necessities. Other studies conducted in ASAL settings have found similar findings (Ambia, 2019; Galgallo, 2017; Harrison, 2017; KNBS & ICF Macro, 2015). The findings of this study on caregivers age and nutrition status of the children concurs with other Kenyan studies that reported significant negative associations (Abuya et al., 2010; Korir, 2014). This suggests that

older caregivers are possibly more experienced on child nutrition and health; therefore, better nutrition outcomes for their children than their younger counterparts.

5.1 Breastfeeding Practices

During complementary feeding practices, of children aged 6-23 months, breastfeeding contributes significantly to the overall nutrient intake, fills most of the energy needs and remains an important source of vitamin A and C, as well as essential fatty acids (Mukuria, Kothari and Abderrahim, 2006). The current study findings indicated breastfeeding rate was relatively high compared with the Kenya national figures as reported in the KDHS (KNBS and ICF Macro, 2008-09). This was also expected given that about a third of the study children were older (aged 18-23 months) (28.9%) and the fact that culturally Africans breastfeed their children. The findings were however lower than in a study on (IYCF) practices among mothers of children aged 6–23 months in two agro-ecological zones of rural Ethiopia where 95.4% of the mothers had ever practiced breastfeeding (Roba et al., 2016).

In this study about a fifth of caregivers used pre lacteal foods (22%) and this was in agreement with a study by Roba (2016) in rural Ethiopia on IYCF where 22.2% of children aged 6-23 months used pre lacteal foods. The current findings on continued breastfeeding at 1 year was similar to several countries in Sub-Sahara Africa (Marriot et al., 2011). Other studies in Pakistan by Hanif et al. (2010) showed increasing trends of continued breastfeeding among children 6-23 months of age as well as the study by Sawadogo et al. (2011) in Burkina Faso. This study findings were however lower than

with the Kenyan national rate of continued breastfeeding at one year which was 90% in 2014 (KNBS & ICF Macro, 2015) and with another similar study in Tharaka Nthi County, where continued breastfeeding at one year stood at 92.3% (Ambia, 2019). Similarly the results were lower than those in a survey in Kitui County in 2017, where continued breastfeeding indicator results were higher compared to the national average as indicated by the KDHS 2014 results; continued breastfeeding at 1 year (91.2%). The findings were also lower than those of a study conducted in Marsabit County where the prevalence of breastfeeding up to 1 year was 85.7% (Galgallo, 2017). In this study about a third of caregiver's were casual workers working many hours away from home living their children behind with other secondary caregiver's and perhaps that was the reason why the rate was lower compared to the other studies.

In 2015 the proportion of breastfed children in Kenya declined with age to 61% at the age of 18-23 months (KNBS & ICF Macro, 2015) which was lower but close to the current findings. According to KNBS and ICF macro (2010) results, continued breastfeeding at 2 years or beyond was 57% and therefore lower than those of the current findings and those of a survey in Marsabit County where the prevalence of breastfeeding up to 2 years was 75% (Galgallo, 2017). The proportion of children being breastfed dropped from 73.3% at age of one year, to 69.2% at the age of two years in this study which was a slight drop compared to a study by Amunga in Isiolo County, Kenya (2015) where the proportion of children being breastfed dropped from 94% at age of one year, to 64% at the age of two years. The findings however agreed with those of a survey in Kitui County in 2017, where continued breastfeeding at 2 years was 70.8% (Infant et al., 2017). The findings

were close to those of a study in Tharaka Nthi County, Kenya where the prevalence of continued breastfeeding for two years and beyond was 66.7% (Ambia, 2019). The findings were however higher than in another similar survey in Machakos County where by ages 20-23 months, only 49 per cent of children, were still breastfeeding (KNBS, 2009) and in a SMART survey that was conducted in Marsabit County which indicated that 50.5% of children between age 20-23 months respectively were breast fed (UNICEF,2013). The decline in breastfeeding with an increase in age could be attributed to the increase in consumption of other solid, semi-solid or soft foods, as identified in this study, as well as to increasing households and child care demands. The high level of breastfeeding in this study is a positive finding because breastfeeding has been shown to benefit the health and nutrition status of children. Further, Kenya's nutrition action plan aims to promote continued breastfeeding as a key component of optimal infant and young child feeding.

5.1.1 Complementary Feeding Practices among Children Aged 6-23 Months

In this study, seven indicators of CF practices were assessed: whether a child ever breastfed; continued breastfeeding at one year; continued breastfeeding at two years; MDD; timely introduction of complementary foods, MAD and MMF. The results of this study indicated that the breastfeeding practices, timely introduction of complementary foods and MMF (with the exception of non-breastfeeding children 6-23 months) and MDD were largely appropriate while MAD was poor. These study findings differed from those of a study by Amunga (2015) in Isiolo County in Kenya which indicated that the CF practices were poor except breastfeeding practices that were indicated to be high.

5.1.2 Introduction of Solid, Semi- Solid or Soft Food

At the age of six months, an infant's demand for calories and nutrients commences to exceed what is provided by breast milk, hence introduction of solid, semi-solid and soft foods is essential to meet energy and nutrient needs (WHO, 2006b) and if these foods are not fed when a child has finished 6 months, an infant's growth may falter (WHO, 2015). In this study majority of the caregivers introduced complementary foods to their children timely. The findings disagreed with those of a similar study in rural Ethiopia on IYCF where only a half of caregiver's introduced timely complementary feeding at 6 months (Roba et al., 2016) and another similar study in Mandela, County Kenya on IYCF where only 53.2% of children aged 6-8 months were introduced to solid, semi-solid or soft foods (GOK, 2017). Nevertheless these findings were close to those contained in the Kenya demographic & health survey report (2009) where 84.9% of infants aged 6-8 months had timely complementary feeding practices. The findings were however higher than the national rate, reported by (KNBS & ICF Macro, 2015) where 79.6% of children were introduced to solids and semi-solid foods which indicated a declining national trend.

Most previous studies however have documented an early introduction of complementary foods before the recommended period of six months. Such a study was one conducted by Macharia-Mutie, Brouwer, Mwangi and Kogi, where the mean age of complementary food introduction was 2.45 (\pm 1.7) months and a similar study in Tharaka Nthi County , where introduction of children to solid and semi solid foods according to focus group discussion was as early as three months (Ambia, 2019). This study found while majority of the study children had been introduced to complementary foods at the time of data

collection about a tenth of the children had not taken complementary foods in the previous 24 hours indicative of late introduction of complementary foods. This study findings are nevertheless, lower than in a study by Amunga (2015) in Isiolo County where about a third (31%) of the children aged 6-8 months had not been introduced to semi-solid and or solid foods indicative of late introduction of complementary foods. In the context of communities living in ASAL, the late introduction of complementary foods might be due to the challenges relating to access to food and availability as well as related difficulties that are encountered like working many hours away from home and poor knowledge regarding child feeding. It is, therefore evident that the timely introduction of complementary foods is a challenge that might have an impact on the growth and development of the child, which particularly predisposes the child to poor nutrition status, in terms of both macronutrients and micronutrients. In this study, from the FGD findings, complementary foods were introduced earlier in life (i.e., before 6 months of life) therefore this inappropriate feeding was associated with risk of child developing infections like diarrhea. Caregivers who practiced timely introduction of complementary foods reported to have received information from medical staff during their prenatal clinic visits, those who practiced timely complementary feeding it was not complicated and they noticed its benefits as their children rarely developed diarrhea.

5.1.3 Minimum Meal Frequency

The frequency of feeding is an important indicator of the attainment of adequate dietary intake and therefore health and nutrition status (Marriott et al., 2015). According to WHO 2010 recommendations, a MMF is attained when complementary foods are consumed:

four times or more for non-breastfed children aged 6-23 months, thrice or more for breastfed children aged 9-23 months and twice or more for breastfed infants aged 6-8 months. In this study majority of the breastfed children attained MMF unlike their counterparts, the non-breastfed children. This findings were in agreement with those of a study by Romulus (2011) in Brazil which found out that attainment of MMF among breastfed children was common (Makena, 2016) and those of an educational intervention to promote appropriate CF practices in young children in India which established that the mean meal frequency for children 9 months old was 4.4 and 3.9 times for intervention and control groups respectively (Makena, 2016). The proportion of children in this study who met their recommended MMF was also found in other studies in India (Parashar et al., 2015; Jain et al., 2014), and Kenya (Korir, 2014; Kimiywe and Chege, 2015).The findings were also in concurrence with the once found in a study in Isiolo County ,Kenya where almost all breastfed children attained their MMF (Macharia et al., 2019).The findings also agreed with those of studies conducted in Kitui and Isiolo Counties where MMF was high except for the non-breastfed children (GOK, 2017; Macharia et al.,2019).

The study findings were nevertheless higher than in a similar survey in Bangladesh in 2016 where almost a half of children under five years, did not consume the MMF (Makena, 2016) and with the Kenya demographic and health survey which indicated that only 51% of children aged 6-23 months in Kenya had been fed the minimum number of times appropriate for their age (KNBS & ICF Macro, 2015). Similarly the findings were higher than those of a study by Amunga (2015) in Isiolo County, Kenya which found MMF to be achieved by 60% of the children and in a similar survey in Tharaka Nthi

County where those who met the MMF among breastfeeding children aged 6-23 months in rural areas was 45.6% and 49.5% for non-breastfeeding children (KNBS & ICF Macro 2015). The study findings were however lower than in another similar study conducted in Ghana by Christina (2011) which indicated that most of the children met the MMF and the findings of Budimali & Chebrolo (2015) in Guntur District in Delhi which established that 94.0% of children aged 6-23 months attained MMF.

The findings of this study differed with those of a study in Pakistan where frequency of CF was inadequate in 76.47% of the children (Memon et al., 2001) and a similar study in northern Ethiopia, where only 44.7% of children received MMF (Roba et al., 2016). The findings similarly contrasted those of a study in Isiolo County, Kenya where only 9.5% of the non-breastfed children attained the MMF (Macharia et al., 2019) and another study in Mandela County on MIYCN where among all age groups (6-23 months) only 14.9% of them attained a MMF (GOK,2017). Of concern in this study was the frequency of meals served to non-breastfed children, who consumed the same number of meals as their breastfed counterparts despite the fact that they needed to consume more times since they did not get additional nutrients from breastfeeding. No special consideration was given to these children.

5.1.4 Minimum Dietary Diversity

The recommended minimum dietary diversity (MDD) for a child aged 6-23 months is the consumption in 24 hours to data collection of \geq four food groups among the recommended once which ensures that a child who is aged above six months obtains the

required amounts of micronutrients and macronutrients that are necessary for growth and development. The WHO 2010 recommends foods from roots, tubers and grains, legumes and nuts, flesh foods, dairy products, eggs, vegetables & fruits rich in Vitamin A and other vegetables and fruits. The current findings on MDD were much higher than obtained in the most recent data on the quality of complementary foods and feeding practices which indicated that globally 72.0% of children aged 6–23 months were not fed the minimum diverse diet needed to grow healthy (UNICEF, 2020) and another similar study where in eleven of the twenty seven sub Saharan African countries analyzed, fewer than 30% of children aged 6-23 months achieved a MDD (Jones et al., 2014). The current findings on MDD were also higher than in another similar study on IYCF among children aged 6-23 months in rural Ethiopia where the overall prevalence of children achieving MDD was 22.2% (Roba et al., 2016) and the findings established in studies carried out in the Kenyan ASAL areas (Kimiye and Chege, 2015) in addition to the national figures (KNBS & ICF Macro, 2015). In Kenya 41% of children aged 6-23 months had adequately diversified diet in 2014 (KNBS & ICF Macro, 2015) compared to 58% in 2010 (KNBS & ICF Macro, 2010) which indicated a declining national trend of which the findings were lower than those of this study. Similarly, the findings were higher than reported in a study in Mandela County, Kenya where among children aged 6-23 months only 24.0% received a MDD (GOK, 2017). The findings were also similarly higher than those found in a similar study in Marsabit County, Kenya where 67.2% of the children aged 6-23 months had low diversity (Galgallo, 2017) and where overall, the mean dietary diversity was 3.07 food groups. Likewise, the findings were higher than in a study by (Amunga, 2015) in Isiolo County, Kenya where the MDD was achieved by less than two

eighths (35%) of the children surveyed which was attributed to being from a pastoralist community that lived in a remote, dry area and which, therefore, experienced challenges relating to the access to and the availability of a variety of foods often thereby resulting to food insecurity. The findings were also similarly higher than those found in a similar study in Tharaka Nthi County, Kenya where the proportion of children aged 6–23 months who met WHO recommended MDD was 47.3% (Ambia, 2019) and in another study in Machakos County where only 27.7% of children aged 6-23 months had adequate dietary diversity (Bukania et al., 2014).

The difference between the findings of this study and those relating to the other ASAL rural households in Kenya could be due to the fact that this study though conducted in ASAL, was in an area with close proximity to irrigated horticulture vegetables farming where many caregivers worked as casual laborers. The findings might also have been affected by the time of data collection which was in December when the short rains were going on making diverse vegetables and fruits to be available. The fruits rich in vitamin A like Mangoes and pawpaw's were in season and available to the caregivers. The results may have been probably different if data in this study was corrected in a month like September. However, the mean dietary diversity score was below the recommended ≥ 4 food groups (WHO, 2010). The findings however, agreed with a study in Malawi by Leonie (2012), which reported that the indicator MDD was achieved by 60.9% of children. This study findings were also close to the Kenya national rate, where children aged 6-23 months who achieved the recommended dietary diversity was 58.0% (KNBS, 2010) and the Nairobi County rate which was 58.7% (KNBS & ICF Macro 2010).

