A comparative study on caregiver's nutritional knowledge, attitude, practices and child's nutritional status: positive deviance approach.

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Abstract

Caregiver's nutritional knowledge, attitude and practices (KAP) and child nutritional status were compared within a project of the Kenya Agricultural Research Institute (KARI) and McGill University. This initiative focused on development of gender responsive technologies and innovations to increase agricultural productivity for the achievement of food, nutrition and income security. The food security sub-team conducted both baseline and end line studies aimed to determine the health and nutrition impacts of the project, which in the present study focused on determinants of weight-for-age for the children. The data collected involved 94 caregiver-child pairs from Makueni County of Eastern Province consisting of 62 from a treatment arm and 32 from the control arm of the larger Innovation for Resilience Farming study being conducted in this area. Of these, weight-for-age z-score was used to identify well-nourished caregiver-child pairs (Positive deviance (PD) = 48) and malnourished caregiver-child pairs (Non-positive deviance (NPD) = 38). Data on caregiver's knowledge, attitude and practices were collected using a designed knowledge, attitude and practices questionnaire and a KAP score generated. Data from focus group discussions was collected as well as caregiver's socio-demographic and child nutrition indicators (weight-for-age, weight-for-height and height-for-age). Bivariate analyses showed no significant difference between caregiver's mean knowledge, attitude and practices score between positive deviance and non-positive deviance households ($p>0.05$). No association was observed between caregiver's knowledge attitude and practice score with the following variables: child's growth status i.e. weight-for-age, weight-for- height and height-for-age, caregiver's gender, caregiver's marital status and caregiver's level of income. A significant association was noted between caregiver's level of education and caregiver's knowledge, attitude and practice score. Further analysis with multiple regression showed that caregiver's knowledge, attitude and practice score could not independently predict child's growth status when controlling for caregiver's age, caregiver's gender, level of education, household income level and marital status. Caregiver's level of education and household income level could, however, predict child's growth status when controlling for caregiver's gender, marital status, age and knowledge attitude and practice score ($p <0.05$). These results imply that maternal nutritional knowledge attitude and practices may not be sufficient to improve weight-for-age of children in poor households.

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List of acronyms

EAR Estimated Average Requirement

HAZ Height-for-Age Z-scores

HIV/AIDS Human Immunodeficiency Virus/Acquired Immunodeficiency Syndrome

IFP Infant Feeding Practices

IYCF Infant Young Child Feeding

IYCN Infant Young Child Nutrition

KAP Knowledge Attitude and Practices

KARI Kenya Agricultural Research Institute

KEMRI Kenya Medical Research Institute

MDG Millennium Development Goals

NPD Non-Positive Deviance

PD Positive Deviance

PDI Positive Deviance Inquiry

UNICEF United Nations Children's Fund

UNSCN United Nations Standing Committee on Nutrition

W/A Weight-for-Age

WAZ Weight-for-Age Z-scores

WFP World Food Programme

WHA World Health Assembly

WHZ Weight-for-Height Z-scores

WHO World Health Organization

Chapter 1.0

1.1 Introduction

Improving nutrition in developing countries is not only of humanitarian importance but economically imperative as well. Thus, several organizations such as the UN agencies have combined efforts to combat malnutrition in developing countries as well as to endeavor to achieve the Millennium Development Goals by 2015. However, it is more than 15 years since the establishment of the MDG and efforts to achieve the goals set have not come to fruition as malnutrition still remains at unconscionable levels. The most vulnerable in this situation are infants and young children.

A number of United Nations bodies had estimated that globally, nearly 20 million children under the age of five years are suffering from severe acute malnutrition (WHO/WFP/UNSCN/UNICEF, 2007). A year after the MDG deadline, the UN report still shows that poverty in the the Sub-saharan Africa is considered very high despite a general reduction in the global poverty levels (Millennium Development Goal Report 2015). This could be one of the reasons resulting to about 150 million children in the world being underweight while 180 million being stunted (Ministry of Foreign and European Affairs, 2011). This is higher in Asia and Sub-Saharan Africa than elsewhere (Black et al., 2013). The burden of childhood malnutrition is greatly felt in developing countries with an estimate of about 32% of the children being affected (Black et al., 2013; UNICEF, 2004) with the prevalence showing that one in every three pre-school children is affected (UNSCN, 2004). The prevalence of underweight children in Asia and Africa has been estimated to be at around 22% and 20% respectively (UNSCN, 2011). This could be highly contributed to by forces of globalization, commercialization, industrialization, population increase and urbanization which change patterns of food production and consumption in ways that profoundly affect human diets (Johns & Eyzaguirre, 2006) with great impact on child health & nutrition as well.

The case in Kenya is no different. In 2014, the anthropometric measurements conducted by Kenya Demographic Health Survey reported that, 26% of Kenyan children under-five years are stunted. Although there has been a 4% (30% to 26% in 2008 & 2014 respectively) decrease in the national stunting levels of children, those levels are still considerably high. Moreover, 11% of the children are underweight (low weight-for-age) with 2% classified as severely underweight

(below -3SD). This is still a burden to the government health services which already have overstrained resources.

The etiology of early childhood malnutrition is complex with a number of factors coming to play. It is has been widely documented that inadequate food intake the immediate cause of childhood malnutrition. Nevertheless, behind these deficiencies lies a myriad of factors acting individually or interacting with one another to influence infant feeding practices and thus children's nutritional status and health (Appoh & Krekling, 2005). Today's nutrition transition has seen a change in the diets of people from all walks of life. For those with limited resources, it has led to abandonment of traditional diets and lifestyles which has placed them at particular risk of both infectious and non-communicable disease (Johns, Smith, & Eyzaguirre, 2006). This could be due to lack of sufficient nutrition knowledge on the importance of traditional foods to the general health and well-being. As a result, obesity has become the other nutritional issue that causes a double burden to public health nutrition interventions (Gewa, Oguttu, & Yandell, 2012). With under nutrition still in the picture, it can be easily said that over nutrition and under nutrition coexist side by side with children being at greater risk than before. Despite the fact that childhood obesity is not yet endemic does not mean it should be overlooked. Several studies have shown that stunted children are more likely to be overweight and obese than well-nourished children (Gewa, 2010; Hoffman, Sawaya, Verreschi, Tucker, & Roberts, 2000). Hence, reducing childhood under nutrition (especially stunting) could be key to preventing obesity.

Somehow, with all these nutrition issues, complementary feeding practices remain one of the most neglected determinants of young child malnutrition despite the fact that they play an important role in growth pattern of the child (Gewa et al., 2012). There have been fewer studies looking at early feeding practices and childhood overweight among populations in Africa (Gewa et al., 2012). Whereas it is widely known that feeding behavior is an expression of knowledge acquired from schooling, nutrition education or both, it could be put into use in a right way if well understood or be used wrongly if totally misunderstood. Of more importance is determining the caregivers' nutritional knowledge on infant and young child nutrition and understanding how it influences their practices and in the long run their children's nutrition status.

Nutritional knowledge as well as knowledge on hygiene has been found to be vital for caregivers of children below five years of age. Children at this age are very susceptible to various health issues such as diarrhea, anemia and other infectious diseases. It is assumed that

underlying nutrition information increases the caregivers' nutritional knowledge which brings about the desired changes in their food related attitude and behavior. Supporting these assumptions are several studies that have proved that among other factors associated with child health such as caregiver's level of education, knowledge attitude and practices (KAP) significantly interrelate in determining nutritional status (Ministry of Foreign and European Affairs, 2011; Berggren & Wray, 2002; Glewwe, 1999; Kumar, Goel, Kalia, Swami, & Singh, 2008; Ruel & Menon, 2002; Sethi, Kashyap, & Seth, 2003; Webb & Block, 2003). An important goal is the protection of the health and development of the next generation of young children in the world's poorest regions (Zeitlin et al., 1990). Hence, it is of great importance that efforts are made to ensure that the caregiver has the required nutritional knowledge to promote child health.

1.2 Problem statement

Nutritional status is the ultimate outcome of food security (Ngugi & Nyariki, 2005); this has seen numerous interventions in different parts of the world directing resources at reducing poverty levels or reducing the effects of poverty on child nutrition through provision of food. On the other hand, inappropriate breastfeeding and poor feeding practices represent major risks to the health and development of children (WHO, 2001). Globally, it is estimated that under nutrition in the aggregate including fetal growth restriction, stunting, wasting, and deficiencies of vitamin A and zinc along with suboptimum breastfeeding is a cause of 3•1 million child deaths annually or 45% of all child deaths in 2011 (Black et al., 2013).

The situation is not any different in the Eastern Province of Kenya where it was observed that the prevalence of stunting in the first year of life is low but increasing with age (Macharia, Kogi-Makau & Muroki 2005). This was consistent with the results of the baseline study conducted in Eastern Province by the KARI-McGill food security project which showed that children aged 24-36 months were more wasted (30.8%) and stunted (13.5%) than their counterparts of aged 6-23 months (wasting -18.3% and stunting-5.9%) (KARI-McGill Food security project 2013). Ndiku et al., also showed higher means for height-for- age Z scores and weight-for-age Z scores in boys (-1.33 &-0.60) than girls (-2.02 & -1.37) in all age groups (0-60 months) and 13 -18 months, stunting levels positively correlated with age (Ndiku, Jaceldo-Siegl, Singh, & Sabaté, 2010). Consequently, the KDHS (2008-2009 & 2014) &Central Bureau of Statistics, (2008) indicated that Eastern Province has one of the highest proportion of stunted

children at 30%. Macharia, Kogi-Makau & Nyariki (2005) concluded that chronic malnutrition was a problem in Makueni District of Eastern Province and age was an important determining factor.

The diet in Eastern Province, Makueni area, is maize-based where children are fed on porridge made from maize flour with low energy density (Ndiku, Jaceldo-Siegl, & Sabaté, 2010; Tomedi et al.,2011). These staples are low in many other nutrients that are needed for the child's growth and development such as protein and micronutrients (WHO, 2000b). Children of the age between 18-36 months are mostly affected. Their feeding is characterized by low frequency and low diet diversity (Ndiku et al., 2010). Moreover, it is documented that poor complementary feeding are among other factors that contribute to child malnutrition in Makueni (Macharia etal., 2005). Children in the age group between 18-60 months often get most of their diet from the general family pot. Chances are that these children are fed less frequently than they supposed to and their diets do not get much consideration in terms of nutrient quality. This could be because at this age a child is able to feed themselves hence less attention is given to ensure they feed adequately. The quality, quantity and frequency of feeding could be among the factors that contribute to the poor nutrition status of the children.

1.3 Justification

Nutrition's importance as a foundation for healthy development is usually underestimated. Childhood under nutrition remains a pervasive and damaging condition in Kenya (Ngare & Muttunga, 1999). Poor nutrition leads to ill health and most often it is the young children who are mostly affected (WHO, 2001). The effects of poor nutrition and stunting continue throughout life, contributing to reduced productivity and social development. This explains why their nutritional well-being reflects household, community and national investments in family health thereby contributing to overall country development (Macharia et al., 2005).

Poverty has more often than not been linked to malnutrition. Available evidence has shown that whereas global poverty reduction during the past decade has been progressive but the economic gains have not automatically been translated into nutrition benefits and progress against malnutrition has been less than stellar (Webb & Lapping, 2002). Findings from a study conducted in Makueni by Macharia et al. 2005 concluded that stunting among children in

Kathonzweni division is a problem despite the community development especially poverty eradication support given by World Vision Kenya (Macharia et al., 2005). In addition to this, in controlling for socio-economic status, there was no significant difference in the nutritional status of children covered under World Vision program and the control. There is more evidence indicating that the linkage between child malnutrition and poverty has been oversimplified (Appoh & Krekling, 2005). For an area with recurring drought situations like Makueni District, food shortages are bound to occur thus resulting in inadequate dietary intake over the long term. Despite this, there are households with children who are well-nourished.

World Health Organization identifies inappropriate feeding practices as a major cause of the onset of malnutrition in young children (WHO, 2001) and feeding behaviors serve as examples of the broader group of care practices critical for good child nutrition (Engle, Bentley, & Pelto, 2000). For the children who are transitioning from exclusive breastfeeding to family foods, attention to quality, adequacy and safety of complementary foods is key. This is because any deficits acquired at the age between 6-18 months are difficult to compensate for later childhood (Daelmans, 2003). The KARI/McGill baseline results showed that children older than 24 months were more malnourished than their younger counterparts, this could be as a result of earlier malnutrition or poor feeding practices which can be attributed to caregiver's nutrition knowledge. In most African countries nutrition is mostly a gender issue as women are primarily responsible for the characteristics of the family food basket and thereby family health. Many a times the lack of awareness and not poverty per se may be the most likely cause of faulty infant feeding practice (IFP) (Sethi, Kashyap, Seth, & Agarwal, 2003).

Factors that precipitate child malnutrition in Makueni are: unfavorable breastfeeding practices, poor complementary feeding and health seeking practices, close birth spacing, low education levels and the general low socio-economic status (Macharia et al., 2005). Poor infant feeding practices, directly or indirectly result to under nutrition, morbidity, and mortality in infants (Sethi, Kashyap, & Seth, 2003). Of specific concern is how caregiver's feeding behavior and characteristics of the diet during complementary feeding is affected by caregiver's knowledge and further how all these are reflected in the nutrition status of the child.

The value of interventions that seek to enhance mothers' nutrition knowledge to child nutrition has been recognized for decades (Webb & Block, 2003). Moreover, KDHS (2008 & 2014) showed that stunting levels have an inverse relationship with mothers' level of education

and wealth quintile in Eastern Province (KDHS, 2008). It is expected that a caregiver with a higher education level has a better understanding of nutrition issues due to the general nutrition knowledge gathered from attending school as well as from reading different articles on health and nutrition. Nutrition education in been conducted with the aim of improving nutrition knowledge which can be translated to positive nutrition outcome. Many nutrition education interventions have been conducted with the aim of improving child nutrition status through enhancing caregiver nutritional knowledge (Morgan et al., 2010; Mushaphi, 2011). These studies have shown a positive correlation between nutrition knowledge and nutrition practices urging more efforts to be channeled towards promoting nutrition knowledge. However, little has been done to identify and promote local knowledge on nutrition.

Positive deviance is a promising approach to combating malnutrition. Studies from different countries have shown that children from poverty stricken households have remained nourished despite their limited resources (Berggren & Wray, 2002; Marsh & Schroeder, 2002; Zeitlin et al., 1990). Most of the studies on the relationship between child feeding practices and health outcomes have focused on single behaviors such as exclusive breast feeding, introduction of complementary feeding among others. Due to its flexibility and suitability in capturing complex behavior and patterns (Ruel & Menon, 2002), this study will employ qualitative and quantitative approaches on identifying the available nutrition knowledge, attitude and practices and how it relates to child feeding and nutrition outcomes. Programs that include care should make an effort to identify and support good practices, rather than simply provide messages asking for change (Engle et al., 2000). Furthermore, there is need for efforts to identify and strengthen good practices such as the use of indigenous plants and fruits in Infant and Young Child Nutrition and motivate caregivers using their own values and motivations. This not only ensures acceptability but sustainability as well. The results from this study will be shared with key stakeholders to improve planning and programming of IYCN and aid in refining communication and enhance strategies that promote child health.

1.4 Objectives

1.41 General objectives

To assess caregivers' nutrition knowledge, attitudes and practices and its relation to child nutrition status in children 6-60 months using a positive deviance approach in Makueni County.

1.42 Specific objective

In order to achieve the overall aim of this study the following objectives were defined:

- To determine the knowledge/understanding and attitudes of caregivers towards infant and young child feeding practices for a child.
- To determine the nutritional status of the children.
- To determine the nutritional practices of the caregivers.
- To identify the best infant and young child nutrition practices that should be promoted in this community.

1.5 Study questions

- What differences exist in nutrition knowledge attitudes and practices between the positive deviance caregiver and the non-positive deviance caregivers?
- Do the differences affect child nutritional status?

1.6 Limitations of the study

Human Immunodeficiency Virus (HIV) of the children was not determined and this may affect the results of the study. This is because HIV infection affects nutrition through increases in resting energy expenditure, reductions in food intake, nutrient malabsorption and loss and complex metabolic alterations that culminate in weight loss and wasting common in AIDS (Marsh & Schroeder, 2002). Hence the children's anthropometric status may be affected by the effects of HIV/AIDS. Moreover, conducting the study once at a given time does not clearly indicate the true practices by the caregivers as well as hampers the identification of seasonal variation in food intake. Using W/A to categorize PD and NPD children increases the likelihood of categorizing a stunted fat child as a PD (healthy).

