ASSESSMENT OF CAREGIVERS' NUTRITION KNOWLEDGE, ATTITUDES AND PRACTICES ON DIET ADEQUACY AND NUTRITIONAL STATUS OF CHILDREN 6-23 MONTHS IN RONGAI SUB-COUNTY, KENYA

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DECLARATION AND RECOMMENDATION

Declaration

I declare that this thesis is my original work and has not been previously published or presented for the award of any diploma or conferment of any degree in this or any other university/institution.

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DEDICATION

To all that value and support maternal and child health and nutrition in the society.

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ABSTRACT

Under nutrition among children is still a global concern affecting many developing countries. Lack of adequate nutrition knowledge among caregivers translates to inappropriate complementary feeding practices hence under nutrition especially among children aged 6-23 months. Caregivers' knowledge, attitudes and practices (KAP) on infant and young child nutrition (IYCN) have been associated with child diet adequacy and nutritional status. Varied results and recommendation have been documented from studies done to investigate the association of caregivers' KAP on IYCN and nutritional outcomes. Therefore, the aim of this study was to assess caregivers' nutrition KAP regarding IYCN on diet adequacy and nutritional status of children aged 6-23 months in Rongai Sub-county, Nakuru County. A cross-sectional study design was conducted among 388 randomly selected caregiver and child pairs. Socio-demographic and KAP related data were collected using a researcher-administered structured questionnaire. A Qualitative 24-Hour Food Recall data was used to generate child diet diversity. Child anthropometric measurements were taken and z-scores computed. All data were analyzed using Statistical Package for Social Sciences (SPSS) version 20.0. Caregivers had low knowledge on young child feeding (83.3%), dietary diversity (98.2%), and water and sanitation (92.7%). Moreover, all caregivers (100%) attitudes on young child feeding and dietary diversity were negative. Overall, 65.6% of caregivers had poor practices on young child feeding and were significantly different ($P>0.004$) across the two agro-ecological zones. More than half (56.9%) of the children had minimum diet diversity (MDD) with more children from low potential areas attaining minimum meal frequency (MMF) per day compared to those from high potential area. The overall prevalence of wasting, underweight and stunting was 6.2%, 9.2% and 23.4% respectively with no difference ($P>0.05$) across the agro-ecological zones. Caregivers' education level positively ($P<0.05$) associated with MDD in low potential area [AOR= 3.797, 95% C.I; (1.477-9.759)] and with MAD in high potential area [AOR=1.874, 95% C.I; (1.014-3.465)]. In addition, children from high potential areas whose diets met MDD [AOR=0.129, 95% C.I; (0.027±0.609)], MMF [AOR=0.244, 95% C.I; (0.076±0.785)] and MAD [AOR=5.417, 95% C.I; (1.350±21.732)] requirements were less likely to be underweight. In conclusion, caregivers' KAP on IYCN varied across the agro-ecological zones and contributed to child diet adequacy and subsequently nutrition outcomes of children. There is need for nutrition education and interventions that target improving caregivers' KAP on IYCN, child diet adequacy in order to improve children's nutrition outcomes.

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

LIST OF ABBREVIATIONS AND ACRONYMS

AOR	Adjusted odds ratio
B	Estimated coefficient
C.I	Confidence interval
Cm	Centimetres
DD	Diet diversity
DDS	Diet diversity score
FAO	Food and Agriculture Organisation
HAZ	Height for age z-score
IYCN	Infant and Young Child Nutrition
KAP	Knowledge. Attitudes and Practices
KDHS	Kenya Demographic and Health Survey
KNBS	Kenya National Bureau of Statistics
Kg	Kilograms
MAD	Minimum adequate diet
MDD	Minimum diet diversity
MMF	Minimum meal frequency
SPSS	Statistical Package for Social Sciences
UNICEF	United Nations Children's Funds
WASH	Water, sanitation and hygiene
WAZ	Weight for age z-score
WHO	World Health Organisation
WHZ	Weight for height z-score