Findings from this study indicated that majority of the children aged 6-23 months consumed foods made from grains, roots, and tubers because they were readily available. The findings are similar to those found in studies conducted in Kenya (Ndiku et al., 2010; Kamau, 2014; Korir, 2014), Ethiopia (Mesfin et al., 2015; Gatahun et al., 2015), Ghana (Adokiya, 2010) and Tanzania (Mamiro, Kolsteren, Roberfroid, Opsomer and Van Camp, 2019). This study findings of a high consumption of grains, roots and tubers is also comparable to the Kenya national figures (80.0%) as reported in Kenya Demographic Health Survey (KNBS & ICF Macro 2015), and the findings of a study in Mandela County, Kenya where children's diets mainly consisted of grains, roots & tubers (76.5%) (GOK, 2017). Likewise, the findings agreed with those of a study by Galgallo (2017) in Marsabit County, where the most frequently consumed foods were cereals, roots and tubers (97.1%). Such diets might potentially be lacking in the diversity that is required in terms of the consumption of all the food groups and their prevalence might also contribute to the inability to achieve recommended CF practices.

In this study the consumption of flesh foods and eggs was low and thus concurred with the findings of a study which noted that globally, the majority of young children consumed breastmilk, but they were not eating enough animal-source foods, and relied heavily on grains (UNICEF, 2020). The inadequate intake of iron rich and iron fortified foods in this study was also in agreement with previous findings in Zambia (Serlmitos & Fusco, 2001) and Tanzania (Mamario et al., 2005) Kenya and the eastern region in particular (Gatahun (2015), Kimwele (2014) and Kipruto, (2010). 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 this study. The findings were however higher than with those of a study in Kitui County, Kenya where consumption of animal source foods was low, barely 4.6% of the children consumed eggs while consumption of dairy products and flesh foods was at 32.1 and 13.0% respectively (Infant et al., 2017). The low consumption of animal origin foods may be as a result of the elevated poverty incidents in the ASALs and hence insufficient income to buy foods. From the FGDs with caregivers they felt that lack of a diverse diet was contributed to by lack of adequate money to purchase a variety of foods. This study findings however differed with those of a study in rural Ethiopia where only 1.9% of the mothers fed their children iron-rich food (Roba et al., 2016).

5.1.5 Minimum Acceptable Diet

The WHO 2010 -recommended minimum acceptable diet (MAD) relates to meeting the minimum dietary diversity (MDD) and minimum meal frequency (MMF) for the non-breastfed and breastfed children aged 6-23 months. In this study, only about two fifths of the children attained the MAD. Majority of the breastfed children attained MMF, a lower percentage attained the MDD and consequently, a lower percentage attained the MAD. This findings agreed with those of a similar study in rural Ethiopia where few non-breastfed children met their MAD compared to their breastfed counterparts (Roba et al., 2016) and the Kenyan national rate where the proportion of children aged 6-23 months who met the MAD among rural residents in Kenya in 2014 were 17.4% and 11.6% for breastfeeding and non-breastfeeding children respectively (KNBS & ICF Macro

2015). The findings were also in concurrence with those of a study in Isiolo County, Kenya where more breastfed children met their MAD than their non-breastfed counterparts (Macharia et al., 2019). This may be either because of caregiver's lack of knowledge on proper CF practices or other difficulties experienced in ASALs like primary caregiver's working many hours away from their children which make non-breastfed children unable to meet the MMF. However the current findings contrasted those of another similar study in Tharaka Nthi County, Kenya where less breastfed children met their MAD compared to the non-breast fed children at 21.2% and 25.0% respectively (Ambia, 2019). Nevertheless this findings agreed with those of a another study where among poor populations, general food intake was below the minimum requirements (Nube&Voortman, 2006) and the study which indicated that sub-optimal CF practices was a major cause of under nutrition in 2009 (WHO, 2010).

This study findings were nevertheless higher than in a study in 2019 where globally only 1 in 6 children were receiving a minimally acceptable diet (Berhanu et al., 2019) and by other studies where the consumption of a MAD appeared in 2012 to be a challenging aspect as the percentages attained by many developing countries were low (Aemro et al., 2013). Likewise the findings were higher than in a study in 2015, where the national assessments available in west African countries reported that the prevalence of a MAD was low as it ranged from 11.0% in Nigeria (2003) to 29.9% in Ghana (2007) (Issaka, Agho, Burns, Andrew, &Dibley, 2014; Ogbo, Page, Idoko, Fernanda, &Agho, 2015). The findings were also higher than obtained in the Kenyan national level (KNBS & ICF Macro, 2015) where only about 21% of children aged 6-23 months in Kenya consumed a

MAD and those obtained earlier in the Kenyan national level KDHS (2009) which established that the MAD was only attained by 20% of the children which indicated a near stagnant trend in about 5 years. The findings were similarly higher than in a similar study in Tharaka Nthi County, Kenya where the proportion of children who met the MAD was 21.2% and 25.0% for breastfeeding and non-breastfeeding children respectively (Ambia, 2019).

This study findings differed from the one where the percentage of children who attained the MAD in Sub Saharan Africa was 10% (UNICEF, 2014) and the findings reported by Mekbib et al,2014 (11.9%), EDHS,2014 (5.2%) and with a study in rural Ethiopia where only 12.0% of the children accomplished the MAD (Roba, 2016). Likewise the findings of this study contrasted those of a study in 2019 in southern and eastern Africa where only one in ten children aged 6-23 months consumed a MAD (Berhanu et al., 2019) and the findings of a similar study in Mandela County, Kenya where among children aged 6-23 months only 6.2% of them realized the MAD (GOK, 2017). The difference between the findings of this study and those relating to other ASAL rural households in Kenya could be due to the fact that this study though conducted in ASAL, was in an area with close proximity to irrigated horticulture vegetables farming where many caregivers worked as casual laborers. The findings might also have been affected by the time of data collection which was in December when the short rains were going on making diverse vegetables and fruits to be available. The fruits rich in vitamin A like mangoes and pawpaws were in season and available to the caregivers. The results may have been probably different (lower) if data was collected in a drier month like September.

The results were however lower than obtained in Kenya by Mwangi (2018) where all children attained MAD which was attributed to the high dietary diversity and meal frequency and the one in Machakos County where the percentage of children aged 6-23 months who had the MAD was 48.1% (KNBS, 2009). The trend is that MAD was declining in Machakos County at the time of data collection. Food insecurity in Machakos County was reported as likely to increase between July and September because of the early start of the dry season, which lead to shortage of food and reduced opportunities for casual jobs. These factors could explain why barely about two fifths of the children in the study received their MAD. The low percentage of children attaining the MAD indicated that the complementary foods that were provided to children among ASAL communities at the time of data collection were both of poor quality and of insufficient quantity. Six percent of all deaths among children under the age of five years could have been prevented by appropriate CF practices in developing countries in 2015 (Roba, 2016).

5.2 Nutrition Status of Children Aged 6-23 Months in Relation to Feeding Practices

The nutrition status of children is an important indicator of their health and wellbeing. Poor nutrition status in children under two years of age is associated with increased risk of morbidity and mortality. Overall, in this study, the magnitude of under-nutrition was high among children based on stunting, poor for wasting while the prevalence of underweight was higher than the acceptable rates in developing countries. These findings on the prevalence of stunting concurred with the latest available data in the 2020 edition of the UNICEF/ WHO/World Bank Group Joint Child Malnutrition estimates which

indicated that in sub-Saharan Africa, stunting affected one third of children under 5 years (UNICEF, 2020) and those of a similar study where childhood stunting continued to be a public health issue in many African countries in 2015 (Agedew & Chane, 2015). The prevalence of stunting that was found in this study was also in agreement with that by the Kenyan national estimate, since, according to the (KNBS & ICF Macro 2015), the level of stunting was 35% and findings of a similar study in Isiolo County, Kenya where the prevalence of stunting among children was 33.8% (Macharia et al., 2019). The findings also concurred with those obtained in Tharaka Nthi County Kenya in a similar study where 32.1% of children were stunted (Ambia, 2019) and in Machakos county in the eastern region in Kenya in 2014 where 33.6% of children under-five years were stunted (KNBS & ICF Macro, 2015).

The findings were lower but close to the once in a study in 2010 in Sub-Saharan Africa, where the prevalence of stunting among the group of under-fives was estimated at 41% (WHO, 2010) and with the study in Ethiopian national level in 2014, where 44% of children under age of five years were stunted and 21% were severely stunted (Agedew & Chane, 2015). This findings on stunting were higher than the global rate as indicated in a survey which noted that despite the envisaged decline in global trends of acute under nutrition, the figures remained alarmingly high with about 25% of children under five years still stunted in 2012 (WHO, 2012) and in a similar study by Amunga (2015) in Isiolo County Kenya which showed that the prevalence of stunting was 19.1%. Likewise the findings were higher than obtained in a similar study in Kitui County Kenya, where the prevalence of stunting among children aged 6-23 months was 28% (Kimiye &

Chege, 2015) and another similar study in Marsabit County Kenya where the prevalence of stunting was 18.1% (Galgallo, 2017). Overall the parameters of nutrition status that is; stunting (33.7%), wasting (6.6 %) and underweight (16.4%) were slightly higher than the national figures (stunting 26%, wasting 4.0%, underweight 11.0%) (KNBS & ICF Macro, 2015). Despite this the prevalence of stunting, underweight and wasting were above the acceptable levels for a developmental area which is an issue of concern (WHO, 2006).

In this study, the percentage of children with stunting who were aged 6-23 months old increased with an increase in age. This finding is comparable with the national Demographic Health Surveys (DHS) that have been undertaken in 14 different third world countries (including Kenya), where overall and for each country, the prevalence of stunting increased with increase in age group (6-11, 12-17, 18-23 months) (Marriott et al., 2015). These findings are also in agreement with those from a study in India in which stunting was most commonly found in the older children (Makena, 2016). The negative and significant relationship observed between children's age and nutrition status based on stunting and underweight could be explained by the fact that as the child grows older, he/she becomes more independent and accesses different food than the younger child who depends on what is provided by the caregiver (Meme, 1996).

As is illustrated in the WHO conceptual framework for childhood stunting, the main cause of stunting is chronic inadequate complementary feeding, which subsequently leads to both short-term and long-term health, nutritional and economic consequences. The Lancet 2008 series highlighted that appropriate CF practices have the capability to reduce stunting in children aged five years and under - with or without food supplementation -

and in both food-secure and food-insecure households by 6.0%. Therefore, the higher stunting levels in children aged 18-23 months (as compared to 6-11 and 12-17 months) among the ASAL communities might be due to the poor CF practices that were identified in this study and which tended to start early in life but which were probably masked by the time that data was collected (when vegetables and fruits were available as short rains were going on) which was not the normal condition in an ASAL setting. Stunting as a form of malnutrition remained the biggest challenge in the study area; about a third of children were too short for their age. The high burden could be attributed to the double burden of poor feeding practices and prevalence of morbidity which have immediate consequences on the nutrition status of children and which is a threat to achieving the Kenyan vision 2030 and sustainable development goals. The poor feeding practices may be due to either lack of knowledge by the caregivers or lack of adequate food.

This study findings were in agreement with another study in Kenya where wasting levels reduced with increase in the age group such that the prevalence were highest for the children in the age groups 6-8 months (11%) and 9-11 months (11%) compared to older age groups (KNBS & ICF Macro, 2015). The overall prevalence of wasting in this study was poor according to the WHO 2006 and unacceptable in developing countries. This finding were higher than the Kenyan national rate of wasting among children below five years (4%) which also had indicated a poor prevalence based on WHO 2006 threshold (KNBS & ICF Macro, 2015) and the findings of a similar study by Amunga (2015) in Isiolo County, Kenya where wasting was 5.2%. The findings were nevertheless slightly lower but close to that of the latest available data in the 2020 edition of the UNICEF/

WHO/World Bank Group Joint Child Malnutrition Estimates which indicated that globally about 7 per cent of the children were wasted (UNICEF,2020) and the findings of another similar study in Tharaka Nthi County, Kenya where the proportion of children who were wasted was 7.3% (Ambia, 2019). The findings however disagreed with those of a study on factors associated with nutrition status of under-fives in Marsabit County, Kenya where the prevalence of wasting was critical (29.9%) (Galgallo, 2017) and those of another similar study in Isiolo County, Kenya where the overall prevalence of wasting was serious (14.7%) (Macharia et al., 2019).

In this study, the prevalence of underweight was above the acceptable rates in developing countries when compared to the WHO 2006 global thresholds for underweight. The prevalence was higher than the Kenyan national rate of underweight among children below 5 years which was 11% (KNBS & ICF Macro, 2015) and the one obtained in a study in Isiolo County Kenya by Amunga (2015) where the prevalence was 7.3%. This findings were close to those obtained in a similar study in Isiolo County Kenya where the prevalence of underweight were 14.7% (Macharia et al., 2019). The findings however contrasted those obtained in Marsabit County, Kenya where the prevalence of underweight was 27.9% (Galgallo, 2017). When the indicator was further split up into age categories, children aged 18-23 months were found to have a higher prevalence of underweight, as compared to the other younger groups (6-11, 12-17 months) and this was in agreement with the study by Amunga (2015) in Isiolo County in Kenya. This increasing trend had a close similarity to the trend in the weighted total prevalence of underweight in 14 low-income countries, which was found by Marriott, White, Hadden,

Davies and Wallingford (2014). Similar to stunting, higher underweight levels among children aged 18-23 months might be an indication of poor CF practices that had started early on in an infant's life, prior to attaining this age but which may have probably been masked by the time of data collection as discussed earlier or prevalence of morbidity among children and maternal nutrition and health inadequacies.