Chapter 2.0 Literature review

2.1 Introduction: IYCF and malnutrition situation in Makueni

One in every three children who is under five suffers from stunted growth in Asia and Sub-Saharan Africa (WHO, 2001). There are several factors that contribute to malnutrition. The main contributing factors for under five stunting are sex of child, child age, diarrhea episode, deprivation of colostrum, duration of breastfeeding, pre-lacteal feeds, type of food, age of introduction of complementary feeding and method of feeding (Daelmans, 2003; Dewey & Brown, 2003; Kenneth, 1998). Of these, poor breast-feeding patterns, low nutrient density and poor quality of the foods that complement breast-feeding account for much of the nutrient deficiency (Kenneth, 1998).

In Kenya, it has been estimated that 32% of children under the age of 6 months were exclusively breastfed (Central Bureau of Statistics, 2008). Although there has been a remarkable improvement in the numbers of exclusively breastfed babies in Kenya (from 13% in 2003 to 32 %) some studies have shown that the improvement is not uniform in all areas of the country. Makueni for example has showed that only about 20% of children 0-6 months were exclusively breastfed (Central Bureau of Statistics, 2008; Macharia et al., 2005; Ndiku et al., 2010). When comparing energy consumption of the children in Kenya's Mwingi and Makueni, Ndiku et al. (2010), reported marked difference in the consumption of carbohydrates, proteins, fat and iron, with higher intakes in Mwingi than Makueni. Inappropriate complementary feeding explains the high rates of malnutrition in this area.

Breast milk according to WHO is safe and sufficient to meet the child's needs during the first six months following birth and early introduction of family foods may result to nutrition deficiencies (WHO, 2001). There was a high prevalence of malnutrition in children who breastfed for a period lesser than 12 months in Makueni. More than 50% of children who had complementary feeding introduced earlier than 3 months were wasted, stunted and underweight (Macharia et al., 2005).WHO and UNICEF recommend the introduction of complementary solid food at 6 months as at this age; breast milk alone is considered inadequate to maintain a child's optimal growth. During the transition period towards eating the family diet (usually 6 – 23 months), the prevalence of malnutrition increases substantially because of inadequate, inappropriate and untimely introduction of complementary feeds. More often than not the diet for

these children is not sufficient to meet macronutrient and micronutrient needs, it is lacking in variety and they are fed less frequently. The mean diet diversity score for the children in Eastern Province was between 2.15 to 2.65 characterized with low frequencies of feeding (Kimiywe & Chege, 2014).

2.2 Factors affecting infant and young child nutrition

When looking at factors that affect IYCN, both diet and non-dietary causes must be taken into consideration. They bring into play a whole range of social, economic, environmental and cultural factors.

2.21 Exclusive breast feeding, introduction of complementary foods and duration of breast feeding

The benefits and limitations of infant feeding on child nutrition status have been well documented, primarily focusing on exclusiveness of breastfeeding, introduction of complementary foods and duration of breastfeeding**.** In May, 2001 the 54th World Health Assembly urged Member States to promote exclusive breastfeeding for six months as a global public health recommendation. It was then concluded that exclusive breastfeeding for six months confers several benefits on the infant and the mother (WHA, 2001). The nutrient needs of full-term, normal birth weight infants typically can be met by human milk alone for the first 6 months if the mother is well nourished (Kenneth, 1998; WHO, 2000b). Chief among these is the protective effect of exclusive breastfeeding against infant gastrointestinal infections, which is observed not only in developing country settings but also in industrialized countries (Kramer et al., 2001). In Brazil, exclusive breast feeding had provided protection against persistent diarrheal disease independent of age. Exclusively breast fed children had 8 fold lower diarrhea rates compared to weaned children (Lima et al., 2000). It was also found out that breast fed children had reduced episode duration of diarrhea than non-breast fed children (Arifeen et al., 2001; Lima et al., 2000).

Moreover, timely introduction of complementary foods also plays a big role in child nutrition status. Introduction of complementary foods too early and too late have led to devastating effects on child health and nutrition. Provision of complementary foods too soon predisposes the child to various infections as the child ceases to get more protective factors from

the breast milk (WHA, 2001; WHO, 2000b). On the other hand, late introduction of complementary foods leads to retardation in growth of the child. WHO (2000) recommends that a child should be introduced to family foods at his/her 180th day following birth. This is because before then, breast milk alone is believed to be sufficient to meet the child's needs and any introduction of family food to the child compromises the child's health. In developing countries the age at which the child is first introduced to complementary foods is of public health importance because of diarrheal disease from contaminated weaning foods (Cohen, Brown, Dewey, Canahuati, & Rivera, 1994). This has been shown in studies where weaning started at 3 months in Ghanaian children was positively associated with malnutrition (Brakohiapa et al., 1988). Another study in Honduras showed that complementary feeding started at 4-6 months had no advantage in infant intake or growth (Cohen et al., 1994). However, there are instances when a child can be introduced to family foods earlier than six months, mostly between the 4th and the 6th month (WHO, 2001; WHO, 2000a) when the caregiver realizes that the child does not gain the required weight or is often hungry despite appropriate breastfeeding. Wrong interpretation of this knowledge can, however, mislead caregivers to poor complementary feeding practices.

Currently, exclusive breast feeding is recommended for 6 months, and with appropriate complementary foods, breast feeding should be continued for 2years (Dewey, 2001). This has, however, stirred up controversies on the benefits of prolonged breast feeding, with other studies reporting that prolonged breast feeding in fact resulted to malnutrition by reduction of food intake (Brakohiapa et al., 1988). In addition to this, Onyango et al. (1998) reported that in Kenya diet diversity instead of prolonged breast feeding after 12 months was of more benefit to the child's health (Onyango, Koski, & Tucker, 1998). Reverse causality has been studied in Lima Peru, where it was reported that it is in fact poor growth what led to prolonged breast feeding and not vice versa (Marquis, Habicht, Lanata, Black, & Rasmussen, 1997). A mother was bound to continue breast feeding upon realizing the child was malnourished. Cousen et al. 1994, argues that in fact prolonged breast feeding reduced clinical malnutrition (malnutrition as a result of diseases) in children 12-36 months whereas it did not have any effect on stunting levels. In Guinea- Bissau, Molbak et al, reported that the benefits of breast feeding are not restricted to infancy; moreover, children 12-35 months who were breast fed had lower mortality rates than their counterparts who were not breast fed (Molbak et al., 1994). The differences in these studies arise because of different anthropometric variables (height-for-age, weight-for-height, weight-

for-age and mid upper arm circumference) being measured, different target populations and study designs. All in all, assessing caregiver's knowledge and practices on these issues may help identify behaviors that need emphasizing on and those that need to be discouraged.

2.22 Complementary feeding

Adequate nutrition during infancy and early childhood is fundamental to the development of each child's full human potential. It is recognized that the period from birth to two years of age is a "critical window" for the promotion of optimal growth, health and behavioral development. Complementary feeding is defined as the process started when breast milk is no longer sufficient to meet the nutritional requirements of infants, and therefore, other foods and liquids are needed, along with breast milk (Dewey, 2001; Kenneth, 1998; WHO, 2001). The target range for complementary feeding is generally taken to be 6 to 24 months which means breastfeeding may be continued beyond two years.

Feeding complementary foods requires much more from the caregiver than food selection and preparation (Engle, Menon, & Haddad, 1997). It requires a great understanding of the nutritional needs of the child at the given stage in life in terms of quality of the food, quantity and frequency of feeding required. In any culture, the following appear to be important factors: viscosity of food, frequency of feeding, nutrient density, quantity, hygiene, patience, and persistence (Allen, Gillespie, & Unies, 2001). These are recommended behavioral activities that are specific for each age group of children thus very important for the caregiver's knowledge. To keep young children healthy during the period of transition from exclusive breast feeding to family foods, complementary foods should be nutritious, clean and safe and fed in adequate amounts (WHO, 2000a); this is because as the baby grows, he/she becomes more active and needs more nutritional needs which cannot be fulfilled by breast milk alone. WHO (2000), suggests that appropriate complementary feeding is:

- Timely – all children should start receiving foods in addition to breast meaning that foods are introduced when the need for energy and to milk from 6 months onwards.
- Adequate – the foods should be of variety to provide sufficient energy, protein and micronutrients to meet the child's needs.
- Safe –measures should be taken to minimize contamination

- Appropriate – should be appropriate texture for the age of the child and consistent with the child's signals of appetite and satiety.

Different studies have used different methodologies to measure and quantify child feeding practices as well as assess associations with nutrition status. These efforts, have however, been largely futile (Ruel & Menon, 2002). To add to this, the difference in the age specific feeding practices within a narrow age is challenging. Despite this, some studies have shown that better feeding practices had been found to have a positive association with higher HAZ in children under the age of five (Ruel & Menon, 2002). A cross sectional study conducted in India in 2003-2004 found that there was a significant relationship between improvement in nutritional status of children younger than five years and adoption of proper infant feeding practices. It concluded that delayed initiation of breast feeding, deprivation from colostrum and improper weaning practices are significant risk factors for malnutrition among children under the age of five (Engle et al., 1997). Table 2.1 shows WHO age specific recommendations for infant and young child feeding.

Table 2.1 Age specific recommendations complimentary feeding

Age of child in months	Frequency of breast feeding	Frequency of feeding/day	Amount in kcal
6-8	8 times or as often as a child wants	2-3 times	200
9-11	as often as a child wants	3-4 times	300
12 and above	as often as a child wants	5and above	550

WHO, 2000b.

2.23 Dietary diversification

Uncertainties in rainfall and low adoption level of improved technologies in crop production contribute to low levels of food availability in developing countries. The impact of this has been highly felt in many poor households. Increased use of exotic species of plants has led to abandonment of indigenous plants (Babu, 2000; Johns & Eyzaguirre, 2006) and increased

market price of the exotic plants thus making various household vulnerable to fluctuations in the market price of the various foods (Babu, 2000). A study carried out in Western Kenya found that maize and cassava were the most popular foods consumed by the community whereas the pre-colonial staples were grown less (Ekesa, Walingo, & Abukutsa-Onyango, 2009).

Dietary diversification refers to "varied approaches that are aimed at ensuring that people consume a variety of foods which provide adequate quantity and quality of all essential nutrients for necessary health" (Ruel, 2001). Over the years, the emphasis has been on the importance of dietary diversification in reduction of the burden caused by micronutrient deficiencies. Many authors have in fact reported that dietary diversification is not only important to improve micronutrient intake but the intake of macronutrients as well (Ekesa et al., 2009; Ruel, 2001).

In Kenya, 220 traditional leafy vegetables are used in the country (Maundu, 1993). The traditional leafy vegetables (TLVs) have in the past contributed significantly to the nutritional wellbeing of various communities (Chweya & Eyzaguirre, 1999). The wide range of plant species provides a platform to improve food security as well as ensure nutrition security of the most vulnerable groups but still micronutrient malnutrition is a burden.

Dietary diversification can be encouraged to reduce micronutrient deficiency through enhancing nutrition knowledge on importance of increased production and in intake of micronutrient rich foods. Babu (2000) indicated that most indigenous vegetables (cowpea leaves, pumpkin leaves, *Amaranthus* leaves) that are consumed in Malawi are rich in micronutrients such as vitamin A, vitamin C and calcium. The fact that most developing countries harbor the largest amounts of biodiversity makes one wonder whether the issue of micronutrient deficiency in developing countries could be due to lack of awareness. Moreover, several studies have shown that the home garden, coupled with nutrition education, increased the intake of vitamin A-rich foods, leading to improved micronutrient status of children (Morgan et al., 2010; Ruel & Levin, 2000).

Dietary quality, which is greatly enhanced by the inclusion of a variety of foods, is of critical importance to weaning age children; and after 12 months of age, it may be of greater importance than whether or not breastfeeding is continued (Onyango et al., 1998). This means diet diversity as opposed to breast feeding could be of more importance to children of age 12 months and above. Among the challenges facing diet diversity is the popularity of exotic vegetables which has rendered traditional vegetables extinct (Chweya & Eyzaguirre, 1999).

Actions such as assessment of nutrition knowledge on diet diversification practices need to be supported and promoted. Even more, identification and strengthening of knowledge and practices that seek to diversify local diets will help nourish the children who are the most affected by micronutrient deficiencies as well as conserve the use of indigenous vegetables.

2.24 Caregiver's nutritional knowledge, attitude and practices on IYCF

Knowledge refers to a set of understandings (Gumucio, 2011) such as whether the caregiver knows the number of meals per day that should be given to children, quality of food, the recommended period for exclusive breastfeeding e.t.c. Attitude explains one's choice of behavior when subjected to a certain stimulus (Gumucio, 2011) while practice is the behavior adopted. This can refer to the number of meals, types of food from different food groups and indigenous foods.

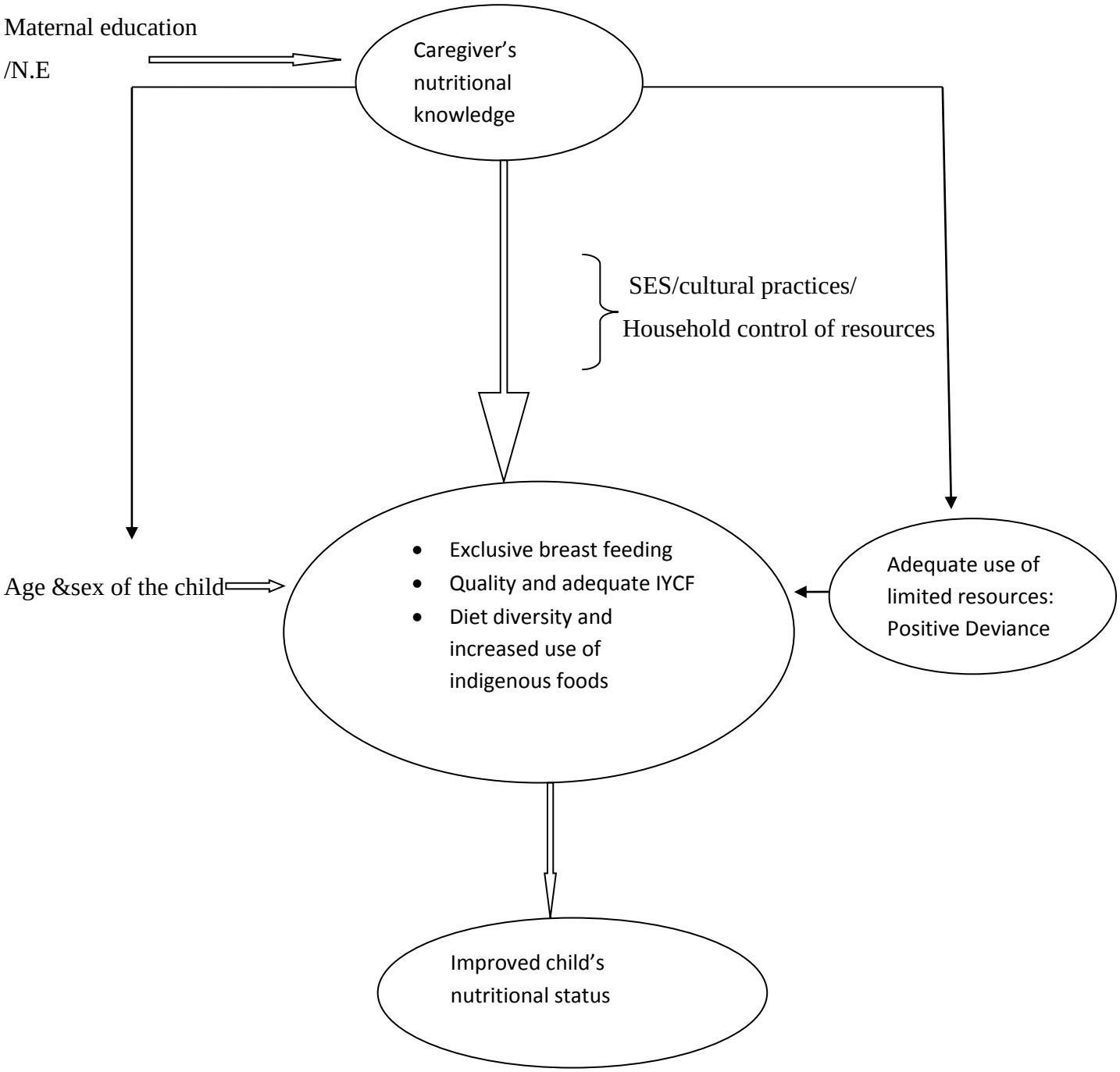
Behavior/practices are certainly an expression of knowledge and these practices translate food security and health care into a child's well-being (Engle et al., 2000). Nevertheless, the extent of nutritional knowledge has been found to predict dietary quality (Axelson, Federline, & Brinberg, 1985) where nutrition education intervention programs are used to create awareness and increase the intake of quality foods, including fruit and vegetables (Gibson, Wardle, & Watts, 1998). With nutritional knowledge, it is possible for caregivers to provide care with limited resources. Some analyses have demonstrated the effect of knowledge which is independent of educational level and occupational category, both of which are known to be linked with food intake and nutrition knowledge (Wardle, Parmenter, & Waller, 2000). It furthermore appears that nutritional knowledge matters mainly when children are most at risk of stunting i.e. when they are less than two years of age. Controlling for different factors, studies have shown a positive correlation between nutritional knowledge and dietary behavior (Axelson et al., 1985; Gibson et al., 1998; Wardle et al., 2000) as well as nutritional knowledge and nutritional status (Appoh & Krekling, 2005; Glewwe, 1999; Ruel, Habicht, Pinstrup-Andersen, & Gröhn, 1992; Webb & Block, 2003). Grant & Stone on the other hand have reported no correlation between nutrition knowledge and nutritional status (Grant & Stone, 1986). Despite this, its impact on nutrition status cannot be ignored.