CHAPTER ONE
INTRODUCTION

1.0 Background Information

Under nutrition among children under five years is a still a global concern with many developing countries facing this public health issue. In sub-Saharan Africa, suboptimal infant feeding practices, poor quality of complementary foods (soft and semi-solid foods fed alongside breast milk), micronutrient deficiencies and frequent infections have been associated with increased morbidity and mortality among infants and young children (Onyango *et al*., 2014). The World Health Organisation (WHO) conceptual framework on childhood under nutrition (Stewart *et al*., 2013), describes how child care practices and interactions between caregivers and children play a key role in influencing child nutrition and health. Inappropriate complementary feeding practices by caregivers who lack adequate nutrition knowledge and information has been linked to under nutrition especially among children aged 6-23 months (Khanal *et al*., 2013; Shi & Zhang, 2011).

While the specific causes of under nutrition are complex, inappropriate feeding practices during the complementary feeding period (between age 6 and 23 months) have been identified as major factors contributing to inadequate nutrient intake among infants and young children (Na *et al*., 2017). Caregivers' knowledge, attitudes and practices (KAP) on infant and young child nutrition (IYCN) have been associated with child diet adequacy and nutritional status (Christian *et al*., 2015; Garoma, 2013). Food resources may be available at homes but caregivers might not use them effectively due to a lack in knowledge of the best foods for young children, cultural beliefs and practices, and inappropriate advice (Bhandari *et al*., 2004; Inayati *et al*., 2012). However, various studies have documented that caregivers' knowledge on IYCN does not necessarily translate to appropriate practice (Berisha *et al*., 2017; Mbugua, 2014; Ochola, 2017a; Subedi *et al*., 2012). Therefore, understanding gaps in caregivers' KAP on IYCN will aid in formulating guidelines to improve child feeding practices during the early stages of life.

The 6-23 month period is an important stage and window of opportunity to improve child growth and development through appropriate complementary feeding practices. Appropriate complementary feeding practices include; continued breastfeeding up to two years or beyond; introduction of complementary foods at 6 months, practicing responsive feeding, good hygiene and proper food handling (World Health Organisation (WHO), 2008). Inadequate nutrition during the complementary feeding period is associated with growth faltering, increased risk for morbidity and mortality, delayed motor development, impaired cognitive

development, and reduced educational attainments and social capacities (de Onis *et al*., 2012; Victor *et al*., 2010). Low maternal education, young child's age, poor post-natal health care seeking behaviour and poverty are recognised as some of the contributors to inappropriate complementary feeding practices (Victor *et al*., 2014).

Consuming a diverse diet amplifies the chances of adequate intake of essential nutrients (Habte & Krawinkel, 2016). Conversely, in Kenya, common diets fed to infants and young children during the complementary feeding period are typically based on starchy staples with little or no nutrient-dense foods such as animal source proteins, fruits and vegetables (Kenya National Bureau of Standards (KNBS) & International Coaching Federation (ICF), 2015). Aside from diet diversity, meal frequency is equally important in order to attain an acceptable diet for children (WHO, 2010). However, meeting these two requirements concurrently is a challenge as evidenced by the low prevalence (22%) of acceptable diet consumption by children in Kenya (KNBS & ICF, 2015). This demonstrates a gap in achieving an acceptable diet for children therefore it is important to understand the factors that may contribute to lack of simultaneous attainment of diet diversity and meal frequency.

Diversity of diets may also be dependent on the farm agricultural productivity. For example, in Eastern Kenya, children from higher potential agricultural zones were less stunted and had diets that are more diverse compared to those from the lower potential agricultural zones (Bukania *et al*., 2014). On the contrary, in Western Kenya, households from low potential areas consumed more diverse diets compared to those from high potential areas (Waswa *et al*., 2014). Furthermore, several other studies identified agro-ecological zones (AEZ) as a contributing factor to variation in diet adequacy of children (Christian, *et al*., 2015; Dulal *et al*., 2017; Roba *et al*., 2016). However, adequate research has not been done to further explore such occurrence in Kenya at the sub-county level.