The current study findings nevertheless compared well with those of a study of 16 demographic and health surveys in sub-Saharan Africa which revealed that, in 10 countries in sub-Saharan Africa, under-five male children were more likely to become stunted than their female counterparts (Wamani et al., 2007) and the national prevalence indicated in Kenya Demographic Health survey (KNBS, 2010). Likewise, this findings were in agreement with that by Makena (2016) in Kenya where malnutrition based on wasting, stunting and underweight was more pronounced in boys than girls and in another similar study by Katepa-Bwalya et al. (2015) where more boys were undernourished than girls according to all the studied nutrition status indicators (wasting, stunting and underweight). Likewise in a similar study in Isiolo County, female children were found to be better nourished (i.e. had a normal WAZ) than the male children (Amunga, 2015). In the same study almost twice the number of female children continued breastfeeding at one year (63.0%) than did the male children (37.0%) while more female children (55.0%) than male children (45.0%) were breastfed at two years (Amunga,2015). Additionally, nearly two-thirds (69.0%), of the children aged 6-8 months had received solid, semi-solid and soft (complementary) foods at the time of study, with slightly more females (53.0%) than males (47.0%) having achieved this indicator (Amunga, 2015). In another study in Isiolo County the feeding practices between the boys and the girls was further tested with

regard to meeting the MAD which, showed no significance ($\chi^2=0.084$; $p=0.848$). Consequently, the occurrence of malnutrition amongst more boy compared to girls in that study was then attributed to high activity level as reported by the mothers in the FGDs (Macharia et al., 2019). In the Micro Indicator Survey (MIS) for Machakos County female children were more likely to be exclusively breastfed irrespective of which duration is taken into account compared to their male counterparts (KNBS,2009). These previous findings could partly explain why female children had better nutrition status in this study compared to males as there exist a large body of evidence on the contribution of optimal breastfeeding and CF practices to children's nutrition status. However, the findings differed 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). Other studies are required to explain the relationship between sex and nutrition status, which is an important phenomenon as far as understanding malnutrition is concerned.

5.3 Prevalence of Morbidity Among Children Aged 6-23 Months

The synergistic relationship between illness and malnutrition is central in determining the nutrition and health status of children (UNICEF, 2019). Among the major risk factors associated with early childhood morbidity and mortality in 2014 were poor feeding practices (WHO, 2015). In this study most of the children had not been sick two weeks before data collection and this was in agreement with a study by Macharia (2019) in Isiolo County Kenya. In this study diarrhea was one of the illnesses that had the most common symptoms reported while cough with difficult breathing had the least mentioned hence the findings contrasted those in a study in Isiolo County, Kenya, where cough with

difficult breathing had the most common symptoms reported while diarrhea (27.2%) had the least mention (Macharia et al., 2019). The findings were nevertheless, in agreement with a global survey which established that around the world, diarrheal and other diseases undermined the nutrition of tens of millions of children (UNICEF,2019) and with the findings of a study where childhood diarrheal illnesses and intense lower respiratory infections were the main sources of the world's burden of sickness (Manesh, 2008). This finding also concurred with the Kenyan national rate where according to KNBS and ICF Macro (2010) based on a two-week recall, 8% of children under five years had symptoms of acute respiratory infection (ARI) and the findings of a study which observed that in Ghana, and other developing countries under nutrition was the main source of children sickness and mortality (Hong, 2007) given that malnourished children are more susceptible to diseases, and have relatively low life expectancies compared to the well-nourished counterparts.

The findings also compared well with the Kenyan national rate where Malaria, diarrhea, and acute respiratory illnesses were significant reasons for child morbidity (KNBS & ICF Macro, 2015) and in another similar study in Kwale County, Kenya where under nutrition remained a vital indicator of children morbidity and mortality (Adeladza & Adeladza, 2009). According to Ruel, & Alderman, (2013) under nutrition was significantly responsible for morbidity and mortality in developing nations and this was in agreement with the findings of this study where the children's nutrition status indices were above those acceptable in developing countries probably resulting into the observed children morbidity in this study. The findings were relatively lower than the Kenyan national rate

which according to (KNBS & ICF Macro, 2015), the proportion of children aged below five years reported to have had fever and diarrhea two weeks preceding data collection in Kenya was 24.4% and 15.2% respectively and the findings of (KNBS & ICF Macro, 2015) in a study in Tharaka Nthi County, Kenya where, 28.1% and 20.5% of under-fives were reported to have had fever and diarrhea respectively.

Fever is one indicator of immune system activation, which can suppress appetite and lead to re-allocation of nutrients away from growth (Dewey & Mayers, 2011). The presence of disease, can result in reduced bioavailability, increased needs, nutrient losses or loss of appetite and can thus be an immediate cause of malnutrition. Underweight measure, reflects both long term chronic malnutrition and recent food insecurity or illness. It can thus reflect prenatal under nutrition, infection and possibly inadequate childcare practices. A well-diversified diet is a sure way to achieve the important micronutrients of the body. In this study the diets reflected poor diversity with low consumption of the micronutrient rich animal foods and high consumption of the energy-dense staples.

5.4 Relationships between Complementary Feeding Practices and Nutrition Status of Children aged 6-23 Months

No significant relationships were identified between CF practices with wasting, stunting and underweight among the study children. This was contrary to the evidence, suggesting that the relationship between CF practices and nutrition status was significant. According to (Dewey, 2005; KNBS & ICF, 2015; Waswa, 2015) poor feeding practices had been recorded among the key causes of infant and young child malnutrition. In a review that

was conducted by Marriott, White, Hadden, Davies and Wallingford, et al.,2012 of 14 DHS data sets from poor countries found that dietary diversity and meal frequency were associated with lower risk of both underweight and stunting ($\rho < 0.001$). Many local studies have also documented significant correlations between CF and nutrition status among children. In a related study in Marsabit County, there was a positive and significant relationship between frequency of consumption of Vitamin A rich fruits and vegetables with underweight. Similarly a significant relationship was observed between consumption of other fruits and vegetables and stunting (Galgallo, 2017). In the same study three quarters (75.4%) of the wasted children were not consuming MDD. Likewise, majority of the children who were underweight did not consume MDD. In a study on the determinants of childhood malnutrition in Tharaka Nthi County, the test results indicated a significant relationship between dietary diversity and underweight (Ambia, 2019). In a study on CF practices and nutrition status of children aged 6-23 months in Kitui County, the DDS and MMF, correlated significantly ($P < 0.05$) with nutritional status of the children (Kimiye & Chege, 2015).

The differences that were found in this study might be due to the difference in study sample, since the other surveys were mainly national surveys. Additionally, this study was conducted in one community and context (with the Kamba ethnic group consisting 88.6% of study sample) and it, therefore, did not take care of the diversity of factors influencing CF practices such as demographic and socio-economic as well as KAP present in the context of national surveys. The findings could also have been probably affected by the time of data collection which was during the rainy season where

vegetables and fruits were readily available which is usually not the normal situation in the ASAL settings. Additionally, the study though conducted in the ASAL was in an area with close proximity to irrigated vegetables commercial farming where many of the caregiver's and their spouses worked as casual laborers.

5.4.1 Relationships between the Demographic and Socio-Economic Characteristics of Households with Complementary Feeding Practices among Children aged 6-23 Months

5.4.1.1 Households income

Household's income had a positive significant relationship with minimum acceptable diet (MAD) implying that children in households with higher income were more likely to achieve MAD. These findings were in agreement with a study by Darmon & Drewnowski (2015) where higher economic status was associated with improved access to informational, financial, and material resources. In a study in the former Mbeere District, there was a significant association ($P < 0.05$) between household's income and the number of food groups consumed by the children (Badake et al., 2014). On the other hand, household's income had a weak negative correlation with attainment of MMF and MDD implying that children in homes with higher income were less likely to achieve MMF and MDD. The findings of this study disagreed with that by Gewa & Leslie (2015) where children living in households within higher wealth index quintiles were associated

with significantly higher odds of achieving adequate dietary diversity score compared to those living in households within the first wealth index quintile (Gewa & Leslie, 2015).

5.4.1.2 Caregivers Main Occupation

Caregiver's main occupation (house wife) showed a significant and positive correlation with MAD implying that children of house wives were more likely to achieve MAD compared to those engaged in other occupations. The study findings were in agreement with those obtained in 2017 by Mitchodigni (2017) in southern Benin, where children whose caregivers were involved in income-generating activities, were less likely to meet MMF ($p < 0.05$) (Mitchodigni et al., 2017). On the other hand the main occupation had a weak and negative relationship with attainment of MMF and MDD implying that children of house wives were less likely to achieve MMF and MDD compared to children of caregivers with other occupations. This was in agreement with findings of a study by Gewa & Leslie (2015), where children with caregivers who were working at the time of data collection were related with 47% chances of attaining acceptable dietary diversity score compared to those with non-working caregiver's (Gewa & Leslie,2015).

CHAPTER SIX: SUMMARY, CONCLUSION AND RECOMMENDATIONS

6.1 Summary of the findings

Almost all the participants were mothers to the children in the study and majority were young and married. About two fifths of caregivers were of primary level of education and many households had low income. The major occupation for majority of the husbands was casual laborers while more than a half of the caregivers were housewives and about a third were casual workers. The average size of a household was large and above the national average for rural households in Kenya. In most of the households, spouses/ husbands provided the households with food and other requirements. Challenges experienced in feeding the children based on FGDs and KIIs included; food shortages due to inadequate income to purchase enough food, high food prices, poverty (indicated by household's income and ownership of assets), occupations that kept caregivers away from home most of the time and lack of reliable jobs that could provide steady income.

On the whole, the complementary feeding practices in the ASAL Yatta Sub-County fell below the recommendations by WHO (2010) because of the relatively low percentage of children aged 6-23 months who attained the minimum acceptable diet and worse off were the non-breastfed children. Overall majority of the children were still breastfeeding and no significant drop was found with regard to continued breastfeeding at 1 & at 2 years. Majority of the children aged 6-8 months had been introduced to semi-solid and solid foods although some of them prematurely. The frequency of feeding for the majority of breastfed children was appropriate but the dietary diversity of the meals was inadequate making many children not to attain the MAD. Additionally, the consumption

of foods from animal sources which are rich in iron was low among children but consumption of Vitamin A rich foods was high. Significant gaps on caregiver's knowledge on CF practices identified were mainly: caregiver's low knowledge related to importance of enriching complementary foods and the risks of introducing complementary foods too early and early cessation of breastfeeding.

The magnitude of under-nutrition among children aged 6-23 months based on stunting, wasting and underweight were above the acceptable rates in developing countries as recommended by WHO 2010. The study findings also revealed that malnutrition based on stunting, wasting and underweight was significantly higher in boys than girls and increased with age except wasting which showed a negative relationship with age. This poor nutrition status was attributed to lack of sufficient nutrients to meet the nutritional requirements and presence of illnesses among children. The findings of the study highlighted that chronic malnutrition was a consistent problem within this ASAL setting in Kenya. The morbidity burden among children aged 6-23 months was low with only about a third of children being sick two weeks to data collection. Fever, diarrhea, and acute respiratory infections (ARIs) were the most common illnesses among children two weeks to data collection. These illnesses were attributed to poor environmental sanitation, consumption of dirty water, poor personal hygiene and poor child care practices.

The study did not find any significant relationship between CF practices and nutrition status among children aged 6-23 months but it found significant relationships between the demographic and socio-economic characteristics of households with CF practices. The study found a positive and significant correlation between caregiver's main occupation

(house wife) and achievement of MAD implying that children of housewives were more likely to attain MAD compared to children of caregiver's engaged in other occupations. The study also found a positive and significant correlation between household's income, and MAD meaning that children in households with higher income were more likely to attain MAD. The results revealed that these variables had significance with CF practices.

6.2 Conclusions

This study was to determine the CF practices and nutrition status among children aged 6-23 months in ASAL households in Yatta Sub County Machakos County. The study showed that household's income and caregiver's occupation, determined the CF practices of children in the study area but no relationships were found among the variables investigated and the children nutrition status. Children in households with higher income were found to be more likely to meet their MAD compared to children in households with low income. Children of housewives were similarly found to be likely to meet their MAD compared to children of caregiver's engaged in other occupations. This study therefore demonstrates the critical role of household demographic and socio-economic characteristics, in ensuring optimal CF practices and which have been related to the nutritional status of children in many studies.

Almost all the children were introduced to complementary foods after six months. As reported by the caregivers, the most common foods consumed by the children were maize porridge, *Ugali*, milk, rice and beans. The children consumed more of the cereals as compared to proteins, due to affordability. The children's diets were high in fruits and

vegetables probably because data was collected during the rainy season. The dietary diversity score of 3.46 showed lack of a diversified diet that reflected a monotonous diet which was low in nutrient rich foods such as animal origin foods and high in carbohydrates. On the whole, the complementary feeding practices in the ASAL Yatta Sub County fell below the Kenya MOH guidelines (GOK, 2012) and the WHO (2010) recommendations because of the relatively low percentage of children aged 6-23 months who achieved the MAD.