Mothers are the main providers of primary care for their children and the quality of the care they provide is largely dependent on their knowledge of nutrition and health practices. The

patterns of feeding are not simply the result of food availability in the household (Sethi, Kashyap, Seth & Agarwal, 2003) but also the caregiver's nutritional knowledge.

Nutritional knowledge may be obtained from several sources including formal education, families and friends, mass media and community health services (Ruel et al., 1992). The beneficial effects of female education on child nutritional outcomes have been widely documented. While the broad development benefits of female education are indisputable the pathways by which it contributes to nutritional outcomes in the absence of precise knowledge about nutrition are less clear (Webb & Block, 2003). For example, the relationships between maternal nutritional knowledge, maternal education and child nutritional outcome have been found to be mediated by family socio-economic status (Sethi et al., 2003). Ruel et al., (1999) report that for poorer households, nutrition knowledge was not associated with child nutritional status while maternal schooling had a large and statistically significant positive effect ($p<0.05$) (Ruel, 1999). However, controlling for income, the children of educated mothers in Central Java Indonesia are still better nourished if they also have nutrition knowledge, while children belonging to mothers with similar education without nutrition knowledge are worse off (Webb & Block, 2003). That said, nutritional knowledge has been shown to be equivocal and undermining its impact on nutritional health of children will be biased. Figure 2.1 shows how nutritional knowledge affects child nutrition status.

Figure 2.1 Mechanism by which nutritional knowledge affects child's nutritional status



From "Modified hypothesized mechanism by which maternal schooling affects child nutrition status" (Ruel et al., 1992).

2.25 Economic factors influencing ideal IYCF

Related to the issue of association between maternal nutrition knowledge and child nutritional status is the question of the relative importance of nutrition knowledge versus socioeconomic status with regard to nutrition outcomes (Webb & Block, 2003). Socio-economic factors are known to influence nutritional status. The relationship between the growth of children and their socio-economic background has been extensively studied (Baba, Hamadeh, & Adra, 1991; Bredan, Kumar, & Bshiwah, 1984; Lahmann, Schelp, Changbumrung, Egoramaiphol, & Feldheim, 1985). Economic factors may directly contribute to growth faltering by determining the money available to purchase complementary food or the resources (i.e., fuel and time) necessary to prepare it (Underwood & Hofvander, 1982). However, there is a general consensus that increasing income alone is not sufficient for improving children's nutritional status (Engle et al., 2000). A mother's ability to plan and organize her work was significantly associated with children's nutritional status apart from standard socio-economic indicators (Zeitlin et al., 1990). This has been strongly supported by positive deviance studies that have proven poverty does not necessarily result in malnourished children. With the dire effects of poverty on food security and health care, enhanced care-giving can optimize the use of existing resources in poor households to promote child health (Engle et al., 2000). This has ensured that their children remain nourished in spite their resource constraints.

Without their knowledge, Positive Deviance caregivers have led to the discovery of successful survival for the entire group of people with limited resources (Sethi et al., 2003). Positive deviance refers to the ability of some caretakers to undertake successful practices that enable them to raise well-nourished children in communities where there is poverty and child malnutrition, and studies have shown that in the midst of poverty and childhood malnutrition some mothers successfully raise well-nourished children (Appoh & Krekling, 2005; Glewwe, 1999; Marsh & Schroeder, 2002; Sethi et al., 2003). These findings suggest that it is the attitudes, beliefs and practices related to child care and the way limited resources are used rather than economic status that differentiates positive deviant mothers from other mothers (Appoh & Krekling, 2005).

If their knowledge and practices are analyzed and shared with the rest of the mothers in similar situation, most caregivers will be able to practice the survival behaviors by themselves. This might help reduce time and cost of nutrition interventions which would aim at introducing

new ideas. The acceptance of new ideas, the application of new practice and even assuring a constant source of food requires a continuing education program paced at speed appropriate for each individual (Bosley, 1976). This could explain why in spite of considerable investment in NE programs in developing countries, relatively few interventions have documented sustained changes in community practices related to women and children's nutrition (Allen et al., 2001).

2.26 Socio-demographic factors influencing IYCF

Socio-demographic factors such as age, gender, parental education and marital status have been associated with child nutrition status. More widely controversial is the impact of education on child nutrition status. KDHS 2008-2009, reported a negative correlation between maternal education and stunting levels in Kenya (KDHS, 2008). In Uganda, Kabahenda found that the mother's education remained an outstanding independent predictor of stunting even after adjusting for socio-economic indicators (Kabahenda, 2006). Furthermore, it is believed that children born to educated women suffer less from malnutrition which manifests as underweight, wasting and stunting in children (Abuya, Ciera, & Kimani-Murage, 2012; Kabubo-Mariara, Ndenge, & Mwabu, 2009). The question that needs to be asked is: will nutrition education also be beneficial to mothers lacking formal education or is it only through formal education that appropriate nutrition knowledge can be obtained? Studies that have looked into this have shown that maternal education and maternal nutritional knowledge are significantly but independently associated with child nutrition outcomes (Webb & Lapping, 2002). Moreover, Milkulencak (as cited by Sethi et al., 2003) has shown that nutrition education (NE) can empower a mother to maximize the resources around her for the health of her child (Milkulencak, 1999).

2.27 Cultural influences of IYCF

Culture is a very influential factor for the introduction and continuation of complementary feeding and it is much diversified. Traditional culture, can present a platform with diverse plants that serve potentially valuable solutions to nutrition and health (Johns, 2003). Thus, learning about the common cultural feeding attitudes and practices can help direct questioning regarding infant foods. According to Sellen, cultural beliefs can influence maternal-child health and nutritional status in important ways and of more interest are those affecting child weaning (Sellen, 2001). Given that due to nutrition transition, diets in most developing countries

are characterized by lower diversity in fruits and vegetables (Johns, 2003) which contributes greatly to deterioration in child health, it is important to assess how culture affects child nutrition in households that stuck to it. General cultural factors such as health beliefs and food taboos may either limit feeding or prescribe alternate practices during illnesses of which both affects health. Of more concern is that these practices are attributed to different knowledge, attitude and practices of different caregivers. In Kenya, women have valuable knowledge in nutritional and medicinal value of certain fruits and traditional leafy vegetables (TLVs) (Chweya & Eyzaguirre, 1999) and since they are the main caregivers, determining their knowledge and practices around child health will aid in providing solutions to various health issues (Johns, 2003) and moreover, it holds the promise of self-sufficiency (Johns & Eyzaguirre, 2006).

2.28 Control of household resources

Gender issues regarding income and employment, assets and control of farm inputs are of great relevance when it comes to child health status. It has been suggested that mothers are more likely to allocate higher percentage of household income towards child health thus resulting to better health outcomes (Engle, 1991; Engle, 1993; Johnson & Rogers, 1993). In Busia district of Kenya, diet diversity was higher in children from female headed households (Onyango, Tucker, & Eisemon, 1994) whereas in Guatemala, mother's total income was positively related to HAZ and WAZ whereas father's income was not (Engle, 1993). In many African communities where tradition and culture dictates men as the head of the household, assessing how control of resources and survival tactics affects child nutrition is of great importance. Here again the question to be asked is what happens to the nutritional status of children belonging to male headed household with limited resources?

2.29 Summary of literature review

Caregivers feeding practices and nutrition attitudes are greatly influenced by the nutrition knowledge acquired. Feeding practices which are inclusive of breastfeeding practices are among the top causes for malnutrition in children. Literature shows that the main contributing factor that affects feeding practices is the timing; either of initiating breastfeeding and how long a child should breastfeed, initiating complementary feeding and the adequate number of meals a child should have in a day. Diet diversity is one way of ensuring that children get adequate quantity and quality of essential nutrients. To promote diversification in diets, caregiver's knowledge on

the nutritional benefits of various foods to child health needs to be improved. Although malnutrition is associated with both economic and socio-demographic factors, caregivers' nutrition knowledge, attitude and practices has been found to have great impacts on child nutrition status. It is because of this that many nutrition education interventions have been used to create awareness among caregivers and increase the intake of quality foods especially in children. Furthermore NE interventions have had a greater impact on behavior change communication.

Positive deviance studies have looked at the possibility of eradicating malnutrition in limited resource areas by encouraging the local knowledge and adoption of nutrition practices that promote child health. Success stories have risen from these studies indicating that children from poor households can still nourish and it all depends on caregiver's nutrition knowledge, attitude and practices. There are few studies that have actually looked into identification of local knowledge and practices that promote child health. This study, however, seeks to close this gap by comparing caregivers' knowledge and practices with the aim of identifying the difference and further relating it to child nutritional status.

Chapter 3.0 Methodology

3.1 Introduction

The aim of this study was to compare caregiver's nutrition KAP and relate it to nutritional status of the children under five. In this chapter, the proposed research methodology used for collection of the necessary data is described, including the study site, study design, study population, measurements, data collection procedures and statistical analysis.

3.2 Study sites

The research took place in Eastern Province Makueni County. Makueni has an area of 7966 km^2 (KDHS, 2014.) The region falls within a unit of the KARI-McGill food security research.

3.3 Study population

The study population was predominantly of the Akamba ethnic group who live in the semi-arid Eastern Province of Kenya (KDHS, 2008). The focus was on caregivers of malnourished and well-nourished children (6 -60 months), who participated in INREF baseline study in March, 2012 when they were (6-36months).

3.4 Study design

The study was a cross-sectional study adopting both qualitative and quantitative methods of data collection.

3.41 Inclusion and exclusion criteria

Inclusion criteria:

- Caregivers from households with low socio-economic status which participated in the INREF baseline survey. The caregiver is anyone who regularly looks after the child and knows the welfare of the child in terms what and when the child eats.
- Children 6-60 months who came from households of the low socio-economic status which participated in the INREF baseline survey.

Exclusion criteria:

- Anyone who is not the caregiver of a child
- Non-participants of the KARI-McGill study
- Children who were below 6 months and above 60 months.

Using the children's weight-for-age z-scores, the selected participants will then be categorized as positive deviant (well-nourished) and non-positive deviant (malnourished).

3.5 Sample selection and sample size determination

Using the INREF (KARI/McGill project) baseline survey results, the households with children under age of five at the time of this study were identified. Focus group discussions were conducted in the randomly selected villages. Thereafter, a Positive Deviance Inquiry (PDI) was conducted to identify Positive Deviance (PD) and Non-Positive Deviance (NPD) households. These included woman child pairs who had adopted the KARI resilient technologies as well as those who had not. Caregiver in this study was identified as someone who stayed with the child more regularly/frequently than not thus knew what the child ate from morning till evening.

The baseline survey had a population size estimated at 277 in both Machakos and Makueni counties. The effect size difference in the INREF sample size determination had been set at 13.7% (25.2% -11.5%) and a power of 90% (corresponding to Z=1.28). This yielded to a sample size of 135 per arm. The minimum sample size to detect a 13.7**%** point difference with a 95% confidence level and a power of 90**%** is estimated as follows:

$n= [Z_{1-\alpha/2} \sqrt{2p(1-p)} + Z_{1-\beta} \sqrt{p_1(1-p_1) + p_2(1-p_2)}]^2/(p^1-p^2)^2$

P1 = prevalence of underweight in Eastern Province = 25.2%

P2 = Expected prevalence after intervention=11.5 **%**

n= $\{1.645\sqrt{2}*0.184\ (0.816) + 1.28\sqrt{\ (0.252*0.748+0.115*0.885)}\}^{\ 2}/\ (0.137)^2$

= 135

Cohen's effect size value d= $\frac{\mu 1-\mu 2}{\sqrt{sd1^2+sd2^2}/2}$

$Mean_1$ KAP for positive deviant – 6.98

$Mean_2$ KAP for non-positive deviant- 7.11

SD_1 KAP for positive deviant – 4.15

SD_2 KAP for non-positive deviant- 3.91

$$d= \frac{6.98-7.11}{\sqrt{4.15^2+3.91^2}/2}$$

=0.032

The Cohen's effects size of the difference in KAP between positive deviant and non-positive deviant has a low practical significance.

However this study involved only Makueni County. It consisted of 69 households in the treatment arm and 65 household in the control arm and brought the total to 134 woman child pairs in the baseline. The final study had 94 caregiver-child pairs interviewed from the expected 134 due to participant drop out related to death, separation and/or because the participant moved out to a different town and could not be traced.

3.6 Data collection procedures

Here, the variables assessed and evaluated are nutritional knowledge, attitudes and practices, dietary assessment, anthropometric assessment, socio-cultural, economic and demographical data.

3.61 Socio-economic, socio-cultural and demographic data

Data on gender and age of the child was collected. On the caregiver's part, education level, occupation, marital status and household control of assets was determined. A number of questions were used to assess cultural determinants of infant and young child feeding as well.

3.62 Nutrition assessments

Anthropometric assessment

Growth indicators for children comprised weight-for-age, height-for-age, weight-for-height and Z-scores. These indices provide predictors for underweight, stunting, wasting or over weight respectively. Worlds Health Organization (WHO, 2009) growth reference standards were used.

Dietary intake assessment

A multi pass 24-hr recall and diet diversity questionnaire was used to collect data on food intake and variety in the diet respectively. This was used to quantify the amount of nutrients consumed. The 24-hr recall was also used to estimate energy intakes. The data was entered into a nutrient composition database containing local foods and codes for each (the database was created using CS dietary software which allows one to tailor it to fit any specification). Each code has an associated nutrient and food group composition in grams and milligrams.

Diet diversity score (DDS)

Diet diversity was defined as the number of foods or food groups consumed within the previous 24 hours. A series of yes/no answer questions were asked to the caregiver about the foods consumed by child within the previous 24 hour period. Foods groups were starchy staples, dark green leafy vegetables, other vitamin A fruits and vegetables, other vegetables, organ meat, meat and fish, eggs, legume, nuts and seeds, milk and milk products. DDS was calculated by summing up the number of food groups consumed during the last 24 hours (Krebs-Smith, Smiciklas-Wright, Guthrie, Krebs-Smith, 1987). Any yes answer to any of the groups mentioned was given one point and zero to any no answer given (1 to 10 points). Scores were allocated according to points e.g. points <4 were termed low diet diversity score, points between 4 and 5 was termed as moderated diet diversity score while points >5 were termed as high diet diversity score.

3.63 Nutrition knowledge attitude and practices

A total of six focus group discussions consisting of a maximum of 10 members in each group were conducted to assess issues surrounding maternal infant and young child nutrition in the community. A 2hour questionnaire was used to guide the discussions as information was tapped by use of short notes and recorders. Individual interviews were used to collect data on KAP where a questionnaire composed of three interrelated sections of Knowledge, Attitude and Practices relevant to IYCF was used to assess caregiver's KAP. Verification of knowledge, attitude and practices focused on breast feeding practices and infant and young child feeding.

Calculation of nutrition knowledge, attitude and practices scores

Three scores were computed based on the results of the questionnaire: Nutrition Knowledge Score (NKS), Nutrition Practice Score (NPS) and the Nutrition Attitude Score (NAS). The subjects were asked a series of five questions each on nutrition knowledge, attitude and practices. The correct response on knowledge was given 1 point (knows) and an incorrect or no response was given 0 point (don't know). Each attitude item was on a 4-point scale (Strongly agree, Agree, Disagree and Strongly disagree). Depending on the question the responses strongly agree and agree and that of disagree and strongly disagree were termed as either positive attitude or negative attitude. Positive attitude was given 1 point and the negative attitude was awarded 0 point. The responses in the practice item were categorized as either healthy practice which was given 1 point or unhealthy practice which was awarded 0 point. The maximum score for knowledge, attitude and practices was five for each individual, with higher scores representing higher knowledge, positive attitude and good practice. The overall nutrition knowledge, attitude and practice score (KAPS) was derived from the sum of all the three scores.