Inadequate dietary intake together with poor complementary feeding practices play a key role to the characteristic negative growth trends and deaths observed in developing countries (Onyango *et al*., 2014). Increasing diet diversity of children aged 6-23 months is crucial for positive nutrition outcomes (Mallard *et al*., 2014). In Kenya, the level of stunting, wasting and underweight currently is 26%, 4% and 11% respectively (KNBS & ICF, 2015). As much as this is a decline from previous statistics, it is still a public health concern. In Nakuru County, the stunting level is 27.6%; wasting is 4.5% while underweight is 10.2% among children aged 6-23 months (KNBS & ICF, 2015). Evidence suggest promoting appropriate complementary feeding practices as a measure of reducing stunting incidences hence better

nutrition and health outcomes of children (Black *et al*., 2013; United Nations Children's Fund (UNICEF), 2011).

Studies done to investigate the association of caregivers' KAP on IYCN and nutritional outcomes have documented results and recommendations that vary from region to region (Mbugua, 2014; Mbugua, 2017; Ochola, 2017a; Ochola, 2017b). Similarly, different AEZs contribute to diets and nutritional outcomes of children differently (Bukania *et al*., 2014; Waswa *et al*., 2015). Therefore, this study aimed at assessing caregivers' KAP on IYCN and determines its influence on diet adequacy and nutritional status of children compared across the two AEZs of Rongai sub-county, Nakuru County, Kenya. Aside from building on the literature available, findings of this study will also be useful in determining the barriers and key entry points for interventions that target improving child diet adequacy and reducing under nutrition at the sub-county level. This study was part of a larger project aimed at determining the relationship between agro biodiversity and dietary diversity of women and young children in Rongai sub-county, Kenya.

1.1 Statement of the Problem

Caregivers' KAP on IYCN plays a key role in determining diet adequacy and appropriate complementary feeding practices of children. This therefore informs caregivers' choices regarding diet diversity, frequency, time and method of child feeding. Inadequate diet adequacy coupled with inappropriate feeding practices will lead to inadequate nutrient intake consequently poor nutritional outcomes of children. This is of particular concern among children aged 6-23 months since this is considered the window of opportunity stage where inadequate nutrient intake may have lasting effects throughout life. Poor nutrition outcomes include stunting which still is a public health concern country wide is with a prevalence of 27.6% among children aged 6-23 months in Nakuru. Despite studies having been done on caregivers' KAP regarding IYCN association with child diet adequacy and nutritional outcomes, documented results are seen to vary depending on region and more so on

Caregivers' KAP on IYCN is a major contributor to child diet adequacy and responsive feeding methods. This is because caregivers determine complementary diet choices, frequency, timing and method of child feeding. The nutritional status of children aged 6-23 months is critical during the complementary feeding period. Inadequate nutrient intake during this period may lead to impaired growth and development and subsequently stunting. Stunting is associated with growth faltering, impaired cognitive development, increased morbidity and mortality among children. The prevalence of stunting among children aged 6-23 months in

Nakuru County is 27.6%. The study sought to determine the influence of the caregivers' KAP regarding IYCN on dietary adequacy and subsequently the nutritional status of children aged 6-23 months. In addition, the study sought to establish the variation of these factors across the agro-ecological zones of the study area. The study was specific to Rongai Sub County of Nakuru County due to its diverse agro-ecological zones. This allowed for comparison of child dietary diversity between the agro-ecological zones with respect to the agricultural potential of the area.

1.2 Main Objective

To assess contribution of caregivers' knowledge, attitudes and practices on infant and young child nutrition to diet adequacy and nutritional status of children aged 6-23 months across the agro-ecological zones of Rongai Sub-county, Nakuru.

1.3 Specific Objectives

The specific objectives will be to:

i) Assess knowledge, attitudes and practices of the caregivers of children aged 6-23 months regarding infant and young child nutrition.

ii) Determine the dietary diversity of children aged 6-23 months in Rongai Sub-county, Nakuru.

iii) Assess the nutritional status of children aged 6-23 months.

iv) Determine the relationship between dietary diversity and nutritional status of children aged 6-23 months.

v) Determine the relationship between caregivers' knowledge, attitudes and practices regarding infant and young child nutrition and dietary diversity of children aged 6-23 months.