Child malnutrition was widespread in the community with the prevalence of stunting, wasting and underweight being above the WHO 2010 acceptable threshold levels for developmental areas. The elevated prevalence of stunting in older children indicated failure in growth and development during the first two years of life and was the predominant nutrition problem in the area. The poor malnutrition levels were attributed to the deleterious influence of the sub-optimal complementary feeding practices on nutritional status due to low household's income and many caregiver's working long hours away from their children. Long periods of drought were attributed to the aforesaid and the found nutrition status among the children was a threat to achieving the Kenyan vision 2030 and the sustainable development goals. The CF practices were poor as indicated by poor nutrition status .Stunting is a clear sign that children in a country or community are not developing well and is both a symptom of past deprivation and a predictor of future poverty (UNICEF, 2019). The prevalence of morbidity among children was low with only about a third of children being sick two weeks to data collection implying that the high malnutrition levels among the children was contributed

mainly by the poor CF practices than the prevalence of morbidity. Fever, diarrhea and upper respiratory infections were the most common illnesses among the children in the area. There was no significant correlation between illnesses and the nutrition status of the children based on wasting, underweight and stunting implying that appropriate complementary feeding practices are crucial in determining both long term and short-term effects on the human being.

6.3 Recommendations

The following recommendations are made based on the study findings.

6.3.1 Recommendation for Policy

1. This study revealed the importance of household income in ASALs in determining optimal CF practices and nutritional status of children. The County Government of Machakos needs to domesticate National Agricultural Sector and Extension Policy through legislation to improve and sustain household incomes in ASALs.
2. The County government of Machakos needs to domesticate the Kenya food and nutrition security policy where value addition of vegetables and fruits will be prioritized in the County Integrated Development Program (CIDP) in order to support manufacturing thereby creating decent jobs and ensuring sustainable economic development.

6.3.2 Recommendations for Practice

1. The Ministry of Agriculture at County and national level in collaboration with donors should increase funding to strengthen the extension services that support livelihoods, by improving household's incomes, creating employment especially among the youth and enhancement of food security.
2. This study showed that caregiver's occupation (house wife) was associated with good feeding practices especially minimum acceptable diet. The County Government of Machakos needs to invest in female friendly farming technologies such as Kitchen gardening and roof water harvesting in order to occupy caregiver's near the home where they can optimize the CF practices and nutrition status of their children
3. Households in the rural areas should adopt innovative and cost-effective agricultural strategies such as kitchen gardening to promote access to vegetables and fruits which will in-turn improve the intake of micronutrients, and dietary diversity of children and save income. Communities should also adopt/improve livestock rearing technologies so as to ensure iron rich foods and animal origin foods are within their reach and to generate wealth.

6.3.3 Suggestions for Further Research

1. This study was cross sectional. A longitudinal study is recommended to focus on seasonal trends of demographic and socio-economics of households, CF practices and nutrition status of children aged 6-23 months.

2. Multi-disciplinary qualitative studies should be conducted to determine the socio-cultural aspects influencing nutrition status, such as why boys, in comparison to girls, tend to be more malnourished in ASAL communities.

REFERENCES

- Abbi, R., Christian, P., Gujral, S., & Gopaldas, T. (1991). The impact of maternal work status on the nutrition and health status of children. *Food and Nutrition Bulletin, 13*(1), 1-6
- Abuya, B. A., Ciera, J., & Kimani-Murage, E. (2012). Effect of mother's education on child's nutritional status in the slums of Nairobi. *BMC pediatrics, 12*(1), 1-10.
- Adeladza, A. (2009). The influence of socio-economic and nutritional characteristics on child growth in Kwale District of Kenya. *African Journal of Food, Agriculture, Nutrition and Development, 9*(7).
- Aidoo, R., Mensah, J. O., & Tuffour, T. (2013). Determinants of household food security in the Sekyere-Afram plains district of Ghana. *European Scientific Journal, 9*(21).
- Adokiya, M. N. (2010). *Complementary feeding practices and nutrition status of young children 06-23 months of age in the Kassena-Nankana District, Upper East Region, Ghana* (Doctoral dissertation, Kwame Nkrumah University of science and technology).
- Aemro, M., Mesele, M., Birhanu, Z., & Atenafu, A. (2013). Dietary diversity and meal frequency practices among infant and young children aged 6–23 months in Ethiopia: a secondary analysis of Ethiopian demographic and health survey 2011. *Journal of nutrition and metabolism, 2013*.
- Agedew, E., & Chane, T. (2015). Prevalence of Stunting among Children Aged 6—23 Months in Kemba Woreda , Southern Ethiopia : A Community Based Cross-Sectional Study, 2015.

- Akeredolu, I. A., Osisanya, J. O., Seriki-Mosadolorun, J. S., & Okorafor, U. (2014). Mothers' Nutritional Knowledge, Infant Feeding Practices and Nutritional Status of Children (0-24 Months) in Lagos State, Nigeria.
- Ambia, L. J. (2019). Determinants of nutritional status of children aged 6-59 months in marginal mixed farming households in Tharaka.
- Amunga, D. P. A. (2015). complementary feeding practices and the anthropometric status of children aged six to 23 months among the pastoralist communities of isiolo county , kenya, (march 2015).
- Aslam, A., Grojec, A., Little, Căș., Maloney, T., & Tamagni, J. (2014). The State of the Worlds Children 2014 in Numbers: Every Child Counts. Revealing Disparities, Advancing Childrens Rights. *UNICEF*.
- Badake, Q. D., Maina, I., Mboganie, M. A., Muchemi, G., Kihoro, E. M., Chelimo, E., & Mutea, K. (2014). Nutritional status of children under five years and associated factors in Mbeere South District, Kenya. *African Crop Science Journal*, 22, 799—806.
- Bandoh, D. A., & Kenu, E. (2017). Dietary diversity and nutritional adequacy of under-fives in a fishing community in the central region of Ghana. *BMC Nutrition*, 3(1), 1-6.
- Banerjee, R. R., Rangwala, S. M., Shapiro, J. S., Rich, A. S., Rhoades, B., Qi, Y., ...& Stepan, C. M. (2004). Regulation of fasted blood glucose by resistin. *Science*, 303(5661), 1195-1198.
- Barreira, T. V., Staiano, A. E., Harrington, D. M., Heymsfield, S. B., Smith, S. R., Bouchard, C., & Katzmarzyk, P. T. (2012). Anthropometric correlates of total body fat, abdominal adiposity, and cardiovascular disease risk factors in a biracial sample of men and women. In *Mayo Clinic Proceedings* (Vol. 87, pp. 452—460). Elsevier.
- Bashir, A., Mansoor, S., & Naikoo, M. Y. (2018). Knowledge, attitude, and practices of postnatal mothers regarding breastfeeding: a cross-sectional study. *International Journal of Medical Science and Public Health*, 7(9), 725.
- Bergeron, G., & Castleman, T. (2012). Program responses to acute and chronic malnutrition: divergences and convergences. *Advances in Nutrition*, 3(2), 242-249.
- Berhanu, Z., Alemu, T., & Argaw, D. (2019). Predictors of inappropriate complementary feeding practice among children aged 6 to 23 months in Wonago District , South Ethiopia , 2017 ; case control study, 1—13.

- Berra, W. G., & Yang, N. H. (2020). Households Hunger: The Key Attribute to Anthropometric Failures of Children in West Oromia (Ethiopia). *Current Medical Science*, 40(3), 580-585.
- Bhutta, Z. A., Chopra, M., Axelson, H., Berman, P., Boerma, T., Bryce, J., ... others. (2010). Countdown to 2015 decade report (2000—10): taking stock of maternal, newborn, and child survival. *The Lancet*, 375(9730), 2032—2044.
- Black, R. E., Victora, C. G., Walker, S. P., Bhutta, Z. A., Christian, P., De Onis, M., ... & Maternal and Child Nutrition Study Group. (2013). Maternal and child undernutrition and overweight in low-income and middle-income countries. *The lancet*, 382(9890), 427-451.
- Bukania, Z. N., Mwangi, M., Karanja, R. M., Mutisya, R., Kombe, Y., Kaduka, L. U., & Johns, T. (2014). Food insecurity and not dietary diversity is a predictor of nutrition status in children within semiarid agro-ecological zones in eastern Kenya. *Journal of Nutrition and Metabolism*, 2014.
- Bukusuba, J., Kikafunda, J. K., & Whitehead, R. G. (2009). Nutritional status of children (6-59 months) among HIV-positive mothers/caregivers living in an urban setting of Uganda. *African Journal of Food, Agriculture, Nutrition and Development*, 9(6)
- Butte N, Cobb K., Dwyer, J., Graney, L., Heird, W. and Rickard, (2004). The Start Healthy Feeding Guideline for Infants and Toddlers. *Journal of American Dietetics Association*, 104(3): 442-454
- Cashen, M. S., Bradley, V., Farrell, A., Murphy, J., Schleyer, R., Sensmeier, J., & Dykes, P. C. (2006). Exploring the impact of health information technology on communication and collaboration in acute care nursing. *Studies in health technology and informatics*, 122, 575-579.
- Ceatan M.C., Dasilva, S.G., DE Souza, F.I. and Sarni, R.O. (2010). Complementary Feeding: Inappropriate Practices in Infants. *Journal of Pediatrics (Rio Jenerio)*, 86:196- 201
- Chelimo, F. L. (2008). Assessment of complementary feeding practices and nutritional status among children in Athi-River.Machakos district Kenya.
- Children, stella malosso koini, Age, O., Maasai, A., In, C., & South, N. (2018). Association Of Complementary Feeding Practices And Nutritional Status Of

Children 6-23 Months Of Age Among Maasai Community In Narok South Sub-County , Kenya, (July).

- Daelmans, B., Martines, J., &Saadeh, R. (2003).Conclusions of the global consultation on complementary feeding.*Food and Nutrition Bulletin*, 24(1), 126—129.
- Daelmans, B., Dewey, K., &Arimond, M. (2009).New and updated indicators for assessing infant and young child feeding.*Food and Nutrition Bulletin*, 30(2_suppl2), S256-S262.
- Darmon, N., &Drewnowski, A. (2008). Does social class predict diet quality? *The American Journal of Clinical Nutrition*, 87(5), 1107—1117.
- Darmon, N., &Drewnowski, A. (2015). Contribution of food prices and diet cost to socio-economic disparities in diet quality and health: a systematic review and analysis. *Nutrition Reviews*, nuv027.
- De Onis, M., Onyango, A. W., Van den Broeck, J., Chumlea, C. W., &Martorell, R. (2004). Measurement and standardization protocols for anthropometry used in the construction of a new international growth reference.*Food and Nutrition Bulletin*, 25(1_suppl1), S27—S36.
- Demographic, K. K. (2015). Health Survey: Key Indicators 2014. *Nairobi, Kenya*.
- Deribew, A., Alemseged, F., Tessema, F., Sena, L., Birhanu, Z., Zeynudin, A. & Biadgilign, S. (2010). Malaria and under-nutrition: a community based study among under-five children at risk of malaria, south-west Ethiopia. *PLos one*, 5(5), e10775.
- Dewey, K. (2003). Guiding principles for complementary feeding of the breastfed child.
- Dewey, K. G., & Adu-Afarwuah, S. (2008). Systematic review of the efficacy and effectiveness of complementary feeding interventions in developing countries. *Maternal & child nutrition*, 4, 24-85.
- Dewey, K. G. (2013). The challenge of meeting nutrient needs of infants and young children during the period of complementary feeding: an evolutionary perspective. *The Journal of nutrition*, 143(12), 2050-2054.
- Dewey, K. G., Cohen, R. J., Arimond, M., &Ruel, M. T. (2006). Developing and validating simple indicators of complementary food intake and nutrient density for breastfed children in developing countries.

- Dewey, K. G., & Adu-Afarwuah, S. (2008). Systematic review of the efficacy and effectiveness of complementary feeding interventions in developing countries. *Maternal & Child Nutrition*, 4(s1), 24—85.
- Dewey, K. G., & Mayers, D. R. (2011). Early child growth: how do nutrition and infection interact?. *Maternal & child nutrition*, 7, 129-142.
- Dewey, K. G. (2013). The challenge of meeting nutrient needs of infants and young children during the period of complementary feeding: an evolutionary perspective. *The Journal of nutrition*, 143(12), 2050-2054.
- Dey, I., & Chaudhuri, R. N. (2008). Gender inequality in nutritional status among under five children in a village in Hooghly district, West Bengal. *Indian J Public Health*, 52(4), 218-20.
- Drake, L., Woolnough, A., Bundy, D., & Burbano, C. (Eds.). (2016). *Global school feeding sourcebook: lessons from 14 countries*. world scientific.
- Eggersdorfer, M., & Bird, J. K. (2016). How to achieve transparency in public-private partnerships engaged in hunger and malnutrition reduction. *Hidden Hunger*, 115, 224-232.
- Engelbrechtsen, I. M. S., Wamani, H., Karamagi, C., Semiyaga, N., Tumwine, J., & Tylleskär, T. (2007). Low adherence to exclusive breastfeeding in Eastern Uganda: a community-based cross-sectional study comparing dietary recall since birth with 24-hour recall. *BMC pediatrics*, 7(1), 1-12.
- FEWSNET, 2017:Somalia: Persistent drought leads to major food security crisis. Famine Early Warning Systems Network, World Food Programme, accessed 23 March 2018, www.wfp.org/news/news-release/somalia-persistent-drought-leads-major-food-security-crisis-0.
- Frempong, R. B., & Annum, S. K. (2017). Dietary diversity and child malnutrition in Ghana. *Heliyon*, 3(5), e00298.
- Foterek, K., Hilbig, A., & Alexy, U. (2014). Breast-feeding and weaning practices in the DONALD study: age and time trends. *Journal of Pediatric Gastroenterology and Nutrition*, 58(3), 361—367.
- Ng'aari, L. W. (2013). *Influence of parental involvement in feeding program on nutritional status of children aged below five years in Isiolo District, Isiolo*

County, Kenya (Doctoral dissertation, University of Nairobi,).