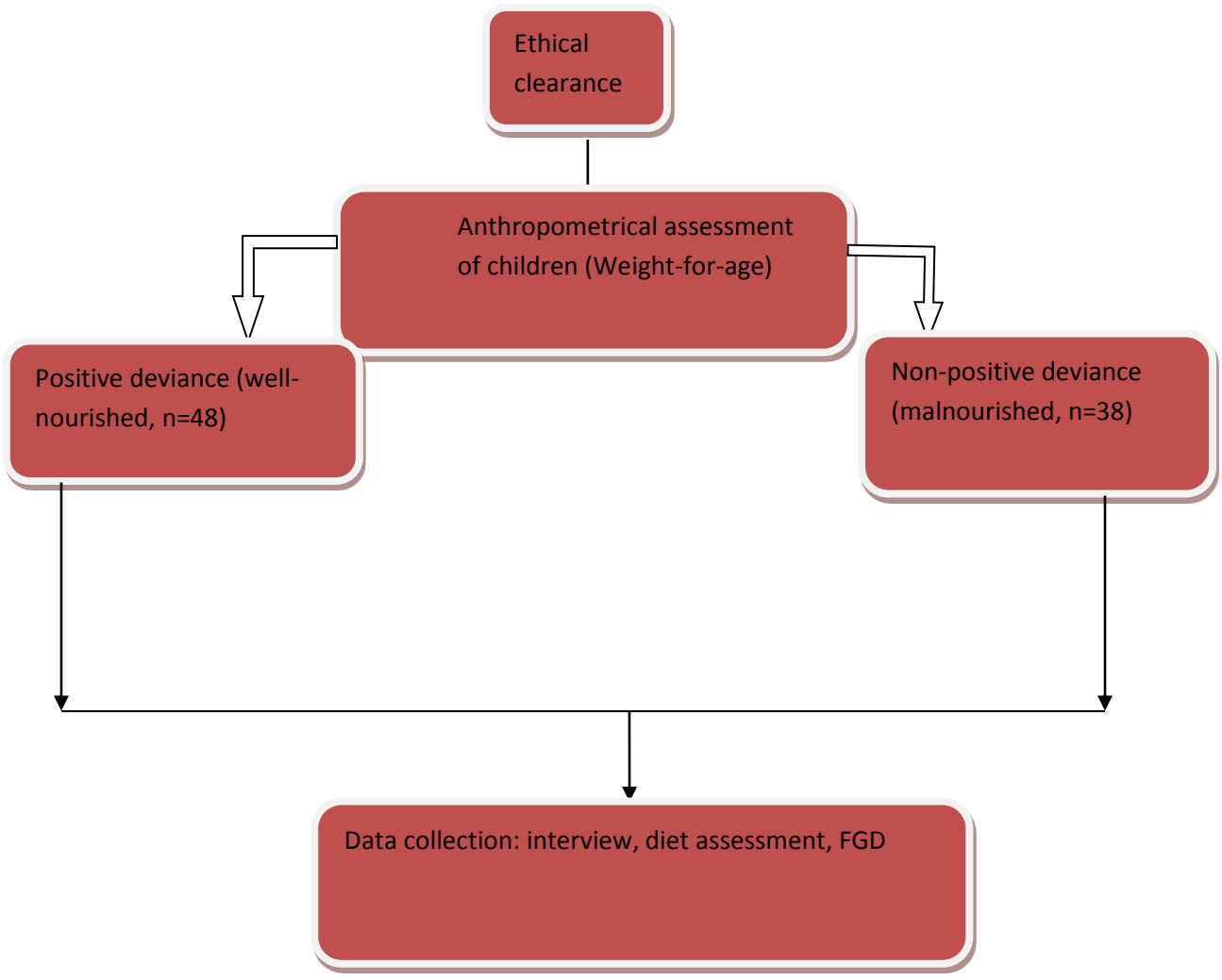
Table 3.1 Scoring and classification of KAP

	Knowledge score	Attitude score	Practices score	KAP score
Scoring	1 for correct answer and 0 for incorrect or don't know answer	1 for a strongly agree and agree, 0 for strongly disagree and disagree (depending on the question)	1 for healthy practice and 0 for unhealthy practice	Knowledge + Attitude +Practice scores
Range	0-5	0-5	0-5	0-15
Classification	Poor: 0-1, Average: 2-3, Good: 4-5	Poor: 0-1, Average: 2-3, Good: 4-5	Poor: 0-1, Average: 2-3, Good: 4-5	Poor: 0-5, Average: 6-10, Good: 11-15

3.7 Data analysis

Data analysis was conducted using SPSS version 20. Data for 94 caregiver-child pairs were entered into the system but only for 86 caregiver-child pairs were fully complete hence were the only ones analyzed. Data for 9 caregiver-child pairs were treated as missing data and thus not included in the analyses. Chi-square test (X^2) and t-tests were used to evaluate associations between categorical variables such as assessing the relationship between nutritional KAP and other population characteristics. Independent t-tests were used to compare differences between groups i.e. differences in nutritional KAP between PD and NPD caregivers. Descriptive statistics was used to analyze demographic data. Linear regression was used to determine the independent contributions of different variables on nutrition status. Focus group discussions were analyzed thematically. Figure 3.1 below shows the process followed during data collection.

Figure 3.1 Flow diagram of data collection procedure



3.8 Ethics

Ethics approval was obtained from the Research Ethics Board of the Faculty of Agricultural and Environmental Sciences at McGill University and the National Scientific and Ethics Committee of KEMRI. This process considered the interests of participants for protection of their privacy, dignity and integrity.

Chapter 4.0 Results

4.1. Introduction

The aim of the study was to compare caregiver's knowledge attitude and practices and relate it to child nutritional status using a positive deviance approach. This sought to identify the differences between caregiver knowledge, attitude and practices and how they are associated with child nutrition status. Positive deviance children are those children from households in resource-poor communities where the families have employed beneficial practices that enable them to have better health as compared to other children in the same community (Marsh & Schroeder, 2002).

Using the WHO (2009) reference standards for growth, weight for age Z-scores were used to identify positive deviance children (Normal WAZ = -1 SD + 1SD) and Non positive deviance children (mild underweight WAZ= -2SD to < -1SD & underweight WAZ = -3SD to < -2SD). Both treatment and the control group had high percentages of positive deviance children (PD) (T (n=31) 54.4% and C (n=17) 58.6%) than non-positive deviance children (NPD).

4.2. Socio Demographic and Related Factors

The average number of people living in the households was six. The number of individuals per households ranged from four to twelve in the experimental households and from three to ten in the control households. The caregivers fell into two categories of positive deviance (n=48) and non-positive deviance (n=38). Table 4.1indicates that most of the caregiver's were women (PD (n=45) 93.8%, NPD (n=34) 89.5%) while fewer than 10% and 20% respectively were men. The majority of the caregivers were aged between 26 to 35 years (PD (n=29) 61.7%, NPD (n=16) 42.1%) with few lying in the range of 50 years and above. In both groups most caregivers (PD (n=41) 87.2%, NPD (n=36) 94.7%) were either married or living with their spouse while less than 20% had either never been married or separated. Primary education has been completed by most caregivers (PD (n=33) 73.3%, NPD (n=16) 42.1%) with the number of caregivers reducing as the level of education increases. Farming activities were the main source of income (PD (n=27) 57.4%, NPD (n=25) 65.8%) followed by own small scale businesses (self-employed) (PD (n=8) 17.0%, NPD (n=5) 13.2%) with few falling into the employed category (PD (n=6) 12.8%, NPD (n=5) 13.2%). The income for most households was USD100 (Ksh.

10000) or less per month (PD (n=37) 80.4%, NPD (n=35) 91.9%). A few households fell between USD100-200 (Ksh. 10000-20000) per month (PD (n=9) 19.6%, NPD (n=2) 5.4%).

4.3 Anthropometric status of the children

The weight-for-age, height-for-age and weight-for-height will be compared with WHO (2009) z-score classification.

i. Weight-for-Age

In comparison with the WHO (2009) z-score classification, about (38) 44.2% of the children were found to be either mild underweight, underweight and severely underweight. The rest had normal weight-for-age (48). This was also used to identify the NPD and PD households respectively (Table 4.2).

ii. Height-for-Age

As shown in table 4.3, more than half of the children (PD (30) = 63.8%) who had normal W/A z-scores had normal height (-1SD to +1SD) while majority of those who were underweight, mild underweight and severely underweight (NPD) also had severe stunting (<-3SD), stunting (-3SD to <-2SD) and mild stunting (-2SD to <-1SD). Shown in Table 4.3.

iii. Weight-for-Height

Majority of the children were classified as having normal W/H z-scores (PD (36) = 76.6%, NPD (29) = 76.3%) as shown in Table 4.4. In general, the negative deviance group 13 of the kids are underweight (using WHO stds), 2 are wasted, 19 are stunted and the rest have low weight-.for-age (-1 Z W/A). This study however, categorized all those who had low weight-for-age as NPD.

Table 4.1 Socio-demographic information (n=86)

Socio-demographic information				
Age in years.	Positive deviance (PDn=48)		Non Positive deviance (NPDn=38)	
	N	%	N	%
15-25	4	8.5	5	13.2
26-35	29	61.7	16	42.1
36-45	12	25.6	12	31.6
46-55	1	2.1	3	7.9
56-65	0	0	2	5.3
66-75	1	2.1	0	0
Gender				
Female	45	93.8	34	89.5
Male	3	6.2	4	10.5
Marital status*				
Never married	3	6.4	1	2.6
Married	41	87.2	36	94.7
Separated	3	6.4	0	0
Widowed	0	0	1	2.6
Education level*				
No school at all	0	0	1	2.6
Lower primary (up to class 4)	2	4.4	1	2.6
Primary complete	33	73.3	16	42.1
Secondary education	6	13.3	14	36.8
Tertiary colleges	4	8.9	6	15.8
Occupation*				
Employed	6	12.8	5	13.2
self employed	8	17.0	5	13.2
Casual worker	2	4.3	2	5.3
Domestic help	4	8.5	1	2.6
Farmer	27	57.4	25	65.8
Household income*				
Kshs < 10, 000	37	80.4	34	91.9
Kshs,10,000-20,000	9	19.6	2	5.4
Kshs 20,000 –30,000	0	0	1	2.7

*** missing data in each case**

Table 4.2 Z -score classification of weight for age in terms of WHO cutoff points (2009)

Z-score classification	**Interpretation**	**Positive deviance (PDn =48)**		**Non Positive deviance (NPDn =38)**	
		N	**%**	**N**	**%**
<-3SD	Severely underweight	0	0	3	7.9
-3SD to <-2SD	Underweight	0	0	10	26.3
-2SD to <-1SD	Mild underweight	0	0	25	65.8
-1SD to +1SD	Normal WAZ	48	100	0	0
>+1SD to ≤+2SD	Possible growth problem	0	0	0	0
>+2SD to ≤+3SD	Possible growth problem	0	0	0	0

Table 4.3 Z-score classification of height for age in terms of WHO cutoff points (2009)

Z-score classification	Interpretation	Positive deviance (PDn =47)		Non Positive deviance (NPDn =38)	
		N	%	N	%
<-3SD	Severely stunted	1	2.1	2	5.3
-3SD to <-2SD	Stunted	2	4.2	17	44.7
-2SD to <-1SD	Mild stunted	14	29.8	14	36.8
-1SD to +1SD	Normal height	25	52.1	3	7.9
>+1SD to ≤+2SD	Normal height	5	10.4	2	5.3

Table 4.4 Z-score classification of weight for height in terms of WHO cutoff points (2009)

Z-score classification	Interpretation	Positive deviance (PDn=47)		Non Positive deviance (NPDn =38)	
		N	%	N	%
<-3SD	Severely wasted	1	2.1	1	2.6
-3SD to <-2SD	Wasted	3	6.4	1	2.6
-2SD to <-1SD	Mildly wasted	5	10.6	6	15.8
-1SD to +1SD	Normal WHZ	36	76.6	29	76.3
>+1SD to ≤+2SD	Possible risk of over weight	1	2.1	0	0
>+2SD to ≤+3SD	Overweight	1	2.1	1	2.6

4.4 Nutritional knowledge of the caregivers

Nutritional knowledge of the caregivers included ascertaining the number of meals to be offered to children, how to enrich a child's food, foods that boost immunity and period of exclusive breastfeeding as well as continued breastfeeding. In total about (n=59) 94% of individuals who answered the question said they had heard nutritional messages (PD (33) = 94.3%, NPD (26) = 92.9%) while only a few mentioned otherwise. Breastfeeding (PD =74.2%, NPD =84%) and complementary feeding (PD = 71%, NPD = 80%) were the topics most learned, followed by nutrition during pregnancy (PD = 12.9%, NPD = 12%) with few caregivers stating they had received nutrition information on Vitamin A supplementation, deworming and iron/folic acid (PD = 9.8%, NPD = 1%). The caregivers stated that they received nutrition information mostly from the government, i.e. health workers (PD = 78.8%, NPD = 92.3%), and secondly form the media especially when listening the radio (PD = 19.2%, NPD = 18.2). In addition to this, health facilities were considered the best platform for communicating nutrition information (PD = 71%, NPD = 80.8%), community events such as Chief's baraza (meetings called upon by chiefs) (PD =22.6%, NPD =15.4%) and media (PD = 9.7%, NPD =11.5%) respectively. A summary of these results is shown in Table 4.5.

Table 4.5 Source and uptake of nutrition information

Variable	Positive deviance		Non Positive deviance	
Nutrition messages	N	%	N	%
Yes	33	94.3	26	92.9
No	2	5.7	2	7.1
Nutrition topic (for those who heard the message)				
Breastfeeding	23	74.2	21	84.0
Complementary feeding	22	71.0	20	80.0
Nutrition for pregnant or lactating women	4	12.9	3	12.0
Iron/folic acid	1	3.2	0	0.0
Vitamin A	1	3.2	0	0.0
Deworming	1	3.2	1	1
Other (balanced diet etc)	0	0.0	1	1
Source (for those who heard the message)				
Gov (Health workers, KARI, KEMRI)	26	78.8	24	92.3
Family & peers	0	0.0	3	11.5
NGOs (World Vision,)	0	0.0	2	7.7
Community health workers	4	12.1	0	0.0
School/teacher	1	3	0	0.0
Radio	6	18.2	5	19.2
Farmer group	4	12.1	3	11.5
Platform (for those who heard the message)				
Health facility	22	71.0	21	80.8
Community event	7	22.6	4	15.4
School	1	3.2	0	0.0
Media	3	9.7	3	11.5
Other (neighbor's house)	0	0.0	1	3.8

Most caregivers (PD = 89.2%, NPD = 92.1%) indicated that children should eat meals three times a day, while a few of them suggested that children should have more than three meals a day (PD = 8.3%, NPD =7.9%). As shown in Table 4.6. The majority of caregivers stated 6 months as the period recommended for exclusive breastfeeding (PD = 72.9%, NPD = 60.5%) (Table 4.7). 24 months was the least often stated as the period recommended for continued breastfeeding (PD = 16.7%, NPD = 31.6%) while other time periods (12 months, 18 months, 36 months, 48 months and 60 months) were stated by the majority of the caregivers as the period they thought best to remove child from breast milk (Table 4.8). In Table 4.9., 62 respondents mentioned at least one way of enriching baby food (PD =35, NPD=27). The majority stated adding milk to the food as a way of increasing nutrients to the child's food (PD =15, NPD=13).

Table 4.6 Knowledge of the number of the number of meals to be offered to children (under five)

Number of meals a day	**Positive deviance (n=48)**		**Non positive deviance (n=38)**	
	N	**%**	**N**	**%**
Twice a day	1	2.5	0	0.0
Three times per day	43	89.2	35	92.1
More than three times per day	4	8.3	3	7.9

Table 4.7 Knowledge of the period recommended to exclusively breastfeed

Recommended period to exclusively breastfeed	**Positive deviance (n=48)**		**Non positive deviance (38)**	
	N	**%**	**N**	**%**
6 months	35	72.9	23	60.5
Other	13	27.1	15	39.5

Table 4.8 Knowledge of the period recommended for continued breastfeeding

Recommended period for continued breastfeeding	Positive deviance (n=48)		Non positive deviance (38)	
	N	%	N	%
24 months	8	16.7	12	31.6
Other	40	83.3	26	68.4

Table 4.9 Knowledge of how to increase nutrients in food

How can one increase nutrients in food for the family especially for young children.	Positive deviance (n=35)			Non positive deviance (n=27)		
	How many times was aspect mentioned	% based on respondents	% based on answers	How many times was aspect mentioned	% based on respondents	% based on answers
Add sugar	8	22.9	12.1	7	28.6	17.4
Add milk	15	42.9	22.7	12	46.4	28.3
Soak legumes	3	8.6	4.5	0	0.0	0.0
Avoid removing husks on maize and legumes	7	20.0	10.6	6	21.4	13
Add cooking oil to maize or sorghum porridge	17	48.6	25.8	10	35.7	21.7
Mix sorghum and maize to make nutritious porridge	4	11.4	6.1	1	7.1	4.3
Always enrich porridge prepared for young children	12	34.3	18.2	7	25.0	15.2
Total	**35**	**100%**	**100%**	**27**	**100%**	**100%**

Eating a variety of food from different food groups was the most popular answer given to the question of how to boost immunity, with about 85.7% of the people who responded to the question and 65.2% of all answers given in the Positive Deviance group, as well as 52% of respondents and 46.4% responses in Non-Positive Deviance group (Table 4.10).