1.4 Research Questions

i) What is the level of knowledge, attitudes and practices of the caregivers of children aged 6-23 months regarding infant and young child nutrition?

ii) What is the dietary diversity of children aged 6-23 months in Rongai Sub-county, Nakuru County?

iii) What is the nutritional status of children aged 6-23 months?

iv) Is there a relationship between dietary diversity and nutritional status of children aged 6-23 months?

v) Is there a relationship between caregivers' knowledge, attitudes and practices regarding infant and young child nutrition and dietary diversity of children aged 6-23 months?

1.5 Justification of the Study

Proper nutrition of children during infancy is important in determining their nutrition and health status in later years. Diet diversity is an important component of a child's diet in ensuring optimal growth and development during this period. Caregivers' KAP on IYCN has a great influence on dietary patterns hence the nutrition adequacy of children's diet. In Nakuru County, the prevalence of stunting among children aged 6-23 months is 27.6%. Therefore, it is important to understand the relationship between KAP of caregivers on IYCN, child's diet diversity and nutritional status in Nakuru County.

1.6 Significance of the Study

The findings of this study will be useful in designing and implementing interventions that target improving caregivers' KAP on IYCN in Rongai sub-county. The study findings also build on the literature available on caregivers KAP on IYCN together with forming the baseline for future research. The study recommendations inform stakeholders such as Ministry of Health and the county government of Nakuru together with other interested players on how to improve child diet adequacy and nutritional outcomes Rongai Sub-County and other similar areas.

1.7 Scope of the Study

The study area was Rongai Sub-county, Nakuru County. Targeted households were from Kampi ya Moto and Menengai divisions which are low and high agricultural potential areas respectively. The target population included caregivers with children aged 6-23 months from Kampi ya Moto and Menengai divisions.

1.8 Limitations

The study was done at one point in time hence the dietary data collected did not capture the disparity in diet that might occur due to seasonal variations.

1.9 Assumptions

The study was based on self-reported information from caregivers responsible for food preparation and child feeding captured using questionnaires. The experiences may not be

independently verified; therefore, it was assumed that the respondents were able to recall all that they had experienced concerning the study indicators.

1.10 Operational Definition of Terms

Caregiver: is anyone ranging from the parent, relative or house help who is actively involved in the decision making of what and how the child is fed on a daily basis.

Complementary feeding: is the gradual introduction of soft or semi-solid foods usually at six months, alongside breastfeeding since breast milk alone is not nutritionally sufficient at this age.

Diet adequacy: is the quality of complementary feeding characterized by achieving minimum diet diversity, minimum meal frequency and having an acceptable diet.

Diet diversity: is the number of food groups consumed by an individual or household within a reference period, usually determined from the foods consumed in the previous 24 hours.

Minimum acceptable diet: is a diet that has attained both minimum dietary diversity and the minimum meal frequency requirements during the previous day.

Minimum dietary diversity: is a diet comprised of four or more food groups from the seven food groups outlined, during the previous day. The seven food groups used for this indicator are; grains, roots and tubers; legumes and nuts; dairy products (milk, yoghurt and cheese); flesh meats (meat, fish, poultry and liver/organ meats); eggs; vitamin A-rich fruits and vegetables; and other fruits and vegetables.

Minimum meal frequency: is the minimum number of times that a child aged 6- 23 months receive solid, semi-solid or soft foods (two times for breastfed infants 6–8 months; three times for breastfed children 9–23 months; and four times for non-breastfed children 6–23 months) in the previous day including a snack.

Knowledge: is the understanding of nutrition, including the intellectual ability to remember and recall food and nutrition related information and facts.

Attitudes: are emotional, motivational and cognitive beliefs that influence thebehaviour or practice of an individual.

Practices: are the observable actions of an individual that could affect the child's nutrition, such as eating, feeding, washing hands, cooking and selecting foods.