- Galgallo, S. O. (2017). Factors Associated With Nutritional Status Of Children Aged 6-59 Months In Maikona Ward Of Marsabit County, Kenya.
- Getahun, D., Jacobsen, S. J., Fassett, M. J., Chen, W., Demissie, K., & Rhoads, G. G. (2013). Recent trends in childhood attention-deficit/hyperactivity disorder. *JAMA pediatrics*, *167*(3), 282-288.
- Gewa, C. A., & Leslie, T. F. (2015). Distribution and determinants of young child feeding practices in the East African region: demographic health survey data analysis from 2008-2011. *Journal of Health, Population and Nutrition*, *34*(1), 6.
- Grummer-Strawn, L. M., Reinold, C., & Krebs, N. F. (2011). Use of World Health Organization and CDC Growth Charts for Children Aged 0—59 Months in the United States (Excerpt).
- Haile, A., & Getahun, D. (2018). Evaluation of nutritional and anti nutrition factors of orange-fleshed sweet potato and haricot bean blended mashed food for pre-school children: The case of Dale Woreda, Southern Ethiopia. *Food Science and Technology*, *6*(1), 10-19.
- Hanif R, Khalil E, Sheikh A, Harji A, Haris S, Rasheed MW et al (2010). Knowledge about breastfeeding in accordance with the national policy among doctors, paramedics and mothers in baby-friendly hospitals; Available from: www.jpma.org.pk/article_id=2351.
- Harrison, M., Brodribb, W., & Hepworth, J. (2017). A qualitative systematic review of maternal infant feeding practices in transitioning from milk feeds to family foods. *Maternal & child nutrition*, *13*(2), e12360.
- Hazir, T., Akram, D. S., Nisar, Y. B., Kazmi, N., Agho, K. E., Abbasi, S., ... & Dibley, M. J. (2013). Determinants of suboptimal breast-feeding practices in Pakistan. *Public health nutrition*, *16*(4), 659-672.
- Health Organization (WHO) infant and young child feeding indicators: Associations with growth measures in 14 low-income countries. *Maternal and Child Nutrition*, *8*(3), 354—370.
- Herforth, A., Jones, A., & Pinstrip-Andersen, P. (2012). Prioritizing nutrition in agriculture and rural development: guiding principles for operational investments.
- Hirvonen, K., Hoddinott, J., Minten, B., & Stifel, D. (2017). Children's diets, nutrition knowledge, and access to markets. *World Development*, *95*, 303-315.

- Hong, R. (2007). Effect of economic inequality on chronic childhood undernutrition in Ghana. *Public Health Nutrition*, 10(04), 371—378.
- Huttenhower, C., Gevers, D., Knight, R., Abubucker, S., Badger, J. H., Chinwalla, A. T., ... & Giglio, M. G. (2012). Structure, function and diversity of the healthy human microbiome. *Nature*, 486(7402), 207.
- Inayati, D. A., Scherbaum, V., Purwestri, R. C., Hormann, E., Wirawan, N. N., Suryantan, J., ... & Bellows, A. C. (2012). Infant feeding practices among mildly wasted children: a retrospective study on Nias Island, Indonesia. *International breastfeeding journal*, 7(1), 1-9.
- Infant, M., Child, Y., & Report, S. (2017). Maternal infant and young child nutrition (miycn) knowledge , attitudes , survey report kitui county october 2017, (October).
- Islam, A. H. M., von Braun, J., Thorne-Lyman, A. L., & Ahmed, A. U. (2018). Farm diversification and food and nutrition security in Bangladesh: empirical evidence from nationally representative household panel data. *Food security*, 10(3), 701-720.
- Issaka, A. I., Agho, K. E., N. Page, A., L. Burns, P., Stevens, G. J., & Dibley, M. J. (2015). The problem of suboptimal complementary feeding practices in West Africa: what is the way forward?. *Maternal & Child Nutrition*, 11, 53-60.
- Jain, S., Borle, A., Agrawal, S. S., Mishra, M. K., Gupta, S. K., & Bathma, V. (2014). Assessment of infant and young child feeding practices among mothers in rural Madhya Pradesh. *Natl J Community Med*, 5(4), 419-23.
- Janevic, T., Petrovic, O., Bjelic, I. & Kubera, A. 2010. Risk factors for childhood malnutrition in Roma settlements in Serbia. *BMC Public Health*. 10: 509. DOI: 10.1186/1471-2458-10-509
- Jeyakumar, A., Jungari, S., Nair, R., Menon, P., Babar, P., Bhushan, B., ... & Sakshi, S. (2021). Prevalence and Determinants of Early Initiation (EI), Exclusive Breastfeeding (EBF), and Prolactal Feeding among Children Aged 0-24 Months in Slums of Pune City, in Maharashtra. *Ecology of Food and Nutrition*, 60(3), 377-393.
- Jones, A. D., Ickes, S. B., Smith, L. E., Mbuya, M. N., Chasekwa, B., Heidkamp, R. A., ... Stoltzfus, R. J. (2014). World Health Organization infant and young child feeding indicators and their associations with child anthropometry: a synthesis of recent findings. *Maternal & Child Nutrition*, 10(1), 1—17.

- Joshi, N., Agho, K. E., Dibley, M. J., Senarath, U., & Tiwari, K. (2012). Determinants of inappropriate complementary feeding practices in young children in Nepal: secondary data analysis of Demographic and Health Survey 2006. *Maternal & child nutrition*, 8, 45-59.
- Kabubo-Mariara, J., Wambugu, A., & Musau, S. (2011). Multidimensional Poverty in Kenya: Analysis of Maternal and Child Wellbeing. *PEP PMMA*, 12.
- Kanjilal, B., Mazumdar, P. G., Mukherjee, M., & Rahman, M. H. (2010). Nutritional status of children in India: household socio-economic condition as the contextual determinant. *International Journal for equity in Health*, 9(1), 1-13.
- Kamau, G. M. (2015). *Impact of Parental socio-economic status on participation of children in ECE centres in Ruiru District, Kiambu county, Kenya* (Doctoral dissertation, University of Nairobi).
- Katepa-Bwalya, M., Mukonka, V., Kankasa, C., Masaninga, F., Babaniyi, O., & Siziya, S. (2015). Infants and young children feeding practices and nutritional status in two districts of Zambia. *International breastfeeding journal*, 10(1), 1-8.
- KDHS. (2008-2009) Kenya Demographic and Health Survey. National Council for Population and Development, Central Bureau of Statistics and Ministry of Planning and National Development, Nairobi. Kenya
- Keding, G. B., & Waswa, L. M. (2015). Diversifying local diets: nutrition education for mothers/caregivers improved the diversity of complementary foods of children in Western Kenya.
- Kenya National Bureau of Statistics. (2009). *Machakos district micro indicator survey*.
- Khamis, A. G., Mwanri, A. W., Ntwenya, J. E., & Kreppel, K. (2019). The influence of dietary diversity on the nutritional status of children between 6 and 23 months of age in Tanzania. *BMC pediatrics*, 19(1), 1-9.
- King'olla, B., Ohiokpehai, O., & David, D. M. (2009). The impact of a nutrition and health programme on the socio-economic status and food access of households in Suba District, Kenya. *Journal of Applied Biosciences*, 21, 1226-1236.
- Kimani-Murage, E. W., Holding, P. A., Fotso, J.-C., Ezeh, A. C., Madise, N. J., Kahurani, E. N., & Zulu, E. M. (2011). Food security and nutritional outcomes

among urban poor orphans in Nairobi, Kenya. *Journal of Urban Health*, 88(2), 282—297.

Kimani-Murage, E. W., Madise, N. J., Fotso, J.-C., Kyobutungi, C., Mutua, M. K., Gitau, T. M., & Yatch, N. (2011). Patterns and determinants of breastfeeding and complementary feeding practices in urban informal settlements, Nairobi Kenya. *BMC Public Health*, 11, 396.

Kimiywe, J., & Chege, P. M. (2015). Complementary feeding practices and nutritional status of children 6-23 months in Kitui County, Kenya. *Journal of applied Biosciences*, 85, 7881-789). Complementary feeding practices and nutritional status of children 6-23 months in Kitui County, Kenya. *Journal of Applied Biosciences*, 85(1), 7881—7890.

Kimiywe, J., Chege, P., Pediat, B., County, V., Kimiywe, J., & Chege, P. (2017). Determinants of Complementary Feeding and Nutrition Status of Children 6-23, 4—7.

Kimwele, A. (2014). *Maternal knowledge on complementary feeding practices and nutritional status of children 6-23 months old, attending Kahawa west public health centre, Nairobi County* (Doctoral dissertation).

KDHS. (2003). Kenya demographic and health surveys. Baltimore: Macro International.

KNBS (2009), “Population Statistics”, Kenya National Bureau of Statistics, Government Press, Nairobi, Kenya

KNBS, (2010). Macro: Kenya Demographic and Health Survey 2008-09. *Calverton, MD: Kenya National Bureau of Statistics and ICF Macro*, 430.

KNBS. (2014). *Key Indicators 2014 Kenya Demographic and Health Survey (KDHS) Millennium Development Goals for 2015*.

KNBS, & NACC, (2015). Kenya demographic and health survey 2014. *Nairobi: Kenya National Bureau of Statistics*, 764, 765.

Konyole, S. O. (2014). *Effect of improved complementary foods on growth and iron status of Kenyan infants*. University of Nairobi.

Korir, J. K. (2013). Determinants of complementary feeding practices and nutritional status of children 6-23 months old in Korogocho slum, Nairobi County, Kenya. *Nairobi: Kenyatta University*.

- Kopi, S. S. (2012). *Factors affecting nutritional interventions on malnourished children (6-59 months), pregnant and lactating mothers in Mandera East and North districts*. University of Nairobi, Kenya.
- Kothari, C. R. (2004). *Research methodology: Methods and techniques*. New Age International.
- Kulwa, K., Verstraeten, R., Bouckaert, K. P., Mamiro, P. S., Kolsteren, P. W., & Lachat, C. (2014). Effectiveness of a nutrition education package in improving feeding practices, dietary adequacy and growth of infants and young children in rural Tanzania: rationale, design and methods of a cluster randomised trial. *BMC public health*, 14(1), 1-16.
- Lamberti, L. M., Walker, C. L. F., Noiman, A., Victora, C., & Black, R. E. (2011). Breastfeeding and the risk for diarrhea morbidity and mortality. *BMC Public Health*, 11(3), S15.
- Lartey, A. (2008). Maternal and child nutrition in Sub-Saharan Africa: challenges and interventions. *Proceedings of the Nutrition Society*, 67(01), 105—108.
- Lawal, M. O., & Samuel, O. B. (2010). Investigation of Acute Toxicity of Pirimiphos-Methyl I (Actellic®, 25% EC) on Guppy (*Poecilia reticulata*, Peters, 1859).
- Leonie, F. J., & Annik, K. S. Nutritional strategies to optimize performance, training adaptation and recovery in team sports.
- Leslie, L. K., Sarah, R., & Palfrey, J. S. (1998). Child health care in changing times. *Pediatrics*, 101(Supplement_3), 746-752.
- Lucia, m. (2008). Factors associated with introduction of complementary feeding of infants below six months, in Machakos district, Kenya/ (Doctoral dissertation, University of Nairobi). (GDK/UNICEF 1992
- lutter, C.K., Daelmans, B.M.E.G., De Onis, m., Kothari, M.T., Ruel, M.T., Arimod, M., Et al (200). Unndernutrition, poor feeding practions and low coverage of key nutrition interentions pediatrics, 128(6), 1418-1427
- Lwanga, S. K. (1991). Sample size determination in health studies. Who 1991).
- Macharia, J., Mbithe, D., Kimani, H., & Chege, P. (2019). Food Science & Nutrition Research Feeding Practices and Nutrition Status among Children Aged 6-23 Months after Discharge from Supplementary Feeding Program in Isiolo County , Kenya.