Table 4.10 Knowledge of how to boost the body's immunity

How can one boost the immunity of their bodies including that of their children?	**Positive deviance**			**Non positive deviance**		
	How many times was aspect mentioned	**% based on respondents**	**% based on answers**	**How many times was aspect mentioned**	**% based on respondents**	**% based on answers**
Eat a variety of foods from different food groups	30	85.7	65.2	13	52.0	46.4
Avoid intake of too much sugar	4	11.4	8.7	0	0.0	0.0
Avoid intake of too much salt	4	11.4	8.7	3	12	10.7
Eat a variety of bright coloured vegetables and fruits	7	20.0	15.2	10	40.0	35.7
Don't know	1	2.9	2.2	2	8.0	7.1
Total	**35**	**100%**	**100%**	**25**	**100%**	**100%**

4.5 Nutritional Attitudes of the caregivers

The attitudes measured were around food availability both in the market and in farms (Table 4.11) as well as food and health (Table 4.12 & Table 4.13). The measurement levels were strongly agree, agree, strongly disagree and disagree.

Table 4.11 Attitude towards food availability

Measurement levels	**Food availability**							
	It is possible to get a variety of foods for a balanced diet from the foods grown on the farm				**In order to get a variety of foods for the family one must have money to buy the foods**			
	PD (33)		**NPD (29)**		**PD (34)**		**NPD (28)**	
	n	**%**	**n**	**%**	**n**	**%**	**n**	**%**
Strongly agree	13	39.4	13	44.8	13	38.2	6	21.4
Agree	16	48.5	12	41.4	13	38.2	8	28.6
Disagree	4	12.1	1	3.4	8	23.5	12	42.9
Strongly disagree	0	0	3	10.3	0	0	2	7.1

Most caregiver either strongly agreed or agreed that variety of food can be gotten from their farms (PD = 87.9%, NPD = 86.2%) whereas only a few felt like variety of food could not be gotten from their farms (PD = 12.1%, NPD = 13.7%). On the other hand, a majority of the caregivers felt that in order to get variety of foods, one needs money to buy them from the market (PD = 76.4%, NPD = 50.0%) while less than a third felt like one did not need money in order to get variety of food (PD = 23.5%, NPD = 50.0%).

Table 4.112 Attitude towards food and health

Measurement levels	Food and health							
	Food is important for preventing diseases in both children and adults				Traditional vegetables (terere, pumpkin leaves etc) are more nutritious			
	PD (34)		NPD (27)		PD (34)		NPD (27)	
	n	%	n	%	N	%	n	%
Strongly agree	23	67.6	20	74.1	26	76.5	21	77.8
Agree	11	32.4	7	25.9	8	23.5	6	22.2
Disagree	0	0	0	0	0	0	0	0
Strongly disagree	0	0	0	0	0	0	0	0

100% thought that food is important for health (PD = 32.4%, NPD = 25.9%) with most strongly agreeing (PD = 67.6%, NPD = 74.1%). Many agreed that traditional leafy vegetables had high nutritional value (PD = 23.5%, NPD = 22.2%) with the majority strongly agreeing (PD = 76.5%, NPD = 77.8%).

Table 4.13 Attitude towards child's health

Measurement levels	You are satisfied with your child's nutrition status			
	PD (34)		NPD (28)	
	N	%	n	%
Strongly agree	18	52.9	10	37.0
Agree	13	38.2	14	51.9
Disagree	2	5.9	4	11.1
Strongly disagree	1	2.9	0	0

From the table, more than a half the total number of caregiver either agreed (PD = 38.2%, NPD = 51.9%) or strongly agreed (PD = 52.9%, NPD = 37.0%) to the fact that they were satisfied with their child's nutritional status while less than a few either disagreed (PD = 5.9%, NPD = 11.1%) or strongly disagreed (PD = 2.9%, NPD = 0.0%) to the fact they were satisfied with their child's nutritional status.

4.6 Nutritional practices of the caregivers

Nutrition practices measured were tailored around feeding practices i.e. identifying the use of indigenous foods/fruits for medicinal purposes, provision of snacks between meals (Table 4.14) age at which child stopped breast feeding (Table 4.15) as well as calculation of diet diversity scores (Table 4.16) and adequate energy intake (Table 4.17).

Table 4.14 Caregiver feeding practices

	Giving snacks between meals				**Use of indigenous foods/fruits**			
	PD (35)		**NPD (28)**		**PD (33)**		**NPD (29)**	
	n	**%**	**n**	**%**	**N**	**%**	**n**	**%**
Yes	32	91.4	22	78.6	20	60.6	10	34.5
No	3	8.6	6	21.4	13	39.4	19	65.5

As shown in the table above, most caregivers gave their children snacks between meals (PD = 91.4%, NPD = 78.6%) and a few answered no to giving any snacks to their children between meals (PD = 8.6%, NPD = 21.4%). About a half of the caregivers gave indigenous foods or fruits to their children (PD = 60.6%, NPD = 34.5%) while the other half did not give any indigenous foods or fruits to their children (PD = 39.4%, NPD = 65.5%).

Table 4.15 Age at which child stopped breastfeeding

Age in months	**PD (19)**		**NPD (16)**	
	N	**%**	**n**	**%**
Below 6months	8	42.1	4	25.0
Between 6-12	11	57.9	12	75.0
Above 12 months	0	0.0	0	0.0

Table 4.15 shows the majority of the caregivers who answered this question said that they breastfed their children for periods longer than 6 months (PD = 57.9%, NPD = 75%) whereas

less than half of those caregivers who provided an answer to question breastfed their children for periods lesser than 6 months (PD = 42.1%, NPD = 25%).

Table 4.16 Diet diversity score of the children

	PD (48)		**NPD (38)**	
	N	**%**	**n**	**%**
Low DDS (<4 food groups)	22	45.8	18	47.4
Moderate DDS (4-5 food groups)	18	37.5	15	41.5
High DDS (>5 food group)	8	16.7	5	11.1

The diets of most of the children had a moderate (4 to 5 food groups) to high diversity (more than 5 food groups) (PD = 54.2%, NPD = 52.6%), while less than a half showed diets with low diversity (less than 4 food groups) (PD = 45.8%, NPD = 47.4%).

Table 4.17 Probability of adequate energy intake

Age in months	**PD (19)**		**NPD (18)**	
	n	**%**	**n**	**%**
Probability of adequate intake (Intake above EAR)	6	31.6	3	16.7
Probability of inadequate intake (Intake below EAR)	13	68.4	15	83.3

From the Table 4.17 most of the children had energy intakes below the Estimated average requirement for their given sex and age (PD = 68.4, NPD = 83.3) with only a few having a high likelihood of meeting their adequate energy needs.

4.7 Calculation of nutrition knowledge, attitude and practices scores

Three scores were computed based on the results of the questionnaire: Nutrition Knowledge Score (NKS), Nutrition Practice Score (NPS) and the Nutrition Attitude Score (NAS). The maximum score for knowledge, attitude and practices were five for each individual, with higher scores representing higher knowledge, positive attitude and good practice. The overall nutrition knowledge, attitude and practice score (KAPS) was derived from the sum of all the three scores. Tables 4.18, 4.19 and 4.20 show how participants scored in different variables of knowledge, attitude and practice respectively. As shown in Table 4.18, out of the 86 respondents who answered this questions, only about 8% (n-7) of the caregivers had correctly stated the number of meals to feed a child per day (PD-11.8%, NPD-7.9%); about 67.4% (n-58) respondents correctly stated six months as the period recommended for exclusive breastfeeding (PD-72.9%, NPD-60.5%), 23.3% (n-20) respondents correctly stated that a child should be breastfed up to 24 months (PD-14.6%, NPD-34.2%), 74.4% (n-64) had good knowledge about increasing nutrients in food (PD-72.9%,NPD-76.3%) and 68.6% (n-59) stated correctly ways of boosting immunity (PD-70.8%,NPD-65.8%). Concerning attitude, about 87% (n-54) of the respondents who answered this question were positive that balanced diet can be gotten from the farm (PD-87.9%, NPD-86.2%). About 37% (n-23) of the respondents were positive about getting variety of food without money (PD-23.5%, NPD-36.8%). Positive attitude concerning the role of food in disease prevention as well as the nutritive value of traditional vegetables was noted in all the respondents who answered this question (n-63). A total of 56 (88.9%) respondents felt they were satisfied with their children's nutritional status (PD-91.1%, NPD-88.9%). Table 4.20 shows about 86% (n-54) of the respondents had a healthy practice of giving child snacks in between meals (PD-91.4%, NPD-78.6%); almost half the respondents stated that they offer children indigenous vegetable (PD-60.6%, NPD-34.5%), none of the caregivers breastfed their children up to 24 months, and a diet diversity of 4 food groups and above was offered by 53.5% of the children (PD-54.2%,NPD-52.6%). Only about 24% of the children had the probability of meeting their adequate energy intakes (PD-31.6%, 16.7%).

Table 4.21 shows a total of 115, 136 and 86 for the total nutritional knowledge, attitude and practice scores respectively for the positive deviance group and a total of 93, 122 & 55 representing the total nutrition knowledge, attitude and practice scores respectively in the non-positive deviance caregivers. Results testing for mean difference between the positive and the

non-positive deviance showed that there was no significant difference in mean KAP scores between the Positive deviance and the Non-Positive deviance group t (84) = 0.143, p value= 0.886 (p>0.05) (Table 4.22). There was also no significant association between general nutrition KAP and either gender, marital status, level of income and any indicator of growth p value > 0.05. However, there was a significant association between general nutrition KAP with level of education X^2 (12) =18.76, p value = 0.02 (Table 4.23). From the Table 4.24, caregiver's nutritional knowledge, attitude and practices did not independently predict child nutrition status p>0.05. Caregiver's level of education and household income level were independently associated with child nutrition status after controlling for other effects p<0.05.

Table 4.18 Distribution of Nutrition Knowledge Score

Knowledge Variable	Positive Deviance				Non-Positive Deviance			
	Knows (Score-1)		Don't know (Score-0)		Knows (Score-1)		Don't know (Score-0)	
	n	%	n	%	n	%	n	%
No. of meals to offer a child per day	4	11.8	44	88.2	3	7.9	35	92.9
Period recommended to exclusively breastfeed	35	72.9	13	27.1	23	60.5	15	39.5
Period recommended for continued breastfeeding	7	14.6	41	85.4	13	34.2	25	65.8
Increasing nutrients in food	35	72.9	13	27.1	29	76.3	9	23.7
Knowledge of how to boost the body's immunity	34	70.8	14	29.2	25	65.8	13	34.2

Table 4.19 Distribution of Nutrition Attitude Score

Attitude variable	Positive Deviance				Non-Positive Deviance			
	Positive attitude (score-1)		Negative attitude (score-0)		Positive attitude (score-1)		Negative attitude (score-0)	
	n	%	n	%	n	%	n	%
It is possible to get a variety of foods for a balanced diet from the foods grown on the farm	29	87.9	4	8.3	25	86.2	4	13.8
In order to get a variety of foods for the family one must have money to buy the foods	8	23.5	26	54.2	14	36.8	14	36.8
Food is important for preventing diseases in both children and adults	34	100	0	0	29	100	0	0
Traditional vegetables (terere, pumpkin leaves e.t.c) are more nutritious	34	100	0	0	29	100	0	0
You are satisfied with your child's nutrition status	31	91.1	3	8.8	25	88.9	4	11.1

Table 4.20 Distribution of Nutrition practice score

Practice variable	Positive Deviance				Non-Positive Deviance			
	Healthy practice (score-1)		Unhealthy practice (score-0)		Healthy practice (score-1)		Unhealthy practice (score-0)	
	n	%	n	%	n	%	n	%
Give snacks in between meals	32	91.4	3	8.6	22	78.6	6	21.4
Use indigenous foods and fruits	20	60.6	13	39.4	10	34.5	19	65.5
Age at which child stopped breastfeeding	0	0	19	100	0	0	16	100
Diet diversity score	26	54.2	22	45.8	20	52.6	18	47.4
Probability of adequate intake	6	31.6	13	68.4	3	16.7	15	83.3

Table 4.21 Total Nutrition knowledge, attitude and practices score

Scores	Nutrition Knowledge Score (NKS)		Nutrition Attitude Score (NAS)		Nutrition Practice Score (NPS)	
	Positive Deviance(n)	Non-Positive Deviance(n)	Positive Deviance(n)	Non-Positive Deviance(n)	Positive Deviance(n)	Non-Positive Deviance(n)
0	13	10	13	9	7	9
1	0	0	0	0	13	11
2	1	5	4	0	15	10
3	24	10	4	7	11	8
4	9	12	19	9	2	0
5	1	1	8	13	0	0
Total	115	93	136	122	84	55

Table 4.22 Mean difference in nutritional knowledge attitude and practices score between positive deviance and non-positive deviance

Factor	PD mean (SD)	NPD mean (SD)	t-test	d.f	p-value	95% CI
Knowledge	**2.40 (1.55)**	**2.45 (1.64)**	**0.149**	**84**	**0.882**	**-0.636,0.739**
Attitude	**2.43 (1.91)**	**3.21 (1.95)**	**0.903**	**84**	**0.369**	**-0.454,1.208**
Practice	**1.75 (1.10)**	**1.45 (1.08)**	**-1.275**	**84**	**0.206**	**-0.775,0.169**
NKAP	**6.98 (4.154)**	**7.11 (3.910)**	**0.143**	**84**	**0.886**	**-1.622, 1.874**

Table 4.23 Association between nutritional KAP score and socio demographic factors and growth status

Factor	Nutrition Knowledge, Attitude and Practice Score	
	$chi - square\ test\ (x^2)$	p-value
Gender	1.48	0.93
Marital status	2.54	0.86
Level of income	9.41	0.67
Level of education	18.76	0.02*
Weight-for-age	1.86	0.99
Height-for-age	8.07	0.43
Weight-for-height	5.06	0.75

p value < 0.05

Table 4.24 Multiple linear regression of predictors of PD and NPD

Variable	β-coefficient	β-error	t	P value
NKAP score	**0.01**	**0.02**	**0.58**	**0.56**
Age	**-0.04**	**0.21**	**1.75**	**0.58**
Gender	**0.36**	**0.13**	**0.80**	**0.09**
Marital status	**-0.10**	**0.07**	**-2.44**	**0.43**
Level of education	**-0.182**	**0.145**	**3.215**	**0.02***
Household income level	**0.467**	**0.073**	**-0.558**	**0.00***

***Pvalue <0.05**

4.8 Focus group discussion results

A total of 12 FGDs were conducted in Makueni's three divisions (Makindu, Kathonzweni and Wote). Each focus group was divided by gender and consisted of at most 10 members with the discussions lasting from 1.30 minutes to 2 hours.

It became apparent from the discussions that the community's food basket constituted of several foods. The commonly mention foods were cow peas (both seeds and leaves), common beans, maize, sweet potatoes, millet, cassava, sorghum, pigeon peas, green grams, rice, white potatoes, traditional leafy vegetables such as *Amaranthus spp.-"mchicha", Commelina forskaolii vahl-"kikooe" Sclerocarya birrea-"kiuuwa", Cucurbita moschata- "malenge", Digera muricata (L. mart)-"walange", Balanites aegyptiaca (L)-"ndului",Kedrostis pseudogijef –"mkauwu",S.villosum "matulu"* and seasonal fruits mainly mangoes and oranges.

The participants reported that the children in their community aged 24-60months mostly ate from the family pot. However, those aged between 6-23months had special foods made for them. The foods mentioned were mashed white potatoes, porridge of different flour mixtures, green bananas, rice, spinach, milk, bread, mashed beans, cow peas and pigeon peas. Different examples of flour mixtures used in porridge were identified:

- Wheat, finger millet, sorghum, green grams and common beans flour.
- *Dolichos lablab* and maize flour
- Maize, millet and sorghum
- Flour mixtures with added sugar and margarine

It was further noted that these foods were either bought from the market or gotten from the farms but only rarely during the rainy season for both cases.

It became evident that there were no myths, taboos or any cultural beliefs that hindered neither women of child bearing age nor children under the age of five from consuming any food stuff.

One participant did say, *"Long ago, pregnant women were barred from eating eggs with the belief the baby would be too big and thus cause difficulty during child birth but that is no longer the case"*

Women were the main caregivers of children under the age of five in this community and this majority felt like they are best fit to receive nutrition information although it was also mentioned that it would be a good thing if both parents received nutrition information so as to understand the importance of nutrition in their daily lives.