Nutritional status: is the state of the body in relation to the consumption and utilization of nutrients determined by the anthropometric measures and the age of an individual.

Household: refers to people who eat from the same pot and have a common household head.

CHAPTER TWO
LITERATURE REVIEW

2.0 Introduction

This chapter reviews relevant literature on caregivers' knowledge, attitudes and practices (KAP) regarding infant and young child nutrition (IYCN), diet diversity and nutritional status of children aged 6-23 month in line with the study topic. The implications of caregiver KAP on complementary feeding and consequently the children's nutritional status and their overall growth and development is discussed in depth.

2.1 Knowledge, Attitudes and Practices of Caregivers on Infant and Young Child Nutrition

The study on KAP started in the 1950s when there was need to assess people's perception on family planning (Cleland, 1973). From then on, the KAP study approach has been used widely in population studies in monitoring and evaluation of programmes. The KAP studies also expanded to studies in other areas of the health sector especially in nutrition. Nutrition studies investigate the individuals' KAP on foods and nutrition, hygiene and health issues. These studies have been useful in collecting information to be used in designing nutrition interventions and to evaluate interventions on nutrition education (Food and Agriculture Organization [FAO], 2014).

The Food and Agriculture Organisation developed guidelines for assessing KAP on food, nutrition and health issues. In particular, these guidelines aid in the collection, analyzing and presenting data on the KAP of caregivers regarding IYCN. These guidelines provide the questions to determine the caregiver's level of knowledge, their practices and their attitudes towards young child feeding and nutrition. A typical KAP questionnaire used in the assessment of KAP regarding IYCN is subdivided into five thematic areas; young child feeding (6-23 months), diet diversity, micronutrient deficiencies, personal hygiene and water and sanitation (FAO, 2014).

2.1.1 Caregiver's Knowledge on Child Feeding

Knowledge is the understanding of nutrition, including the intellectual ability to remember and recall food and nutrition related information and facts. The assessment of knowledge on IYCN follows the guidelines outlined by FAO (2014). Knowledge can be measured partially using categorized questions that require respondents to provide short answers in their own words, accompanied by a list of correct answers. The indicators used to

quantify knowledge are in terms of numbers or percentages. Scores can also be used where each respondent is given a score based on the number of correct responses provided. For the population level, knowledge score is calculated for each question by dividing the total number of correct responses by the number of respondents who answered the particular question. Respondents who fail to answer the question, or for whom information is incomplete are excluded.

The lack of adequate knowledge on proper complementary feeding among caregivers in developing countries translates to the children being vulnerable to malnutrition (WHO, 2003). Such knowledge includes exclusive breastfeeding, continued breast feeding up to two years and timely introduction of complementary feeding which have a great impact on the child's health and nutritional status (WHO, 2010). In Ethiopia, deaths of children under the age of five years are closely linked to the gap of knowledge on how to feed children appropriately (Centre for the Study of African Economics [CSAE] & ORC Macro, 2012).

In Sub-Saharan African countries, maternal knowledge on child feeding practices and their education level is associated with timely introduction of complementary feeding and appropriate feeding practices while poverty contributes to the inadequacy of complementary feeding diets such as diversity and frequency of the feeds. This was depicted by a study of four Anglophone West African countries (Ghana, Liberia, Nigeria and Sierra Leone) where complementary feeding practices among women of reproductive age group was analysed (Issaka *et al*., 2015).

Maternal knowledge on IYCN does not always translate to proper complementary feeding practices. Subedi *et al*. (2012), in a study in Nepal assessing mother's young child feeding practices, found that 81% of the mothers had knowledge on appropriate time for introducing complementary feeding yet 90% of the mothers did not initiate complementary feeding at the recommended time. Conversely, Guled *et al*. (2016) observed that caregivers in Ethiopia had poor IYCN practices regardless of having high IYCN knowledge. More studies need to be done in order to identify specifically how the gaps in caregiver knowledge affect the feeding practices of their children.