- MacLaren, P. A., Anderson, S. H., &Runde, D. E. (1988). Food habits and nest characteristics of breeding raptors in southwestern Wyoming. *The Great Basin Naturalist*, 548-553.
- Mamat, N. M. B., Bakar, W. A. M. A., Belachew, T., & Assefa, N. undernutrition prevalence and its determinants among children below five years of age in shabelle zone, somali region, eastern Ethiopia.
- Manhas, S., & Dogra, A. (2012). Awareness among Anganwadi workers and the prospect of child health and nutrition: A study in Integrated Child Development Services (ICDS) Jammu, Jammu and Kashmir, India. *The Anthropologist*, 14(2), 171-175.
- Marriott, B. P., White, A., Hadden, L., Davies, J. C., & Wallingford, J. C. (2012). World Health Organization (WHO) infant and young child feeding indicators: associations with growth measures in 14 low-income countries. *Maternal & child nutrition*, 8(3), 354-370.
- Martin, L. (2002). Report of informal meeting to review and develop indicators for complementary feeding 3-5 December 2002 Washington DC.
- Masinde, M., &Bagula, A. (2011). ITIKI: bridge between African indigenous knowledge and modern science of drought prediction. *Knowledge Management for Development Journal*, 7(3), 274—290.
- Masiye, F., Chama, C., Chitah, B., & Jonsson, D. (2010). Determinants of child nutritional status in Zambia: An analysis of a national survey. *Zambia Social Science Journal*, 1(1), 4.
- Maternal infant and young child nutrition (miygn) knowledge , attitudes , beliefs and practices (kabp), survey report mandera county november 2017. (2017), (November).
- Matheka, D. M., Nderitu, J., Vedanthan, R., Demaio, A. R., Murgor, M., Kajana, K., ... & Kishore, S. P. (2013). Young professionals for health development: the Kenyan experience in combating non-communicable diseases. *Global health action*, 6(1), 22461.
- Mekbib, E., Shumey, A., Ferede, S., & Haile, F. (2014). Magnitude and factors associated with appropriate complementary feeding among mothers having children 6—23 months-of-age in northern Ethiopia; a community-based cross-sectional study. *J Food NutrSci*, 2(2), 36.
- Memon, Y., Sheikh, S., Memon, A., &Memon, N. (2006). Feeding beliefs and practices of mothers/caregivers for their infants.*J LiaquatUni Med Health Sci*, 5(1), 8—

- 13.2019, U. (n.d.). *The state of the world's children*.
- Memon, Y., Sheikh, S., Memon, A., & Memon, N. (2001). Feeding beliefs and practices of mothers / caregivers for their infants, 8–13.
- Miller, J. E., & Rodgers, Y. V. (2009). Mother's education and children's nutritional status: new evidence from Cambodia. *Asian Development Review*, 26(1), 131-165.
- Mitangala NP, D'Alessandro U, Donnen P, Hennart P, Porignon D, Bisimwa SG, Zozo N, Dramaix WM, 2012. Clinical malaria and nutritional status in children admitted in Lwiro Hospital, Democratic Republic of Congo. *Journal of Clinical & Experimental Pathology* S3: 004. DOI: 10.4172/2161-0681.S3-004
- Mitchodigni, I. M., Hounkpatin, W. A., & Ntandou-bouzitou, G. (2017). Complementary feeding practices : determinants of dietary diversity and meal frequency among children aged 6 – 23 months in Southern Benin, 1117–1130. <http://doi.org/10.1007/s12571-017-0722-y>
- Muchina, E. N., & Waithaka, P. M. (2010). Relationship between breastfeeding practices and nutritional status of children aged 0-24 months in Nairobi, Kenya. *African Journal of Food, Agriculture, Nutrition and Development*, 10(4).
- Mulugeta, A., Hagos, F., Kruseman, G., Linderhof, V., Stoecker, B., Abraha, Z., ... & Samuel, G. G. (2010). Child malnutrition in Tigray, northern Ethiopia. *East African medical journal*, 87(6), 248-254.
- Mutakaa, L. K. (2014). *Assessment of Nutrition Status and Dietary Diversity among Children 6-59 Months in Mathare Valley, Nairobi County, Kenya* (Doctoral dissertation, Thesis). Retrieved from <http://ir-library.ku.ac.ke/handle/123456789/8993>.
- MOPHS, M. (2010). National Guidelines for the Diagnosis. *Treatment and Prevention of Malaria in Kenya, Third edn: Ministry of Public Health and Sanitation*.
- Motuma, M., Suryabagavan, K.V. and Balakrishnan, M. (2016), “*Land suitability analysis for wheat and sorghum crops in Wogdie district, South Wollo, Ethiopia, using geospatial tools*”, *Applied Geomatics*, Vol. 8 No. 1, pp. 57-66
- Moursi, M. M., Arimond, M., Dewey, K. G., Treche, S., Ruel, M. T., & Delpuech, F. (2008). Dietary diversity is a good predictor of the micronutrient density of the diet of 6-to 23-month-old children in Madagascar. *The Journal of nutrition*, 138(12), 2448-2453.
- Mugenda, O. M. and Mugenda, A. G. (2003). *Research Methods: Quantitative and Qualitative Approaches*, Acts Press: Nairobi.
- MWANGI, T. W. (2018). *Association between paternal illicit alcohol consumption,*

- complementary feeding and nutrition status of children aged 6-23 months in kirinyaga county, kenya* (doctoral dissertation, school of applied human sciences, Kenyatta University).
- Ndanu, Mary Makau. (2013). feeding practices and nutrition status of children aged 0-59 months, (June).
- Ndiku, M., Jaceldo-Siegl, K., Singh, P., & Sabate, J. (2011). Gender inequality in food intake and nutritional status of children under 5 years old in rural Eastern Kenya. *European journal of clinical nutrition*, 65(1), 26-31.
- Ng'aari, L. W. (2013). Influence of parental involvement in feeding program on nutritional status of children aged below five years in Isiolo District, Isiolo County, Kenya.
- Nube, M., & Voortman, R. L. (2006). Simultaneously addressing micronutrient deficiencies in soils, crops, animal and human nutrition: opportunities for higher yields and better health. *Center for World Food Studies. Staff Working Paper*.
- Nyangweso, P. M., Odhiambo, M. O., Odunga, P., Korir, M. K., Kipsat, M. J., & Serem, A. K. (2007). Household Food Security in Vihiga district, Kenya: determinants of dietary diversity. In *8th African Crop Science Society Conference, El-Minia, Egypt, 27-31 October 2007* (pp. 1383-1389). African Crop Science Society.
- Ogbo, F. A., Page, A., Idoko, J., Claudio, F., & Agho, K. E. (2015). Trends in complementary feeding indicators in Nigeria, 2003–2013. *BMJ open*, 5(10), e008467.
- Ojiako IA, Manyong VM, Ikpi AE. Determinants of nutritional status of pre-school children from rural households in Kaduna and Kano states, Nigeria. *Pak J Nutr* 2009; 8: 1497-1505
- Owino, V., Ahmed, T., Freemark, M., Kelly, P., Loy, A., Manary, M., & Loechl, C. (2016). Environmental enteric dysfunction and growth failure/stunting in global child health. *Pediatrics*, 138(6).
- Parashar, A., Sharma, D., Thakur, A., & Mazta, S. R. (2015). Infant and young child feeding practices-insights from a cross-sectional study in a hilly state of North India. *International Journal of Nutrition, Pharmacology, Neurological Diseases*, 5(3), 103.
- Pereira, A. (2016). Reducing stunting and other forms of an investment framework for nutrition in Kenya :, (December).
- Peterson, S., & Tylleska, T. (2005). Infant and Young Child Feeding in Western Uganda : Knowledge , Practices and Socio-economic Correlates, (June). <http://doi.org/10.1093/tropej/fmi048>
- Pollitt, E., Gorman, K. S., Engle, P. L., Martorell, R., Rivera, J., Wachs, T. D., & Scrimshaw, N. S. (1993). Early supplementary feeding and cognition: effects over

- two decades. *Monographs of the Society for Research in child development*, i-118.
- Ratcliffe, S., Angela Gambler, M. B. A., Gross, M., Horst, M., MPHS, M., & Raff, T. (2012). PreventinG PreMAaturity: one WoMAN At A tiMe. *The Journal*, 7(3), 69.
- Rah, J. H., Akhter, N., Semba, R. D., De Pee, S., Bloem, M. W., Campbell, A. A., ... & Kraemer, K. (2010). Low dietary diversity is a predictor of child stunting in rural Bangladesh. *European journal of clinical nutrition*, 64(12), 1393-1398.
- Rahman, S. J., Ahmed, N. F., Abedin, M. M., Ahammed, B., Ali, M., Rahman, M. J., & Maniruzzaman, M. (2021). Investigate the risk factors of stunting, wasting, and underweight among under-five Bangladeshi children and its prediction based on machine learning approach. *Plos one*, 16(6), e0253172.
- Rocha, H. A., Sudfeld, C. R., Leite, Á. J., Rocha, S. G., Machado, M. M., Campos, J. S., ... & Correia, L. L. (2021). Adverse childhood experiences and child development outcomes in Ceará, Brazil: a population-based study. *American journal of preventive medicine*, 60(4), 579-586.
- Roba, K. T., Connor, T. P. O., Belachew, T., & Brien, N. M. O. (2016). Infant and Young Child Feeding (IYCF) Practices Among Mothers of Children Aged 6 – 23 Months in Two Agro-ecological Zones of Rural Ethiopia, 5(3), 185–194.
<http://doi.org/10.11648/j.ijnfs.20160503.16>
- Roberts, T. J., Carnahan, E., & Gakidou, E. (2013). Can breastfeeding promote child health equity? A comprehensive analysis of breastfeeding patterns across the developing world and what we can learn from them. *BMC medicine*, 11(1), 1-12.
- Rodríguez, L., Cervantes, E., & Ortiz, R. (2011). Malnutrition and gastrointestinal and respiratory infections in children: a public health problem. *International journal of environmental research and public health*, 8(4), 1174-1205.
- Ruel, M. T., Alderman, H., & Maternal and Child Nutrition Study Group. (2013). Nutrition-sensitive interventions and programmes: how can they help to accelerate progress in improving maternal and child nutrition?. *The lancet*, 382(9891), 536-551.
- Romulus-Nieuwelink, J. J., Doak, C., Albernaz, L., Victora, C. G., & Haisma, H. (2011). Breast milk and complementary food intake in Brazilian infants according to socio-economic position. *International journal of pediatric obesity*, 6(sup3), e508-514.
- Sakyi, P. (2012). Determinants of food accessibility of rural households in the Limpopo Province, South Africa. *Unpublished MSc dissertation. Gent: Gent University*.
- Sawadogo-Lewis, T., King, S. E., Aung, T., & Roberton, T. (2021). The Potential

Contribution of the Health System to Reducing Stunting in SUN Countries. *Food and nutrition bulletin*, 42(2), 159-169.

- Senbanjo, I. O., Olayiwola, I. O., & Afolabi, W. A. (2016). Dietary practices and nutritional status of under-five children in rural and urban communities of Lagos State, Nigeria. *Nigerian Medical Journal: Journal of the Nigeria Medical Association*, 57(6), 307.
- Serlemitsos, J. A., & Fusco, H. (2001). Vitamin A fortification of sugar in Zambia. *MOST/US Agency for International Development, Arlington, VA*.
- Silvestri, S., Sabine, D., Patti, K., Wiebke, F., Maren, R., Ianetta, M., ... & Cristina, R. M. (2015). Households and food security: lessons from food secure households in East Africa. *Agriculture & Food Security*, 4(1), 1-15.
- Suri, S., & Kumar, D. (2015). Nutritional status and the factors associated with it among children aged 1-5 years in a rural area of Jammu. *International Journal of Scientific Study*, 3(3), 61-65.
- Sussy, M., & Makena, A. N. N. (2016). No Title dietary diversity, morbidity.
- Teshome, B., Kogi-Makau, W., Getahun, Z., & Taye, G. (2009). Magnitude and determinants of stunting in children under five years of age in food surplus region of Ethiopia: the case of west gojam zone. *Ethiopian Journal of Health Development*, 23(2).
- UNICEF Staff. (2011). *The state of the world's children 2011-executive summary: Adolescence an age of opportunity*. Unicef.
- UNICEF. (2013). Improving child nutrition: the achievable imperative for global progress. *New York: UNICEF, 114*.
- UNICEF. (2014). *State of the world children 2015*.
- UNICEF. (2019). Humanitarian action for children – Overview.
- UNICEF, & World Health Organization. (2017). The state of food security and nutrition in the world 2017: Building resilience for peace and food security.
- Vesel, L., Bahl, R., Martines, J., Penny, M., Bhandari, N., & Kirkwood, B. R. (2010). Use of new World Health Organization child growth standards to assess how infant malnutrition relates to breastfeeding and mortality. *Bulletin of the World Health Organization*, 88, 39-48.

- Vossenaar, M., Knight, F. A., Tumilowicz, A., Hotz, C., Chege, P., & Ferguson, E. L. (2017). Context-specific complementary feeding recommendations developed using Optifood could improve the diets of breast-fed infants and young children from diverse livelihood groups in northern Kenya. <http://doi.org/10.1017/S1368980016003116>
- Waswa, L. M., Jordan, I., Herrmann, J., Krawinkel, M. B., & Keding, G. B. (2015). Community-based educational intervention improved the diversity of complementary diets in western Kenya: results from a randomized controlled trial. *Public health nutrition*, 18(18), 3406-3419.
- WHO, & (2003).& (PAHO). Guiding principles for complementary feeding of the breastfed child. Washington, DC/Geneva: World Health Organization.
- WHO, (2006). *The world health report 2006: working together for health*. World Health Organization.
- WHO, (2008) Commission on Social Determinants of Health, & World Health Organization.. *Closing the gap in a generation: health equity through action on the social determinants of health: Commission on Social Determinants of Health final report*. World Health Organization.
- WHO, (2009). *Infant and young child feeding*.
- WHO, & UNICEF. (2013). *Progress on sanitation and drinking-water*. World Health Organization
- WHO, (2010). Indicators for assessing infant and young child feeding practices.
- WHO, (2010).Partners.Indicators for assessing infant and young child feeding practices. Part 3: country profiles. *World Health Organization*.
- WHO, (2010). UNFPA, The World Bank. Trends in maternal mortality: 1990 to 2008 Estimates developed by WHO, UNICEF.
- WHO, (2011). UNFPA and The World Bank (2010) Trends in Maternal Mortality: 1990 to 2008. Geneva: World Health Organization.
- WHO, (2015). *World health statistics 2015*. World Health Organization.
- WHO, (2019). world health statistics 2018
- Zhang, Z., Gu, D., & Hayward, M. D. (2010). Childhood nutritional deprivation and cognitive impairment among older Chinese people. *Social science & medicine*, 71(5), 941-949.
- Zongrone, A., Winskell, K., & Menon, P. (2012). Infant and young child feeding practices and child undernutrition in Bangladesh: insights from nationally representative data. *Public health nutrition*, 15(9), 1697-1704.