The majority of the respondents stated that it was mostly men who were in charge of household resources except for a few women headed household who were widowers. These resources were mainly land and livestock. It was felt by many that if women were in charge of the available resources related to nutrition and food production, their children's health together with the entire family's health would be better. Examples were raised concerning this, such as

"Example, in my case, I am the one who controls these resources, then it is easy to give or sell something to buy a child whatever they want, without seeking permission from anybody."

Another participant stated that,

"Example when you send a man to go and sell a goat and buy food for a child they will first buy themselves a drink and buy half the food in the food list but if it's the woman, she will buy all the food in the list for the child and even keep some money for merry go round."

"This will depend on how a man relates with the family because the man can sale land and not give any money to the wife who is in charge of cooking."

Use of traditional plants as herbs in this community was apparent in our discussion although it came to our attention that it was no longer a popular thing. A few of the plants were mentioned and their uses stated as shown on table 4.25.

Table 4.25 Traditional plants that are of medicinal value and promote good nutrition

Kamba Name	**Scientific Name**	**Use**
Ndului	*Balanites aegytptiaca*	Good nutrition
Ngalawa	*Grewia bicolor*	Good nutrition
Yamba	*Adansonia digitate*	Good nutrition
Muthieti	*Lippia kituiensis*	Flu
Mukandu	*Ocimum gratissimum*	Flu
Muthingii	*Ormocarpum kirkii*	Diarrhea
Muthulu	*Croton megalocarpus*	Measles
Mukenea	*Zanthoxylum chalybeumama*	used in tea for good nutritional value
Musenei	*Acacia nilotica*	used in tea for good nutritional value

Finally, it was mentioned that the main reason that hindered good IYCF was lack of food due to poor rainfall patterns and lack of access to nutrition information among many. Most participants felt nutrition education was highly required especially in complementary feeding. This they believed could be done through their local media station *'Musyi fm'*, health centres/clinics, chief's baraza and schools. A typical comment was, *"Training about nutrition and the importance of the foods we have locally will help us stop selling local nutritious foods to buy other foods like chapatti and Rice."*

Others reasons mentioned were poor clinic attendance and lack of money.

In conclusion, most of the foods that constituted what the child ate were not locally grown. This may have a negative effect on child's nutrition status from houses with limited financial capacity. There is need to encourage use of locally available foods to promote child nutrition. Moreover, men's participation as child caregivers is wanting.

4.9 Summary of the results

The population sample was selected from the larger KARI/McGill food security project in Makueni County. It consisted of 94 caregiver-child pairs from both KARI/McGill treatment (62) and control (32) arms. Of these, 8 caregivers were men while 86 were female. Using the weight-for-age growth indicator for children, Positive deviance (48) and Non- Positive deviance (38) were identified. It was in these two categories that the knowledge, attitude and practices scores were looked into. The mean difference between PD and NPD was not significant statistically.

CHAPTER 5.0 DISCUSSION

5.1 Introduction

Important observations from the results in regards to the effect of caregiver's nutritional knowledge attitude and practices on child nutritional status will be discussed and compared to available literature. Not many studies of this kind have been undertaken in Kenya which makes it difficult to compare the findings; however, comparison can be done with other studies conducted in other African populations. The study population was selected from the KARI/McGill food security study being conducted in Makueni County; one of the semi-arid lands in Kenya.

5.2 Limitation of the study

Despite the fact that weight-for age takes into account both stunting and wasting, the use of weight-for-age to categorize may have missed out a stunted child who might have been fat and thus categorize him/her as a PD (healthy).

Using 24 hour recall may have resulted to caregivers underreporting or over reporting (Lee & Nieman, 1993). In addition to that, caregivers are likely to withhold information due to embarrassment. Underreporting and over reporting was minimized by probing and use of food charts, measuring equipment and use of household utensils to ensure that food portion sizes were as accurate as possible.

Nutrition education activities conducted by KARI/McGill nutrition stream may have an effect on the results observed between the positive deviance and the non-positive deviance households. This could have affected the knowledge aspect of the study as it entirely depends on both the short and long term memory, but not the practice as the case of chronic malnutrition was apparent in this community.

The method used in the study allowed for one data collection on behavior despite the fact that behavior varies with seasons, food prices as well as unforeseen political events (Zeitlin et al., 1990).

5.3 Socio-demographic and other related factors

Most of the caregivers had at least completed primary education (PD =95.5%, NPD = 94.7%). Of these, only a few had more than secondary education (12%) which is slightly less than the national average of 17% (KDHS, 2008). This study shows that more than half the

caregivers were literate which differs from various studies conducted in other countries where most caregivers had low education level (Bridge, Kipp, Raine, & Konde-Lule, 2007; Mushaphi, 2011).

The percentage of households with income less than USD 100 (Ksh10000) per month was high in both positive deviance and non-positive deviance. Almost 40% of those who earned less than USD 100 per month were from non-positive deviance households. This could be compared to the Northwest Ethiopian study, which showed that children at risk of poor nutritional status were more likely to come from households with low income (Edris, 2007).

In this study, the majority of the caregivers were unemployed and depended on farming (cattle keeping and agricultural products) as their main source of income (PD = 57.4%, NPD = 65.8%). The pattern of little to no rain in this area could contribute to poor nutritional status of the children resulting from disrupted sources of income, unavailability of food in the farms as well as high food prices. A study conducted in rural parts of Vihiga and Kitui Kenya, showed that most children who were malnourished belonged to parents who were mostly farmers (McClafferty, Holtz and Pelto, 2013.), indicating that production does not necessarily mean consumption. Moreover, food production heavily relies on seasons which fluctuates from time to time and may result to little or no production of food. For households that depend on farming, this determines availability of food and other resources related to nutrition and in the long the general health. The caregivers in this study were mostly women (PD = 94%, NPD = 90%). This is an indicator that women play a key role in providing care for the family especially with matters concerning the health of their children (Engle, 1993).

In the present study, breastfeeding (PD = 74%, NPD = 84%) and complementary feeding (PD = 71%, NPD = 80%) were the most common nutrition topics received from government sources such as health workers (PD = 79%, NPD = 92%) and media especially the radio (*Musyi fm*) (PD = 18%, NPD = 19%). These made health facility the best platform for passing nutrition information (PD =71%, NPD = 81%). This was comparable to a study in South Africa where health facilities were considered as the best platform for nutrition education (Mushaphi, 2011).

5.4 Anthropometric status of children

The results in this study clearly indicate that the rate of malnutrition among the under five in this community is high, still making it a public health concern. This could be precipitated by poor complementary feeding, unfavorable breastfeeding practices as shown in tables 4.18-4.20 of

the results as well as the apparent low socio-economic status. This agrees with the study conducted in Makueni District of Kenya (Macharia et al., 2005). Most of the children whose measurements were taken had either low weight-for-age (66%) or underweight (34%). This is more than the national average for underweight (11%) (KDHS 2014).

Chronic malnutrition was observed in more than 50% of the children whose measurements were taken. This level is higher than the provincial average level of 30%. (KDHS 2014) and those stated by a comparative study conducted in Makueni (above 40%) (Macharia et al., 2005). Despite the fact that there was no statistical significant association between KAP score and height-for-age, it was apparent from Table 4.23 that with every increase in KAP score by 8.07 increases height for age towards the positive.

Significant association between caregiver's nutritional knowledge and chronic malnutrition has been found in Ghana (Ruel et al., 1992, Appoh & Krekling, 2005). There is a possibility that the same effect could have been achieved in this study if nutrition education was conducted over some period of time and then nutrition knowledge and practices assessed.

Most of the children who had low weight-for-age also had low height-for-age, whereas only a few 6.3% who had normal WAZ were found to be stunted. The high levels of stunting and low WAZ could be as a result of recurring drought common in this place which leads to prolonged food shortage.

5.5 Nutritional Knowledge attitude and practices of the caregivers

Findings of this study regarding the effect of caregiver's nutrition knowledge, attitude and practices on child nutrition status contradict studies (Appoh & Krekling, 2005; Marsh & Schroeder 2002; Mushaphi, 2011) in othe contexts. Contrary to our findings, these studies (Appoh & Krekling, 2005; Mushaphi, 2011) have shown that there is a significant association between caregiver's nutrition knowledge and practices with child nutrition status. Caregivers of well nourished (PD) children had higher observed KAP scores when compared to those of malnourished children (NPD). In the current study the mean difference in KAP scores between the Positive deviance and the Non-Positive deviance group was not statistically significant ($p>0.05$). Contradicting results with those of Marsh and Schroeder (2002) could have risen from difference in variables assessed in knowledge, attitude and practices as well as the tools use d for the assessment. In this study's case, the results were not significant could be because of nutrition education activities carried out by KEMRI (KARI/McGill nutrition stream) in this area almost a

month before this current study. Knowledge can be stored in both short term and long term memory and would require more time for it to cause any change in nutrition status.

Breastfeeding is universal in this community and all caregivers reported to having breastfed their babies. Different aspects of breastfeeding were assessed such as knowledge of the period of exclusively breastfeeding and period for continued breastfeeding. Most caregivers reported six months as the period for exclusively breastfeeding as well as showing fair knowledge of the period recommended for continued breastfeeding. This however, contradicted with the observed breastfeeding practice where none of the caregiver's reported having breastfed their child to 2 years of age and a good percentage of them might or might not even have practiced exclusive breastfeeding (PD = 42.1%, NPD = 25%). Sub-optimum breastfeeding practices were well-evident in this population. This result can be compared to the results of a study conducted in Makueni which found that unfavorable breastfeeding practices could be contributing to the poor child nutrition status (Macharia et al., 2005, Ndiku, 2010, Ngare & Muttunga, 1999).

In addition to this, the majority (85.7%) of caregivers stated that eating a variety of food from different food groups was one way of maintaining good health free from diseases. When compared to the practices, the high percentage of caregivers giving diverse diets to their children was lower (PD = 54.2%, NPD = 52.8%) than those who had the knowledge of its importance to their children's health. Despite the fact that the caregiver's depicted a fairly good knowledge of number of meals to be given to a child per day as well as how to enrich a child's food (PD = 43%, NPD = 47%), more than half their children (PD = 68.4, NPD = 83.3) had low chances of meeting their adequate energy needs for given sex and age. This gap between awareness and practices could arise because of several other factors such as time constraints which arise from caregiver's being burdened by too much work as well as unmet needs of the caregivers (Kumar et al., 2008).

From the focus group discussions held, culturally specific practice was mentioned as something rare in this community. This is supported by the fact that even the core foods for complementary feeding did not comprise the traditionally grown foods in this community. Bananas, white potatoes and white rice formed the base of complementary foods in this community. These foods were bought from the market, their availability being limited to those who can afford them. There is likelihood that in the process of abandoning cultural practices,

these caregivers opted to also abandon some of the locally grown foods also believed to be of cultural importance. A similar case was identified in Vihiga and Kitui (McClafferty et al., 2013).

People's behavior is influenced by their emotions, motivations and perceptions (Carruth & Anderson, 1977). No matter one's knowledge, their attitudes will always determine their actions. In the present study, in order to determine caregiver's willingness to diversify what is in their food baskets from their own food production, participants were asked whether they felt variety of foods could be gotten from their farms. The majority of the caregivers from both PD and NPD depicted positive attitude about their farms being able to produce variety of food. This further indicates their willingness to try and grow different food crops in their farms. Contrary to their feelings, the majority still felt that money was needed in order to get variety of food (PD = 76.4%, NPD = 46.2%). Moreover, it could be said that, the fact that they buy foods that form the base of complementary feeding makes them believe that in order to get variety of food, money is a must.

The role of nutrition in disease prevention, especially the value of traditional/indigenous vegetables was agreed in generality. This was similar to focus group discussions where several vegetables and fruits were mentioned to be used as food for medicinal purposes. According to the health belief model, one is bound to take action to prevent a health problem depending on their perception about their disease severity (Hochbaum, Rosenstock, & Kegels, 1952). On this basis, it appeared that most NPD caregivers felt comfortable with their children's nutrition status as compared to their counterparts (PD = 38.2%, NPD = 51.9%). This means the caregivers in both groups who felt are comfortable with their children's nutrition status were less likely to do anything to change their health situation. Despite the fact that the difference in attitude between PD and NPD was not statistically significant, one would be more concerned noticing that the caregivers in the non-positive deviance group are comfortable with their children's nutritional status when in fact they should not.

Association between general nutrition KAP and either gender, marital status, level of income and any indicator of growth was not significant in this study ($p > 0.05$). However, there was a significant association between general nutrition KAP with level of education. It is possible that the general nutrition information received in schools could be contributing to the caregiver's nutrition knowledge attitude and practices. Moreover, since the caregivers are able to

read and write chances are that they could have acquired the information from books and other reading materials.

From this results, caregiver's nutritional knowledge, attitude and practices did not independently predict child nutrition status ($p>0.05$); however, caregiver's level of education and household income level were independently associated with child nutrition status after the other effects were controlled for ($p<0.05$). Similar to this study, in studies conducted in Guatemala and Central Java in Indonesia level of income and level of education had significant association with child nutrition status (Engle, 1993; Webb & Block, 2003). It can be argued that basic nutrition education learnt in schools helps caregivers to acquire the knowledge required to adopt good child nutrition practices while a higher level of income provides the caregiver the access to healthy food alternatives (Webb & Lapping, 2002).

Caregiver's age, gender and marital status could not predict for child nutrition status when controlling for other factors. This contradicts the study conducted in Ghana where marital status independently predicted for child nutrition status (Appoh & Krekkling, 2005). It can be assumed that being married creates an assured financial support which can be translated to promote child nutrition. These results however, could mean that the caregivers lack sufficient support from their partners to promote child nutrition. Another study with similar results to this was the one conducted by Ruel et al., (1999) in Accra Ghana.

The results of the focus group discussion point to some specific areas that appear to be most promising in improving and promoting infant and young child feeding practices in Makueni County. These are:

- Porridge flour mixtures that improve quality and increase energy density e.g. flour mixtures of same food groups such as maize and millet and/or sorghum, wheat.
- Foods making the community's bread basket form part of the foods consumed by children of age 6-59 months, this reduces limitation to variety and availability e.g. maize meal ugali and maize grains, cowpeas both leaves and seeds, beans, pigeon peas,
- Limited myths and taboos relating to IYCF.

Some factors that came out as evidence to poor complementary feeding practices were as follows:

- Rice, green bananas and white potatoes that form the core foods for complementary feeding are mainly bought from the markets which cause a heavy reliance on income to purchase the foods.
- Poor flour combinations where foods from different food groups are mixed e.g. maize, millet, beans, cowpeas and sorghum flours used to prepare porridge. This may result in poor nutrient interaction making some nutrients unavailable for absorption by the body.
- Lack of sufficient information on IYCFP. Many caregivers stated that they had received little information on infant and young child feeding until recently in the KARI/McGill/KEMRI project activities.
- Time constraint on caregiver's who are mostly mothers leaving them little time to practice responsive feeding.
- Household control of resources related to nutrition and food production is done by the man and not the woman who is the main caregiver to the child.

Chapter 6.0 Conclusion and recommendation

This study suggests that in this population caregiver's nutrition KAP does not associate with child nutrition status since there was no significant differences in mean KAP score between PD and NPD caregivers. In order to detect a clear association between KAP and nutrition status, nutrition education should be conducted and follow up made over a period of time in order detect its effect

The role of government through health facilities and media in promoting child nutrition is evident in this population. More nutrition programs in the media and in health facilities could help promote nutrition knowledge. This makes health centers and media a good platform to communicate nutrition message. Identifying appropriate platforms to communicate nutrition message is important in promoting good nutrition (Black et al., 2013).

Women are the main caregivers to children, hence it is important to include them in both nutrition sensitive and nutrition specific activities (Black et al., 2013) with the aim of promoting child nutrition. Including adolescents in these activities may provide an opportunity to nurture good nutrition practices in early ages. Women also tend to other household activities which limits provision of quality care to the children despite their nutrition knowledge.

Diet diversity scores of the children was quite low and this could be attributed to caregiver's nutrition attitude as well maybe to the mere ignorance of locally available alternatives to the foods that form the base for complementary feeding. Moreover, many of these children had low probability of meeting their adequate intakes resulting from poor feeding practices. Stunting is still a problem in this community with about 56.3% of the children being affected. This could be as a result of infectious diseases resulting from parasites like malaria parasites or helminthes infections that are primarily associated with poor sanitation. This can result to malnutrition thus hampering proper growth and development.

The results also provide evidence of sub-optimal breastfeeding practices, where by the age of 12 months, almost all caregivers had stopped breastfeeding their children. This is compared to studies in other countries such as Asia, Latin America and the Caribbean (Black et al., 2008). Sub-optimal breast feeding has been found to be the cause of more than 1 million child deaths (Black et al., 2008).