2.1.2 Caregivers' Attitudes on Child Feeding

Attitudes are emotional, motivational, perceptive and cognitive beliefs that positively or negatively influence the behaviour or practice of an individual (FAO, 1994). An individual's feeding or eating behaviour is influenced by his/her emotions, motivations, perceptions and thoughts (Carruth & Anderson, 1977). Attitudes influence behaviour regardless of the

individual's knowledge and aids in explaining why an individual adopts one practice and not another (Médecins du Monde, 2011). The terms attitude, beliefs and perceptions are normally used interchangeably.

Attitudes are measured by asking the respondents to judge whether they are positively or negatively inclined towards; a health or nutrition problem, an ideal practice related to nutrition, following nutrition recommendations or food-based dietary guidelines; food preferences or taboos. The respondent is asked to rate his/her answers based on a specified Likert scale which is used to grade the intensity of the respondents' attitudes. Assessment can either be done orally or by the aid of visual aids that show possible reactions (FAO, 2014).

As aforementioned, attitudes influence behaviour regardless of the individual's knowledge; it was contrary in Iraq where maternal knowledge was directly proportional to their attitudes. In the same study, maternal age was associated with their attitudes where young mothers aged 30-34 years had better attitudes regarding IYCN (Shaker *et al*., 2014). However, in Ethiopia, despite caregivers having high knowledge on IYCN, their attitudes on the same was poor (Guled *et al*., 2016). Moreover, a low percentage (35%) of caregivers in Ethiopia had positive attitudes regarding IYCN (Agedew *et al*., 2014). These studies show variation of caregivers' attitudes on IYCN from region to region. Therefore this study would provide insights on caregivers' attitudes on IYCN compared across the agro-ecological zones.

2.1.3 Caregivers' Child Feeding Practices

Practices is defined as the observable actions of an individual that could affect the child's nutrition, such as eating, feeding, washing hands, cooking and selecting foods (FAO, 2014). Nutrition related practices are assessed in terms of dietary diversity (quality of the whole diet), intake of specific foods, frequency of intake of specific foods and specific observable behaviors. The indicators used to measure practices include numbers and percentages.

The World Health Organization (WHO) recommends that complementary feeding starts when a child is six months old since breast milk alone at this age is not sufficient to meet the child's nutritional needs adequately (Caulifield *et al*., 1999). Even with the start of complementary feeding, breastfeeding should still be continued up to two years and beyond and adhere to the guidelines outlined for complementary feeding. Complementary feeding should be timely introduced, adequate and appropriate for a child (WHO, 2003).

Malnutrition is responsible for over a third deaths of children under five years. Over two thirds of these deaths are frequently associated with inappropriate feeding practices and occur during the first year of life (WHO, 2010). If children do not get sufficient amounts of

quality food during complementary feeding period, they may become malnourished and ultimately stunted (Black *et al*., 2008). Optimal complementary feeding is thus an effective practice that can significantly reduce stunting during the first two years of childhood (Dewey & Adu-Afarwuah, 2008).

Optimal complementary feeding depends on the feeding process, time, place and the person feeding the child and not just the food being fed to the child (Pelto *et al*., 2002). Responsive feeding contributes to optimal complementary and it involves following the principles of psycho-social care. These principles include feeding infants directly and assisting older children when feeding themselves; feeding patiently and slowly without force feeding; experimenting with different food combinations, texture and taste when child refuses many foods; minimising distractions during meals and talking to children during feeding time as it is a period of learning and love (Engle *et al*., 2000; Pelto *et al*., 2002).

Studies conducted in low and high-income countries such as Ghana and Ethiopia show that inadequate nutrition during this period increases the risk of becoming underweight or overweight, with potentially serious life-long health effects (Ersino *et al*., 2016; Saaka *et al*., 2015). Malnutrition can exist in a country, regardless of the country's economic status, and tend to affect the poorest population groups (Van de Poel *et al*., 2008). The time of introduction of complementary foods, as well as their type, is crucial not only to ensure that nutritional needs are met in the short term, but also to promote good health later in life (Pearce *et al*., 2013).