APPENDIXA: INTRODUCTION LETTER AND INFORMED CONSENT**Informed consent**

Dear Respondent,

My name is Julius K Kigo, a student of Kenyatta University department of Food, nutrition and dietetics. I am undertaking a study on complementary feeding practices and nutrition status of children 6-23 months of age in Yatta sub county, Machakos county Kenya. This will help inform decision making for proper intervention among children 6-23 months of age in Yatta and other arid and semi-arid areas. The aim of this study is to determine complementary feeding practices and nutrition status of children 6-23 months of age. I will be interviewing the care givers of children 6-23 months of age and will take about 45 minutes.

1. The study will collect data on demographic & socio-economic characteristics of the households with children 6-23 months of age, complementary feeding practices and nutrition status of children six to twenty three months of age.
2. Participation in the study is voluntary and will be highly appreciated. There are no consequences of declining to participate in the study.
3. Confidentiality will be highly maintained and any information obtained from this study will be used for the purpose of this study only.
4. Please note that participation in this study has no financial or other personal benefits.

Procedure that will be followed

You will be requested to recall food consumption of the child 6-23 months of age for the previous 24 hours including breast feeding. This will entail you remembering all the food that the child ate for a period of the last 24 hours. Further you will be requested to describe the type of food, the ingredients used to cook it and the quantity the child took and breast feeding practices. Further you will be requested to state whether the child has consumed the food that will be read out to you in the last seven days and if so how many days. The child's weight will be taken in a convenient location where the child will wear the provided clean weighing pants and the weight taken with a salter scale and the readings recorded. The child will wear minimum clothing as you are comfortable. In the same place the child's height/length will also be taken using a no identifier length mat. Other parts of this study will involve determination of demographic and socio-economic characteristics of the child aged 6-23 months of age and the household.

Discomforts and risks

Some of the questions asked during the interview may make you uncomfortable and in such a case you may decline to answer them. Further you are free to discontinue with the interview at any time.

Benefits

As a result of participating in this study you will benefit by understanding the child's complementary feeding practices and nutrition status. In the event that your child's complementary feeding practices or the nutrition status will be found to have a problem then advice on the appropriate action will be taken. Your participation will also help us

know the complementary feeding practices and nutrition status of children aged 6-23 months in arid and semi-arid areas in Yatta Sub County. Other information you shall help us understand are the demographic & socio-economic characteristics associated with the nutrition status of children six to twenty three months of age in Yatta Sub County.

Confidentiality

The interviews will be conducted in your household where you will find appropriate and any measurements taken in an appropriate setting. There will be no direct reference of your name or that of the child nor will your contact information be published at the end of the study. The information that will be collected from you and your child will be treated with utmost confidentiality. If you have any questions you may contact;

Julius Kigo

P.O BOX 56-10218

Kangari, Kenya

Tel: +254-722 160-262

Or

Dr. Dorcus Mbithe

P.O box 43844-00100

Nairobi, Kenya

Tel: +254 728 379 785

Kenyatta University

Or

Dr. Irene Awour Ogada

Department of Applied Human Nutrition,

Mount Saint Vincent University-Canada.

Tel:+ 1(587)566-3469

+ 2 (254723955466

Respondent's statement

I have understood the information above and the terms of my participation. I have been given a chance to ask questions for clarification for which have been answered satisfactorily. Therefore, I voluntarily choose to participate in this study. I understand that the information I will provide will be treated with confidentiality and kept private. I understand I can refuse to proceed with the interview at any time without any consequences.

Signing or thumb print

Date



Interviewer's statement

I, the undersigned have explained to the respondent the procedures in the study, the benefits and the risks involved in participating in the study in a language she understands.

Name of interviewer

Interviewer signature

Date

APPENDIX B: QUESTIONNAIRE

Complementary feeding practices and nutrition status of children aged 6-23 months in Machakos County Kenya

Instruction to enumerators:

1.0

| Name of sub county | Name of ward | Name of sub location | Team number | Household number | Date of interview dd/mm/yy | Name of interviewer | Name of team leader |
|--------------------|--------------|----------------------|-------------|------------------|-------------------------------|---------------------|---------------------|
| | | | | | | | |

HOUSEHOLD DATA How many people live in the household together and share meals? (Household size)

| 1.1 Age group | 1.2 Persons ID and name (start with youngest to the oldest member of the household) Insert the names of the persons and ensure that numbering is continuous | 1.3 Approx. Age Enter months for children under 5 years and years for over 5s | 1.4 Childs age verified by 1=Health card 2=Birth certificate/notification 3=Baptism card 4=Calendar of events 5=Recall | 1.5 Sex 1=Male 2=Female | 1.6 Main occupation of the household head and the respondent or care giver (Enter code from list) |
|------------------|--|---|--|--------------------------------------|---|
| | | | | | |

| | ID | NAME | Date of birth Dd/mm/yy | AGE(MON THS) | | SEX | OCCUPATION |
|------------------|--|------|---------------------------|-----------------|--|-----|------------|
| Under 5 years | 1 | | | | | | |
| | 2 | | | | | | |
| | 3 | | | | | | |
| | 4 | | | | | | |
| Over 5 years | ID | NAME | Date of birth Dd/mm/yy | AGE (YRS) | | SEX | OCCUPATION |
| | 5 | | | | | | |
| | 6 | | | | | | |
| | 7 | | | | | | |
| CODE | 1=Agricultural labour,2=livestock hearing,3=Own farm labour,4=Employed (salaried),5=Waged labour,6=Petty trade,7=Unemployed,8=Student,9=Merchant/trader,10=Mining,11=House wife (Only those who completely stay home and have no other source of income),12=domestic help,13=Hunting,gathering,14=firewood/charcoal selling,15=Brewing,16=Weaving /basketry,17=fishing,18,very old,19=others(specify)..... | | | | | | |

2: DEMOGRAPHIC AND SOCIO-ECONOMIC CHARACTERISTIC OF THE CARE GIVERS OF CHILDREN 6-23 MONTHS OF AGE

| S/NO | AGE | NO OF CHILDREN | EDUCATION LEVEL | MAIN OCCUPATION | MARITAL STATUS | INCOME 1 YES 2 NO | SOURCE OF INCOME | INCOME RANGE | TRIBE /ETHNICITY |
|------|-----|----------------|-----------------|-----------------|----------------|-------------------------|------------------|--------------|------------------|
| | | | | | | | | | |

KEY:

1. **AGE** :Age in years
2. **Education level:** 1 = No formal education 2 = Primary incomplete 3 = Primary complete 4 = Secondary incomplete
3. 5 = Secondary complete 6 = College certificate 7 = College diploma 8 = University degree 9 = Adult education
4. **Occupation:** 1 = Pastoralist, 2 = Business, 3 = casual worker 4 = House wife, 5 = Civil servant, 6 = Private sector, 7 = Unemployed, 8 = any other specify.
5. **Marital status:** 1 = Married, 2 = Single mother, 3 = Divorced, 4 = Windowed
6. **Source of income:** 1 = Sale of livestock, 2 = Sale of animal milk, 3 = Petty trade, 4 = Business, 5 = Formal employment 6 = No income 7 = any other..... (specify)
7. **Income:** Income per Month **1** = < 2000 **2** = 2,001- 4,000 **3** = 4,001-6,000 **4** = 8,001-10,000 **5** = > 10,000

3. ASSETS OWNERSHIP

| Does the household own the following? 1= Yes 2 = No | | | | | | |
|---|---------|------------|----------------|------------|----------------|------------|
| | Asset | Enter code | Asset | Enter code | Asset | Enter code |
| | Car | | Tape player | | Ox/donkey cart | |
| | Bicycle | | Sickle/Machete | | Grinding mill | |

| | | | | | | |
|--|--------------|--|-----------------|--|------------|--|
| | Television | | Axe | | Shop/kiosk | |
| | Mobile phone | | Chairs/sofa set | | | |
| | Beds | | Paraffin stove | | | |
| | Radio | | Pressure lamp | | | |

| | |
|--|--|
| <p>Do you own/rent land</p> <p>1 = Yes</p> <p>2 = No</p> | <p>Do you practice any cultivation on the land</p> <p>1 = Yes</p> <p>2 = No</p> |
| <p>What is your main source of food?</p> <p>1 = Own crop and animal production</p> <p>2 = Purchase from market</p> <p>3 = Own crop and animal production and purchase from market</p> <p>4 = Donations</p> <p>5 = Others specify</p> | <p>Is the house you live in:</p> <p>1 = Owned</p> <p>2 = Rented</p> <p>3 = Squatting</p> <p>4 = Others specify</p> |
| <p>What is the material of the floor?</p> <p>1 = Concrete 2 = Natural earth 3 = Wood 4 = Tiles 5 = Dung 6 = Others specify</p> | <p>What is the material of the roof?</p> <p>1 = Concrete 2 = Tiles 3 = Straw 4 = Wood 5 = Galvanized Iron 6 = Cloth 7 = Plastic paper 8 = Others (specify)</p> |
| <p>What is the material of the wall</p> <p>1 = concrete 2 = Wood 3 = Straw 4 = Plastic shelter 5 = Galvanized iron 6 = Mud 7 = Card board 8 = Bricks 9 = Plastic paper 10 = Cloth 11 = Others (specify)</p> | <p>What is the main source of cooking fuel</p> <p>1 = Kerosene 2 = Electricity 3 = Firewood 4 = Charcoal 5 = gas 6 = Others specify</p> |

| | |
|---|--|
| <p>What is the main source of lighting</p> <p>1 = Kerosene 2 Electricity 3 = Solar 4 = Candle</p> <p>5 = Others specify</p> | |
|---|--|

5. INFANT AND YOUNG CHILD FEEDING PRACTICES (IYCF) FOR CHILDREN 6-23 MONTHS OF AGE

Every effort will be made to speak with the mother. If she is not available, the primary care giver responsible for feeding of the child will be spoken to.

Now I will ask you about what (Name) drank yesterday during the day and the night. During the day and night, did (Name) receive any of the following fluids?

Refer to the name of the child for each question. READ OUT EACH FOOD ONE BY ONE TO THE MOTHER AND RECORD THE RESPONSE.

| CH. No | Name of child | 4.11 | 4.12 | 4.13 | 4.14 | 4.15 | 4.16 | 4.17 | 4.18 |
|--------|---------------|--|--|--|--|--|---------------------------------------|--|-------------------------------------|
| | | Breast milk Only one answer coded as below: 1. Yes 2. No 3.DNK | Infant formula(lactogen, Nan) 1. Yes 2.No 3.DNK | Other milks: Animal milk,- reconstituted powdered milk(Safari land etc)-Sour milk/Mursiklolon /naoto 1. Yes 2.No 3.DNK | Sweetened flavored juices(Quencher, juicy, afia, juice cola),soda 1. Yes 2.No 3.DNK | ORS/Dawa yachumvi 1. Yes 2.No 3.Dnk | Tea/Coffee 1. Yes 2.No 3.Dnk | Plain water 1. Yes 2.No 3.Dnk | Porridge 1. Yes 2.No 3.Dnk |

Now I will ask you about what solid/semi solid foods (Name) ate Yesterday during the day and night. Yesterday during the day and the night, what food items did (name) receive? (Ask the mother/care giver to mention all foods given to the child and record as mentioned in the appropriate category)

Note: Please wait for the mothers/caregivers response after asking the questions other than reading out the foods.

| Ch no. | Child name | 4.19 | 4.20 | 4.21 | 4.22 | 4.23 | 4.24 | 4.25 | 4.26 | 4.27 |
|--------|------------|-----------------------------------|--|--|---|--|--|--|--|---|
| | | Eggs 1. Yes 2. No 3. Dnk | Porridge Made from CSB/ Unimix /Millet/ sorghum /maize flour Use the correct code. Only one answer. 1. Yes 2. No 3. DNK | Flesh Meats (Chicken, beef, Kidney, liver, Mutton, Camel, Donkey, fish, blood, wild meat) 1. Yes 2. No 3. DNK | Legumes and nuts (Beans, ground nuts, Cowpeas, Lentils, green grams) 1. Yes 2. No 3. DNK | Dairy products (Milk, cheese, Ghee, Fermented Milk) 1. Yes 2. No 3. DNK | Grains, Roots & Tubers (Rice, Bread, Potatoes, Biscuits, Mandazi, Chapatti, Ugali, Cassava, Millets). 1. Yes 2. No 3. DNK | Vitamin A Rich fruits & Vegetables (Pawpaw, Melon, Sukuma wiki, Carrots, cowpea leaves, Spinuch, Avocado, Managu, Sageti) 1. Yes 2. No 3. DNK | Other fruits and vegetables (onions, tomatoes, cabbage, oranges, bananas and tamarind, guavas, cactus fruits) 1. Yes 2. No 3. DNK | Yesterday (During the day and at night), how many times did you feed (name) solid and semi-solid foods? No. of times child was given food to make it full. |