Caregiver's education level played a significant role in increasing nutrition KAP score. This could be a possible indication that education helps in obtaining basic nutrition information

in schools as well as in better apprehending the same nutrition information (Webb & Block, 2003). Caregiver's KAP score could also not predict child nutritional status independently even when controlling for other confounding factors such as caregiver's age, marital status, gender, household level of income and education level. On the other hand, caregiver's level of education and household income level were independently able to predict child nutrition status after the other effects were controlled for. Higher income level increased access to more food choices/variety (Ruel, 1999) and thus result to better nutrition status.

So to play the devil's advocate, if we want to improve child health, women's education and income are the most important factors and not KAP being changed by messaging. There seems to be wide gap between nutrition knowledge and practices, evidence from the fact that the percentage of caregivers who had good knowledge of the importance of eating variety of foods was higher than those offering diverse diets to children. Efforts to bridge this gap is mandatory through integrated nutrition education in order to promote good health.

6.1 Recommendations

The evidence from this study give further support to evidence that maternal education is important in fighting against child malnutrition. Based on this study's results the following recommendations are made:

- Bridge the gap between knowledge and practices through intensifying nutrition education strategies. For example, look into the knowledge and effects of flour combinations on child micronutrient status, reasons for sub optimal breastfeeding practices and the effect on child nutrition status etc.
- Early inclusion of adolescent girls in both nutrition sensitive and nutrition specific activities so as to instill healthy nutrition practices that can be sustained up to adulthood.
- Nutrition KAP should be done after analyzing baseline data when gaps in knowledge and practices have been identified.
- Determining how consumption of indigenous plants and animals can help mitigate the low diet diversity practices in this community.
- More research needs to be conducted using positive deviance approach to identify and encourage these practices within our communities. Furthermore, researchers need to identify new and creative ways to apply positive deviance in our communities.

- If one thinks broadly, more education for women is needed. Investigations should be made as to whether they get little opportunity to go to school.
- Determine the role of men in promoting child nutrition status in this community.

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Chapter 7.0 APPENDICES

APPENDIX 1 INFORMED CONSENT FORM -ENGLISH

Comparative study of caregiver's nutritional knowledge, attitude, practices and child's nutritional status: Positive Deviance Approach.

PART A. INFORMATION SHEET

THE FIRST PART WILL BE READ ALOUD TO PARTICIPANTS, IT EXPLAINS THE REASONS FOR THE STUDY AND DESCRIBES THE STUDY. THE SECOND PART WILL BE READ TO THE PARTICIPANTS INDIVIDUALLY TO OBTAIN THEIR CONSENT.

Introduction

This study is a sub-study under the Kenya Medical Research Institute (KEMRI), Kenya Agricultural Institute (KARI) and Mc Gill University, Canada, who are already carrying out a study in your community to assess your nutrition and health of **women of reproductive age (15-46 years) and children of 6-36 months.** The proposed KARI/McGill project focuses on development of gender responsive technologies and innovations to increase agricultural productivity, improve nutrition, and reduce post-harvest losses, support for on-farm research informed by sound social and gender analysis assessing resilience of food systems to a changing climate and developing underutilized species for the achievement of food, nutrition and income security. Kenya Agricultural Research Institute (KARI) has been undertaking a lot of agricultural activities in your area for a while now. This time they have introduced innovative technologies which they would like to find their impact on the health and nutrition of the communities where these technologies have been introduced. To achieve this, the current study intends to identify how well the technologies are understood by the community and how their understanding impacts on the nutrition and health of the children. The findings will inform future agricultural and health activities that can be undertaken within your community.

Objectives of this Study:

The general objective is to determine the impact of the proposed KARI project interventions to the study population with special reference to caregivers and children 6 to 36 months.

Participation in the study:

We are asking you to join this research study. Joining the study is completely voluntarily. Through your participation we shall be able find out the effects of the new technologies to the

nutrition and health status of the population. The relevant government departments have allowed us to conduct this study. This information will be recorded into standard forms and will enable us provide information on nutrition and health in your community. There are no foreseeable risks of taking part in this study. Alternatively, if you choose not to participate in the study, I will not victimize you in any way.

What your participation will involve

1. In case you decide to participate in this study, you will be asked a number of questions regarding nutrition information and nutrition of your child.

2. If you decide to join the study we shall organize to assess you and the child for various nutrition related parameters.

Procedures

Signing this document means you have agreed to participate in this study. You will be asked questions on your background as well as that your child then continue to questions about your nutrition knowledge, attitude and practices that relate to the health of your child. We will also take weight and height measurements of your child.

Confidentiality

All the information you will provide throughout the study will remain confidential and will only be used for the objective intended for. Only the study team will access this information and will not be relayed to any other persons.

Risks and Benefits of the study

The study has no risks whatsoever to subjects. The findings of this project will be used to improve the nutrition interventions intended for this area.

Costs to you

There is no financial cost to you for participating in the study, however , at most half an hour of your time will be used.

Withdrawal from the study:

You may withdraw from participating in this study at any time without giving any reason. It is only necessary that you inform us in case you make such a decision.

If there are any questions you have about the study, please feel free to ask them to the investigator prior to signing your consent form. You may contact Zipporah Bukania (0722

336292) or Dr Yeri Kombe (0734 257864) of Centre for Public Health Research in KEMRI, or the secretary National/KEMRI Ethical Review Committee (ERC) on Tel: 2722541/2713349

Participants' statement

I have read the information sheet concerning this study and I understand what will be required of me if I take part in the study. Any questions I have concerning this study have been answered.

Name_____Sign_____ Date_____

Researchers Name_____Sign_____Date_____

1.1 FOCUS GROUP DISCUSSION CONSENT FORM

(To be presented to the caregiver after the household survey)

Total Participant time required: 1 hour 30 minutes – 2 hours

Total focus group time: 1 hour 30 minutes – 2 hours

Break: 10 minutes

We would also like to invite you to participate in a group discussion on issues around child feeding practices. The group will consist of other caregivers of children 6-59 months just like you. The purpose for this discussion is to inform us more on dietary and feeding practices of the community. This will help us understand the challenges individuals face in the community in regard to appropriate feeding of our children. Your opinion will be shared with the group who will be encouraged to maintain confidentiality. The discussion will be recorded in order to accurately capture what has been said. The audio recording is password protected hence will be inaccessible for any other person outside this research team. Once the information in it has been used for the intended purposes, it will be destroyed. Everyone will be allowed to speak during the discussion. You may choose how much or how little you want to speak during the group. You may also choose to leave the focus group at any time. The information you will share with us if you participate in this study will be kept completely confidential. Participants will be asked not to use any names during the focus group discussion. Reports of study findings will not include any identifying information.

Participant: ☐ Yes, I will participate in both the survey and focus group discussion

☐ No, I will only participate in the survey.

Name_____Sign_____ Date_____

Researchers Name_____Sign_____Date_____

APPENDIX 2 INFORMED CONSENT FORM - SWAHILI.

FOMU YA RIDHAA

Comparative study of caregiver's nutritional knowledge, attitude, practices and child's nutritional status: Positive Deviance Approach.

SEHEMU A.

SEHEMU YA KWANZA INAELEZA KUHUSU UTAFITII HUU NA SABABU ZAKE. ITASOMWA KWA SAUTI KWA WASHIRIKI. SEHEMU YA PILI ITASOMWA KWA MSHIRIKI PEKEE

Mwanzo

Taasisi ya utafiti ya KEMRI na taasisi ya utafitii wa kilimo KARI (Kenya Agricultural Institute) pamoja na Chuo Kikuu cha Mc Gill, Canada wanachunguza jinsi wanawake wa umri wa kupata watoto (15-46) na watoto wa miezi 6 -36 wanavyo pata au tayarisha lishe na afya yao kwa jumla. Mapendekezo ya mradi wa KARI/Mc Gill unalenga maendeleo ya Teknolojia inayojali jinsia na ubunifu ili kuongeza uzalishaji wa kilimo, uboreshaji wa lishe na kupunguza hasara baada ya mavuno, kutakana na mabadiliko ya hali ya anga. Taasisi ya utafiti ya kilimo (KARI) imekuwa ikifanya shughuli nyingi za kilimo katika eneo lenu kwa muda sasa. Wakati huu wamevumbua teknolojia ambayo wangependa kupata matokeo ya kiafya katika jamii ambazo wanatumia teknolojia hizi. Kwa hivyo utafiti huu chini ya KEMRI ingependa kutathmini mradi huu. Matokeo ya utafiti huu itawajulisha njia bora ya ukulima itakayofaa jamii hii.

Lengo la utafiti

Lengo la jumla ni kuonyesha matokeo ya lishe ya mapendekezo ya utekelezaji wa mradi KARI kuzingatia zaidi walezi wa watoto na watoto miezi 6 hadi 36.

Kushiriki katika utafiti

Tunakuomba ujihusishe na utafiti huu. Kushiriki kwako ni kwa hiari yako. Utafitii huu utaweza kuonyesha matokeo ya teknologia mpya kwa lishe na afya kwa jamii. Wahusika wa serikali wametupa ruhusa kufanya utafitii huu. Habari hii itatufahamisha juu ya lishe na afya katika jamii hii. Hamna hatari au tatanishi yoyote unapo jihusisha katika utafiti huu. Lakini tutakuomba muda wako. Hata hivyo sio lazima uwe mhusika, unaruhusika kukatiza mahojiano wakati wowote ule.

Kuhusika kwako kutahusisha

1.Ukikubali kuwa mhusika katika utafitii huu, utaulizwa maswali kuhusu ujuzi wako wa maarifa ya lishe bora, mtazamo wako na pia jinsi unavyolisha mtoto wako.

2.Iwapo utakubali kuwa muhusika, tuta jiandaa kukuhoji wewe na pia kumpima mizani mtoto wako.

Taratibu

Kwa kuweka sahihi mwisho wa fomu hii, utakuwa umekubali kushiriki katika utafiti huu. Utaulizwa maswali wa kijumla juu yako na mtoto wako, kasha tutakuuliza maswali kuhusu lishe bora ya mtoto wako na pia kumpima mizani wa kilo na urefu.

Usiri

Habari utakayo tupatia haita fichuliwa kwa yeyote, shirika letu lita weka majibu yeko kisiri na Habari hii itatumiwa kwa uchambuzi na utafiti pekee. Majina yawahusika hayata tajwa katika ripoti yoyote, kwa hivyo majibu hayataonekana kama yanahusiana na wenye kujibu.

Hatari naUmuhimu wa utafiti huu

Utafitii huu hauna madhara yoyote kwa wahusika. Matokeo ya utafiti huu yata saidia katika kuimarisha malisho bora katika yenu jamii na hata nchi nzima.

Malipo

Hautaijiki kulipa chochote kwa kuhisika katika utafiti huu.

Kujiondoa katika utafiti huu

Una haki yakutojihusisha katika utafiti huu wakati wowote bila kujieleza. Lakini ni muhimu kwetu ukitueleza unapo wafikia wazo hili.

Ukiwana swali juu ya utafiti huu, tafadhali uliza kabla ya kukubali/kutia sahihi kuwa mhusika katika utafiti huu. Tafadhali wasiliana na Zipporah Bukania (0722 336 292) au Dr. Yeri Kombe (0734 257 864) wa Centre for Public Health Research iliyoko KEMRI au Katibu KEMRI Ethical Review Committee (ERC) kwa nambari hizi 020-272-2541, or 020-272-6781

Taarifa ya washiriki

Nimesoma maelezo juu ya utafiti huu.Ninaelewa jinsi nitakavyo husika katika utafiti huu. Nimepewa nafasi ya kuuliza maswali kuhusu utafiti huu na nimejibiwa, nikaridhika.

Jina_____ Sahihi_____ Tarehe _____ Jina la mtafiti_____sahihi_____tarehe_____

Appendix 3 KNOWLEDGE AND ATTITUDE QUESTIONNAIRE

Comparative study of caregiver's nutritional knowledge, attitude, practices and child's nutritional status: Positive Deviance Approach.

Questionnaire number: _____ Date:_____

Interviewer_____

County: _____ Location: _____ HH NO. _____

SECTION A

Socio Demographic characteristics

	1. Name	2.Age (Yrs)	3.Age Months for < 1	4.Sex Male = 1 Female = 2	5.Relation to respondent	6.Marital Status*	7.Ed level**	8.Occupation ***

***1** = Never maried **2** = Married **3** = Separated 4= Divorced **5** = widowed **99** = not applicable (minor)	** **1** = No school at all 2 = Preschool 3 = lower primary (up to class 4) **4** = primary complete **5** = secondary school education **6** = tertiary colleges **7** = university education **8** = informal education **99** = Not applicable	*** 1 =Student 2 = Employed 3 = self employed 4 = Casual worker 5 = Domestic help 6 = Farmer 7 = other Specify 99 = not applicable (child)

9. Household income

On average how much does the household earn in a month from (all members including yourself)

1. Kshs < 10, 000
2. Kshs,10,000-20,000
3. Kshs 20,000 –30,000
4. Kshs 30,000-40,000
5. Kshs 40,000+

KNOWLEDGE ATTITUDE AND PRACTICES TOOL

Access to Nutrition Education

- Have you ever heard/seen nutrition messages?
    1. Yes
    2. No
- If YES, on which topics? **(*Circle the answers)***
    1. Breastfeeding
    2. Complementary feeding
    3. Nutrition for pregnant or lactating women
    4. Feeding during sickness
    5. Iron/folic acid
    6. Vitamin A
    7. Deworming
    8. Other (specify)
    9.
- How/ from whom did you hear the messages? ***(Circle the answers)***
    1. Gov (Health workers, KARI, KEMRI)
    2. Family & peers
    3. NGOs (World vision,)
    4. Community health workers
    5. Local authorities
    6. School/teacher
    7. Child's health card
    8. TV
    9. Radio
    10. Newspaper/Gazette
    11. Farmer group.....(give name)
    12. Other…….
- Where did you hear these messages
    1. Health facility
    2. Community event

1	**Does your farmer group have a Farmer Nutrition Champion (FNC) (a farmer nominated by the group to train other farmers on nutrition?**	**1= Yes** **2=No.**	
2	**If yes, have you been in any of the sessions that the farmer nutrition champion has trained?**	**1= Yes** **2=No**	
3	**If yes how many sessions have you attended or participated in?**	**1=1 session** **2=2 sessions** **3=3 sessions** **4=4 sessions** **5=5 sessions** **6=more than 6 session**	
4	**Did you find the nutrition education useful?**	**1= Yes** **2=No**	
5	**If yes, how?**	**1 = Informative for personal health/nutrition** **2 = Informative for health/nutrition of household member** **3 = Informative for non-household member** **4= informative for all household members**	
6	**If No, why haven't you participated in the nutrition education sessions?**	**1=Lack of time** **2=Not interested** **3=Don't know** **4=Not aware about trainings**	
7	**How did the FNC train? Did they use any materials (dialogue Cards) during the training sessions?**	**1= Yes 2=No.**	

Knowledge Attitude and Practices			
A	Questionnaire on Knowledge		
1	How many meals should one consume in a day (multiple responses)	1= At least One meals 2= At least two meals 3= At least three meals 4=At least three meals with snacks 5= Don't know 6= other Specify _____	
2	How many meals should a child of 6-8 months consume in a day? a. 9-11 months? b. 1-5 years?	_____ _____ ----------	
3	What do you understand by eating well? (multiple responses) (probe for child)	1 = Each meal should contain a variety of foods 2 = Meals eaten in a day should contain a variety of foods 3 = Eating plenty of bright colored fruits and vegetables 4 = Drink plenty of water at least an hour before or after meals 5 = Full stomach/being satisfied 6 = Don't know 7 = other pecify)	
4	How can one increase nutrients/enrich food for the	1= Add sugar 2= Add milk	

	family? (multiple responses)	3= Soak legumes 4=Avoid removing husks on maize and legumes 5= Add cooking oil to maize or sorghum porridge 6=Mix Sorghum and maize meal to make nutritious porridge 7=Always enrich porridge prepared for young children 8= Don't know 9= other Specify _____	
5	How can you improve the quality of food for the family (multiple responses)	1= Store cereals and legumes in cool dry place after harvesting 2= Avoid removing outer cover of maize because it destroys nutrients 3= Soak legumes 4=Avoid removing husks on maize and legumes 5= Wash fruits well before eating them 6=Boil sweet and Irish potatoes with the skin 7=Always wash vegetables well before cutting them to preserve nutrients 8= Don't know 9= other Specify _____	
6	How can one boost the immunity of their bodies including children?	1= Eat a variety of foods from different food groups 2= Avoid intake of too much sugar 3= Avoid intake of too much salt 4= Eat a variety of bright colored vegetables and fruits 5= Don't know 6= Other (Specify)_____	
7	What are the appropriate complementary feeding practices for children after the age of 6 months	1. _____ 2. _____ 3. _____	