6. FOOD CONSUMPTION AND DIETARY DIVERSITY-ASK FOR CHILDREN 6-23 MONTHS OLD

Twenty four hour recall food consumption among children 6-23 months. The interviewers should establish whether the previous day and night was usual or normal for the child.

| | | | | |
|---|---|---|---|--|
| | <p>7.1 Food group consumed</p> <p>Were the foods consumed</p> <p>1. Usual?</p> <p>2. Not usual</p> <p>(Circle the response)</p> | <p>7.2 Did your child 6-23 months consume food from any of these groups in the last 24 hours (from this time yesterday to now)? Include any snacks consumed</p> <p>1 = Yes 0 = No</p> | <p>7.3 Did your child 6-23 months consume food from any of these groups in the last seven days? Include any snacks consumed</p> <p>1 = Yes 0 = No</p> | <p>7.4 What is the main source of the dominant food item consumed (Please insert the appropriate code)</p> <p>1 = Own production</p> <p>2 = Purchases</p> <p>3 = gifts from friends/family</p> <p>4 = food aid</p> <p>5 = traded or bartered</p> <p>6 = borrowed</p> <p>7 = gathering/wild</p> <p>8 = Others specify</p> |
| | Type of food | | | |
| 1 | Grains, roots and tubers (e.g. sorghum, maize, spaghetti, rice, bulger, wheat, bread, millet, chapatti, Potatoes, white yams, cassava or food from roots, white sweet potatoes) | | | |
| 2 | Legumes and nuts (e.g. beans, lentils, green grams, cow peas, dried pea nuts, pigeon peas, ground nuts, Macadamia nuts) | | | |
| 3 | Dairy products (Milk, Yoghurt, cheese, butter) | | | |
| 4 | Flesh foods (Meat, fish, poultry and organ meats Liver, kidney, heart, tongue, blood based foods, spleen) | | | |

| | | | | |
|---|---|--|--|--|
| 5 | Eggs | | | |
| 6 | Vitamin A rich fruits and vegetables and tubers: Ripe mangoes, papaya other locally available like water melon, Pumpkins, carrots, yellow fleshed sweet potatoes, pumpkin leaves , <i>kunde</i> leaves, Sukuma wiki, spinach, <i>managu</i> , <i>mrenda</i> | | | |
| 7 | Other fruits and vegetables (Oranges, tamarinds, wild fruits Tomatoes, brinjals, onions, cabbage) | | | |

8. Please and accurately indicate the number of meals consumed by child 6-23 months per day and the previous day. Information on child 6-23 months old who ate the previous day, those who did not eat as well as reasons for not eating should be probed and recorded appropriately.

| | | | |
|--|--|--|--|
| <p>7.5. Including food eaten in the morning, how many meals does your child 6-23 months normally eat per day?</p> <p>(Please indicate the number of meals consumed e.g.(1,2,3,4,5,6)</p> | <p>7.6 Did the child 6-23 months eat yesterday?</p> <p>(Please record all responses)</p> <p>1.Yes</p> <p>2.No</p> | <p>7.7. Why did the child not eat yesterday?</p> <p>(Please record all the responses)</p> <p>1=Food not enough</p> <p>2=Sickness</p> <p>3=Away from home</p> <p>4=fasting</p> <p>5Other specify</p> | <p>7.8 Including food eaten in the morning, how many meals did your child 6-23 months eat <u>YESTERDAY?</u></p> <p>(Please indicate the number of meals consumed e.g.0,1,2,3,4,5,6)</p> |
| | | | |

9. MORBIDITY: ASK FOR ALL CHILDREN 6-23 MONTHS OF AGE.

| | | | | | | | | |
|--|--|--|--|--|--|--|--|--------------------------------|
| | | | | | | | | 4= not sure/do not know |
|--|--|--|--|--|--|--|--|--------------------------------|

APPENDIX C: FOCUS GROUP DISCUSSION GUIDE

**Complementary feeding practices and nutrition status among children 6-23 months
in Machakos County, Kenya**

**Respondent/Participants: Caregivers of children aged 6-23 months in Yatta Sub-
County, Machakos District**

1. Name of the village Your main livelihood

.....
.....

2. What are the main sources of food for most of your children 6-23 months of age?

.....
.....

.....

3. At what age did most of you stop breast feeding your children?

.....
.....

4. What are the main reasons that lead you to stop breastfeeding?

.....

5. Are there any cultural factors that affect breastfeeding of your children?

.....
.....
.....

6. At what age did most of you introduce water and solid, semi-solids or soft foods
to your children?

7. What are the most common types of food fed to your children 6-23 months of age?

.....

8. How do most of you prepare food for your children 6-23 months of age?

.....

.....

.....

9. What determines the food frequency fed to most of your children?

.....

10. Are there cultural factors that dictate how children 6-23 months of age should be fed?

.....

..

.....

11. Does the climate affect the children's 6-23 months food intake?

How?

12. What other factors affect the dietary intake of the children 6-23 months?

.....

.....

.....

13. Are there challenges that most of you face in feeding your children 6-23 months?

.....

.....
.....

14. How do most of you overcome those challenges when feeding the children?

.....
.....

15. What is the distance to the nearest health facility?

16. What are the common nutrition services offered to children 6-23 months in the health facility?

.....

.....
.....

17. What are some of the observations made by nutritional service providers about feeding of your children 6-23 months and their nutrition status?

.....
.....
.....

18. Are there any guides that most of you are given on feeding children 6-23 months at the health facility?

.....
.....

19. What is the main source of drinking and cooking water for most of your children 6-23 months?

.....
.....

20. What is the shortest distance to the source of drinking and cooking water for the children 6-23 months?

APPENDIX D: KEY INFORMANT INTERVIEW GUIDE

Complementary feeding practices and nutrition status among children 6-23 months in Machakos County, Kenya

Respondent/Participants: Nutritionists and community health volunteers in Yatta Sub-County, Machakos District

1. Name.....Age.....Highest academic qualification attained..... Name of organization..... Designation period of service in the organizationPeriod of service in the area..... Approximate population served Ward Locationsub-county.....

2. What are your main duties and responsibilities

.....
.....
.....
.....

6 Describe the availability of food to the children 6-23 months of age

.....
.....
.....

7 How is the understanding of complementary feeding practices among caregivers of children 6-23 months of age?

.....
.....

8 Briefly describe the complementary feeding practices in the area.....

.....
.....

9 What are some of the factors that influence feeding of children 6-23 months of age and their nutrition status?

.....

10 What determines the frequency of meals fed to the children among the caregivers?

.....
.....

11 Are there any challenges that caregivers face with regard to breastfeeding and complementary feeding?

.....
.....
.....

12 Briefly describe the nutrition status of children 6-23 months of age in the area

.....
.....
.....

13 What are the most common illnesses among children 6-23 months of age in the area?.....

.....

14 What are the possible causes of these illnesses?

.....
.....
.....

15 What is the source of drinking and cooking water for children 6-23 months?

.....

16 What is the average distance to the nearest source of drinking and cooking water for children 6-23 months?

APPENDIX E: KU GRADUATE SCHOOL APPROVAL

**KENYATTA UNIVERSITY
GRADUATE SCHOOL**

E-mail: dean-graduate@ku.ac.ke

P.O. Box 43844, 00100
NAIROBI, KENYA
Tel. 020-8704150

Website: www.ku.ac.ke

Internal Memo

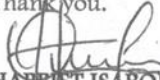
FROM: Dean, Graduate School **DATE:** 31st May, 2018
TO: Mr. Julius Kienji Kigo **REF:** H60/CTY/PT/24644/13
 C/o Department of Food, Nutrition & Dietetics
SUBJECT: APPROVAL OF RESEARCH PROPOSAL

We acknowledge receipt of your Research Proposal after fulfilling recommendations raised by the Graduate School Board of 9th May, 2018.

You may now proceed with your Data collection, subject to clearance with the Director General, National Commission for Science, Technology & Innovation.

As you embark on your data collection, please note that you will be required to submit to Graduate School completed Supervision Tracking Forms per semester. The form has been developed to replace the Progress Report Forms. The Supervision Tracking Forms are available at the University Website under Graduate School webpage downloads.

Thank you.


 HARRIET ISABOKE
 FOR: DEAN, GRADUATE SCHOOL



CC. Chairman, Department of Food, Nutrition & Dietetics

Supervisors:

1. Dr. Dorcus Mbithe
C/o Department of Food, Nutrition & Dietetics
Kenyatta University
2. Dr. Irene Ogada
C/o Department of Food, Nutrition & Dietetics
Kenyatta University

APPENDIX F: KUERC APPROVAL

**KENYATTA UNIVERSITY
ETHICS REVIEW COMMITTEE**

Fax: 8711242/8711575
 Email: kuerc.chairman@ku.ac.ke
kuerc.secretary@ku.ac.ke
 Website: www.ku.ac.ke

**P. O. Box 43844,
 Nairobi, 00100**
 Tel: 8710901/12

Our Ref: **KU/ERC/ APPROVAL/VOL.1 (194)**

Date: 16th August, 2018

Julius Kienji Kigo
 P.O Box 43844-00100
 NAIROBI

Dear Julius,

**APPLICATION NUMBER: PKU/851/1916 “COMPLIMENTARY FEEDING STATUS
 AMONG CHILDREN 6-23 MONTHS OF AGE IN MACHAKOS COUNTY KENYA”**

1. IDENTIFICATION OF PROTOCOL

The application before the committee is with a research topic **“Complimentary Feeding Status Among Children 6-23 Months Of Age In Machakos County, Kenya ”** received on 14th June, 2018 and discussed on 14th August, 2018.

2. APPLICANT

Julius Kienji Kigo

3. SITE

Machakos County, Kenya

4. DECISION

The committee has considered the research protocol in accordance with the Kenyatta University Research Policy (section 7.2.1.3) and the Kenyatta University Ethics Review Committee Guidelines and **APPROVED that the research may proceed for a period of ONE year from 14th August , 2018.**

5. ADVICE/CONDITIONS

- i. Progress reports are submitted to the KU-ERC every six months and a full report is submitted at the end of the study.
- ii. Serious and unexpected adverse events related to the conduct of the study are reported to this committee immediately they occur.
- iii. Notify the Kenyatta University Ethics Committee of any amendments to the protocol.
- iv. Submit an electronic copy of the protocol to KUERC.


When replying, kindly quote the application number above.

If you accept the decision reached and advice and conditions given please sign in the space provided below and return to KU-ERC a copy of the letter.



PROF. JUDITH KIMSYA
CHAIRMAN ETHICS REVIEW COMMITTEE

Julius Kigo.....accept the advice given and will fulfill the conditions therein.

Signature.......... Dated this day of 24 08 2018.

cc.
DVC-Research Innovation and Outreach

APPENDIX G: RESEARCH PERMIT

THE SCIENCE, TECHNOLOGY AND INNOVATION ACT, 2013


The Grant of Research Licenses is guided by the Science, Technology and Innovation (Research Licensing) Regulations, 2014.

CONDITIONS

1. The License is valid for the proposed research, location and specified period.
2. The License and any rights thereunder are non-transferable.
3. The Licensee shall inform the County Governor before commencement of the research.
4. Excavation, filming and collection of specimens are subject to further necessary clearance from relevant Government Agencies.
5. The License does not give authority to transfer research materials.
6. NACOSTI may monitor and evaluate the licensed research project.
7. The Licensee shall submit one hard copy and upload a soft copy of their final report within one year of completion of the research.
8. NACOSTI reserves the right to modify the conditions of the License including cancellation without prior notice.

National Commission for Science, Technology and Innovation
P.O. Box 30623 - 00100, Nairobi, Kenya
TEL: 020 400 7000, 0713 788787, 0735 404245
Email: dg@nacosti.go.ke, registry@nacosti.go.ke
Website: www.nacosti.go.ke

REPUBLIC OF KENYA



NACOSTI
National Commission for Science, Technology and Innovation

RESEARCH LICENSE

Serial No.A 21162

CONDITIONS: see back page

APPENDIX H: COUNTY APPROVAL



**THE PRESIDENCY
MINISTRY OF INTERIOR AND COORDINATION OF NATIONAL GOVERNMENT**

Telephone: 21009 and 21983 - 90100
Email Address: countycommasaku@gmail.com.
Fax No. 044-21999

OFFICE OF THE
County Commissioner
P.O. Box 1 - 90100
MACHAKOS.

When replying please quote

REF NO: CC/ST/ADM 5/9 VOL II/234

26th October, 2018

The Deputy County Commissioner
YATTA SUB COUNTY

RE: RESEARCH AUTHORIZATION - JULIUS KIENJI KIGO

The National Commission for Science, Technology and Innovation has authorized the above named researcher to carry out a research on "***Complementary feeding practices and nutrition status among children six to twenty three months old in Yatta Sub County***" in Machakos County for the period ending **11th October, 2019.**

Please be notified and accord him necessary assistance.

ELIJAH OMOYO
FOR: COUNTY COMMISSIONER
MACHAKOS