8	For how long should babies be breastfed before introducing any other food?	_____Months	
9	After Introducing foods in babies for long more should the child be breastfed?	_____Months	
10	What supplements should your child receive from the health facilities? (multiple responses)	1= Vitamin A 2= Iron 3=Vitamin D 4=I do not know 5= Other (specify) _____	

B	Questionnaire on Attitude		
1	It's the responsibility of all members of the family to ensure that they eat a balanced diet with variety of foods	1= Strongly Agree 2= Agree 3=Disagree 4= Strongly Disagree	
2	It's the responsibility of the mother to ensure that children and all family members eat a balanced diet with variety of foods	1= Strongly Agree 2= Agree 3=Disagree 4= Strongly Disagree	
3	It's the responsibility of the father to ensure that all family members eat a balanced diet with variety of foods	1= Strongly Agree 2= Agree 3=Disagree 4= Strongly Disagree	

4	It's the responsibility of both the mother and father to ensure that the family eats balanced diet with variety of foods	1= Strongly Agree 2= Agree 3=Disagree 4= Strongly Disagree	
5	In order to get a variety of foods for the family one must have money to buy the foods	1= Strongly Agree 2= Agree 3=Disagree 4= Strongly Disagree	
6	It is possible to get a variety of foods for a balanced diet from the foods grown on the farm	1= Strongly Agree 2= Agree 3=Disagree 4= Strongly Disagree	
7	Food is important for preventing diseases in both children and adults	1= Strongly Agree 2= Agree 3=Disagree 4= Strongly Disagree	
8	Traditional vegetables(terere, pumpkin leaves etc) are more nutritious	1= Strongly Agree 2= Agree 3=Disagree 4= Strongly Disagree	
9	An individual that is plump/fat (whether child or adult) is healthy	1 = Strongly Agree	

		2 = Agree 3 =Disagree 4 = Strongly Disagree	
10	You are satisfied with your child's nutrition status	1 = Strongly Agree 2 = Agree 3 =Disagree 4 = Strongly Disagree	

C	Questionnaire on Practices		
1	How do you introduce foods to a child who is beginning to eat other foods other than breast milk?		
2	How many meals do you prepare for your family in a day?		
3	Do you give young children small meals between meals?	1= Yes 2= No	
4	If yes what to you give them?	1._____ 2._____ 3. _____	
5	Do you offer (child's name) any traditional plants/ fruits/ foods for medicinal purposes? (both during sickness or in good health)	1= Yes 2= No	
6	Name some of the traditional plants/ fruits /foods (write down in the language specified and describe)	1.---------- 2. ---------- 3.----------	

7	How often do you consume vegetables	1= _____per day 2= _____per week 3= _____per month 4= _____rarely 5= None	
6	How often do you consume fruits	1= _____per day 2= _____per week 3= _____per month 4= _____rarely 5= None	
7	How often do you drink water	1= _____per day 2= _____per week 3= _____per month 4= _____rarely 5= None	

APPENDIX 4 24 HOUR RECALL

Comparative study on caregiver's nutritional knowledge, attitude, practices and child's nutritional status: Positive Deviance Approach.

CHILD (6-59 months)

INTRODUCTORY QUESTIONS

CHILD INFORMATION

Name _____ Sex (1=male; 2= female) ☐ Date of birth ☐☐☐☐☐

Let's now talk about what your child ate yesterday.

CHILD (6-59 months)

First pass				**Second Pass**			**Third Pass**		
#	**Time**	**Name of Food, Drink or Dish**	**Source of Food**	**Description of food**	**Food Code**	**Form of Prep**	**Measurement method**		
							Volume (ml)	*Size*	*Number*
1									
2									
3									
4									
5									
6									
7									
8									
9									
10									

Time	**SOURCE OF FOOD:**	**Form when prepared:**	**Size**
1 = Morning *(00:01-12.00)* 2 = Afternoon *(12.01-17:00)* 3 = Evening *(17:01-19:00)* 4 = Night *(19:01-00:00)*	01 = Home-prepared 02 = Meal/snack prepared outside the home, e.g. chips, take-away) 03 = Local production / wild / raw foods (e.g. banana) 04 = Processed, manufactured food (e.g. bread, biscuits) 05 = Food aid or exchange for work 06= Other (Specify) 99 = Don't know	01 = Raw 02 = No prep 03 = Boiled, not drained 04 = Boiled, drained 05 = Steamed 06 = Stir fried in oil 07 = Deep fried in oil 08 = Roasted/toasted 09 = Baked 10 = Other 99 = Don't know **If multiple,	Small Medium Large

		include	

R9	Is what he/she has eaten in the past day similar to what he/she normally eats? *(Code:* 1=*yes,* 0=*no)*	Y/1	N/0	IF "NO", SPECIFY WHY NOT:
	Is (give the child name) still breastfeeding? *(Code:* 1=*yes,* 0=*no)*	Y/1	N/0	If NO at what age did (CHILD) stop breastfeeding Age _____ *(months)*

RECIPE FORM FOR MIXED DISHES CONSUMED BY CHILD

Second Pass					**Third Pass**		
#	**Recipe Name**	**Total Volume when cooked (ml)**	**Ingredient name and description**	**Form when added**	**Measurement method**		
					Volume (ml)	*Size (S,M,L)*	*Number*

Form when added	**Size**	
01 = Raw 02 = No prep 03 = Boiled, not drained 04 = Boiled, drained 05 = Steamed 06 = Stir fried in oil 07 = Deep fried in oil 08 = Roasted 09 = Baked 10 = Other 99 = Don't know **If multiple, include	Small Medium Large	

RC 1 Was yesterday a usual days pattern : 1 = yes 0 = No

RC2 If no please explain how it was different from your normal daily patterns

……

RC3 Indicate the day of the week the recall was done ……comment…….

Modified INREF 24 hour recall: Enhancing household nutritional and health outcomes through innovation for resilient farming systems and food security in the Semi-Arid midlands of Kenya.

APPENDIX 5 DIETARY DIVERSITY SCORE QUESTIONS (FOR CHILDREN UNDER 5 YEARS)

WE ARE ALMOST DONE. THANK YOU SO MUCH FOR SPENDING THIS TIME WITH ME.

NOW I WOULD LIKE TO ASK YOU ABOUT LIQUIDS OR FOODS THAT **(CHILD NAME)** SINCE YESTERDAY, AT A TIME LIKE THIS. I AM INTERESTED IN WHETHER YOUR CHILD HAD THE ITEM I MENTION EVEN IF IT WAS COMBINED WITH OTHER FOODS.

	SINCE YESTERDAY, AT A TIME LIKE THIS, DID **(CHILD NAME)** DRINK/EAT THE FOLLOWING?		
P31	PLAIN WATER?	NO…….. 0 YES …….. 1 DON'T KNOW …….. 99	
P32	JUICE OR JUICE DRINKS?	NO…….. 0 YES …….. 1 DON'T KNOW …….. 99	
P33	SOUP?	NO…….. 0 YES …….. 1 DON'T KNOW …….. 99	
P34	MILK SUCH AS TINNED, POWDERED, OR FRESH ANIMAL MILK?	NO…….. 0 YES …….. 1 DON'T KNOW …….. 99	→ **P36**
P35	HOW MANY TIMES DID **(CHILD NAME)** DRINK MILK: *(If 7 or more times record 7)*	NUMBER OF TIMES DRUNK MILK ☐	
P36	INFANT FORMULA?	NO…….. 0 YES …….. 1 DON'T KNOW …….. 99	→ **38**
P37	HOW MANY TIMES DID**(CHILD NAME)** DRINK INFANT FORMULA? *(If 7 or more times record 7)*	NUMBER OF TIMES DRANK FORMULA ☐	
P38	TEA?	NO…….. 0 YES …….. 1 DON'T KNOW …….. 99	→**40**
P39	HOW MANY TIME DID **(CHILD NAME)** DRINK TEA? *(If 7 or more times record 7)*	NUMBER OF TIMES DRANK TEA ☐	
P40	ANY OTHER LIQUID?	SPECIFY……..	
P41	YOGURT?	NO…….. 0 YES …….. 1 DON'T KNOW …….. 99	→ **43**
P42	HOW MANY TIMES DID **(CHILD NAME)** EAT YOGURT?		

	(If 7 or more times record 7)	NUMBER OF TIMES EAT YOGURT ☐	
P43	ANY BRAND OF COMMERCIALY FORTIFIED BABY FOOD, E.G. CERELAC?	NO…….. 0 YES ……..…… 1 DON'T KNOW …….. 99	
P44	BREAD, RICE, NOODLES, OR OTHER FOOD MADE FROM GRAINS?	NO…….. 0 YES ……..…… 1 DON'T KNOW …….. 99	
P45	PUMPKIN, CARROT, SQUASH OR SWEET POTATOES THAT ARE YELLOW OR ORANGE INSIDE?	NO…….. 0 YES ……..…… 1 DON'T KNOW …….. 99	
P46	WHITE POTATOES, WHITE YAMS, MANIOC, CASSAVA OR ANY OTHER FOOD MADE FROM ROOTS?	NO…….. 0 YES ……..…… 1 DON'T KNOW …….. 99	
P47	ANY DARK GREEN LEAFY VEGETABLES?	NO…….. 0 YES ……..…… 1 DON'T KNOW …….. 99	
P48	RIPE MANGO, PAPAYAS, OR (INSERT ANY OTHER LOCALLY AVAILABLE VIT A RICH FRUITS) ?	NO…….. 0 YES ……..…… 1 DON'T KNOW …….. 99	
P49	ANY OTHER FRUITS OR VEGETABLES?	NO…….. 0 YES ……..…… 1 DON'T KNOW …….. 99	
P50	LIVER, KIDNEY, HEART AND OTHER ORGAN MEATS?	NO…….. 0 YES ……..…… 1 DON'T KNOW …….. 99	
P51	ANY MEAT SUCH AS BEEF, PORK, LAMB, GOAT, CHICKEN OR DUCK?	NO…….. 0 YES ……..…… 1 DON'T KNOW …….. 99	
P52	EGGS?	NO…….. 0 YES ……..…… 1 DON'T KNOW …….. 99	
P53	FRESH OR DRIED FISH OR SHELL FISH?	NO…….. 0 YES ……..…… 1 DON'T KNOW …….. 99	
P54	ANY FOOD MADE FROM BEANS, PEAS, LENTILS, OR NUTS?	NO…….. 0 YES ……..…… 1 DON'T KNOW …….. 99	
P55	CHEESE OR OTHER FOOD MADE FROM MILK?	NO…….. 0 YES ……..…… 1 DON'T KNOW …….. 99	
P56	ANY OTHER SOLID, SEMISOLID, OR SOFT FOOD?	NO…….. 0 YES ……..…… 1 DON'T KNOW …….. 99	

APPENDIX 6 ANTHROPOMETRIC MEASUREMENTS

Name of the interviewer: ……

Child's name: ……..

Child's date of birth: ……

Date of interview: …….

Name of village: …….

Gender

1. Male
2. Female

Child's weight (kg): 1. _____

2. _____

3._____

Child's height (cm): 1. _____

2._____

3._____

Tick where appropriate (For analyst only)

Height for age z score

Positive deviant: Non-positive deviant:

APPENDIX 7 FOCUS GROUP DISCUSSIONS QUESTIONS

Comparative study of caregiver's nutritional knowledge, attitude, practices and child's nutritional status: Positive Deviance Approach.

Nutrition messages

1. What do you understand by good nutrition?
2. Who are the main sources of nutrition information in the community?
3. Could you name the areas that you need information to support infant feeding?
4. Suggest best strategies to provide/communicate infant and young child feeding information?
5. Recommend target audiences for infant and young child feeding messages in your community.

Community social support for caregivers

1. Who are the main caregivers for children under five years of age in the community?
2. How are the caregivers of children under five years of age going to benefit from the KARI/McGill food security project?
3. How are the children going to be under five years of age benefit from the project?
4. Are there any foods children are traditionally not allowed to eat and why? Any myths, taboos or cultural beliefs?
5. Are there any foods women are traditionally not allowed to eat and why? Any myths, taboos or cultural beliefs?
6. What kind of resources relating to food and nutrition exist in the community?
7. Who controls these resources at household level? How and why does that affect child nutrition?
8. Which are the social support services available for women during the complementary feeding period (*who, what do they do and how do they support?)*
9. How do these services enhance or undermine feeding of child (introduction, nutritional quality, frequency and amount given of complementary feeding, Introduction, frequency and continuation of b/feeding)?

Complementary Feeding

1. What foods do we consume in our community? Probe for traditional leafy vegetables too.
2. Where do we get these foods from?
3. What types of foods do we feed our children (6-59moths) in this community? How are they prepared?
4. How does a mother decide that the child has eaten enough food for the meal for proper health and growth?

5. During food preparation what efforts do mothers make to make the food suitable and appealing to the child? (probe for flavor/taste, texture and appealing to the eyes)
6. What are main sources of food for most households in this community?
7. How are the crops being emphasized for growth by KARI being used to promote children's nutritional status in this community?
8. What factors prevent appropriate complementary feeding?
9. Are there times when children are not allowed to eat certain foods? When & why?
10. Are there medicinal plants/fruits that are used to promote child health? Name some of them.

What are your suggestions on improving child feeding practices in this community*?*

Focus group discussions members' demographic data form

N/b: This form will be useful for socio demographic data capture

County_____Location_____FRDA_____Date_____

__

No	Name	Gender	Age	Marital status	Education level	Name of group	Sign

APPENDIX 8 STEPS IN DATA COLLECTION PROCEDURE

Comparative study of caregiver's nutritional knowledge, attitude, practices and child's nutritional status: Positive Deviance Approach.

DEFINITIONS OF TERMS

Caregiver: The person who is most directly involved in the care of the child. The caregiver may be a mother, grandmother, father, or older sibling.

Positive Deviant Person A person whose special practices or behaviors enable him/her to overcome a problem more successfully than his/her neighbors who have access to the same resources and share the same risk factors. In the context of malnutrition, a PD child is a well-nourished child who is part of a poor family and a **NON-positive deviant child (NPD)** is a malnourished child who is part of a poor family.

Positive Deviant Food: A specific, nutritious food that is used by the positive deviants in the community. This food is affordable and available to all.

Positive Deviance Inquiry (PDI): A survey tool used to discover the positive deviant person's successful or desired practices.

Positive Deviant Behavior or Practice: An uncommon and demonstrably successful practice.

TRAINING OF ASSISTANT FIELD WORKERS

Two assistant field workers will be trained on consent seeking process and data collection. Consent form will be completed for every household. This will ensure that the households participated in the study.

Procedure for consent by the fieldworker

- After the household have been identified by the help of community leader, we will enter the household and request to speak to the head of the house. Introductions will be done and permission to conduct the study will be requested. The purpose of the study will be explained as well as the procedure for conducting the study,
- If permission is granted, the household has a child who meets the inclusion criteria otherwise the household is excluded from the study. The study will discussed verbally with the participants, stating clearly the objectives of the study, what is expected of them and voluntary and confidential nature of their participation. Participants will be informed of their freedom to withdraw from the study at any given time. Caregiver will be allowed to ask any questions regarding the study and will be answered to the satisfaction of the

client. Once everything has been agreed upon, the participant will be asked to complete and sign the informed consent.

ANTHROPOMETRIC MEASUREMENTS

Weight

The children will be weighed using a bathroom scale. The children will be weighed following the standards for taking weight i.e. in light clothing and without shoes. Three measurements will be recorded numerically on the questionnaire to the nearest 0.01kg.The accuracy of the weighing scales will be checked daily against known weights.

Height

Height will be taken following the WHO standard procedures. The height will be measured for children 24-36 months who are cooperative and able to stand without assistance. The height will be measured using a portable stadiometer. The height will be taken with the subject standing without shoes, heals close together and against the wall. Length measurements will be taken for infants 6-23 months. The infant will lie in a supine position with the mother helping to hold the head gently at the head piece as the field worker gently brings the feet up then extends it to straighten while ensuring the shoulders still touching and takes the measurement. Height/ length will be taken thrice. The length/height will be recorded to the nearest 0.1cm.

IDENTIFICATION OF PD AND NPD HOUSEHOLDS

Anthropometric data will be compared with WHO growth standards specific for age and gender, to identify malnourished and well-nourished children.

INTERVIEW SCHEDULE

This will involve collecting information on 24hr recall, diet diversity questionnaire and nutrition knowledge questionnaire.

DATA MANAGEMENT

Data Back-up will be done regularly to avoid any loss or tampering. Back-up files will be stored in CDs and/or USB keys. Data cleaning and validation will be performed to achieve a clean dataset that will be exported into a statistical program for social sciences format (SPSS) for analysis. A clean dataset will be stored in a computer hard drive disk for statistical analysis.

EXPECTED USE OF RESULTS

The results from this study will provide a deeper insight into the factors that contribute to infant feeding and nutrition and thus providing guidance to solutions around poor IYCFP.