As a public health measure, the WHO recommends exclusive breastfeeding up to six months of age, followed by adequate, safe and appropriate complementary foods with breastfeeding continuing up to two years and beyond (WHO, 2003). This is because when children attain the age of six months, they are considered to be developmentally ready for other foods. If complementary foods are not introduced around the age of six months, or if they are given inappropriately, an infant's growth may falter.

The guiding principles outlined by the WHO (2008) for appropriate complementary feeding include; continue frequent, on-demand breastfeeding until two years of age or beyond; practice responsive feeding (for example, feed infants directly and assist older children. Feed slowly and patiently, encourage them to eat but do not force them, talk to the child and maintain eye contact);practice good hygiene and proper food handling; start at 6 months with small amounts of food and increase gradually as the child gets older; gradually increase food consistency and variety; increase the number of times that the child is fed: 2–3 meals per day for infants 6–8 months of age and 3–4 meals per day for infants 9–23 months of age, with 1–2 additional snacks as required; use fortified complementary foods or vitamin-mineral

supplements as needed; and during illness, increase fluid intake including more breastfeeding, and offer soft, favourite foods.

2.2 Dietary diversity

Adequate intake of essential nutrients can be achieved through the consumption of quality diet of which diet diversity is a major component (Torheim *et al*., 2004). Ruel (2003) defines diet diversity as the number of different foods or food groups consumed over a given period of time. Diet diversity can be measured at household or individual levels. The individual diet diversity score reflects the nutrient adequacy while the household diet diversity score is a snapshot of a household's economic ability to access a variety of foods (FAO, 2011).

Child diet diversity (CDD) is assessed using the child diet diversity score tool recommended by the WHO (2010) guidelines on assessing CDD. The CDD tool counts the number of different food groups consumed over a given period of time. The tool consists of a number of foods and food groups normally seven in total. The groups include eggs; fruits and vegetables; flesh foods, vitamin A rich fruits and vegetables; dairy products; legumes, nuts and seeds; and grains, roots and tubers. A score of four in diet diversity where a child consumes foods from four different groups reflects minimum diet diversity (WHO, 2010). A diverse diet is vital in meeting the nutrient requirements more so in children since they are growing at an escalated rate thus increasing their bodily requirements.

Although consuming a variety of foods is important in meeting essential nutrient intake to promote growth, traditional diets fed to children in developing countries are mainly based on starchy staples and include little or no nutrient-rich food sources such as animal protein, fruits and vegetables (Arimond & Ruel, 2004).The practice poses a risk to the children's nutritional status including micronutrient status in the body since diet diversity is considered as a proxy indicator of micronutrient adequacy of a diet (WHO, 2007). In a study in Cambodia, it was noted that the consumption of a diverse diet including animal source foods was associated with the reduction of stunting and underweight among children (Darapheak *et al*., 2013)

Micronutrient deficiency may lead to improper growth and development among children below two years. In Ethiopia, poor diet diversity resulted in a threefold likelihood of developing anaemia compared to consuming a diverse diet in children aged 6-23 months (Woldie *et al*., 2015). Maternal knowledge on IYCN practices, attitudes towards feeding young children and their practices regarding infant and young child feeding could be components of achieving dietary diversity among children aged 6-23 months.

2.3 Nutritional Status of Children Aged 6 – 23 Months

Nutritional status is the state of the body in relation to the consumption and utilization of nutrients. Some of the indicators of malnutrition among children below five years include underweight, wasting, stunting and overweight. The age, weight and height of a child are the key parameters taken into consideration which are interpreted using the z-score system.

Malnutrition among children under five years in Kenya is still of public health concern. The prevalence of stunting is at 26% while wasted and underweight children are at 4% and 11% respectively (KNBS & ICF, 2015). There has been a slow decline in the prevalence of malnutrition among young children in Kenya. Low birth weight and infections could increase the chances of stunting and underweight among children (Masibo & Makoka, 2012). It is therefore important to identify the points for interventions in order to develop appropriate strategies that will aid in the reduction of malnutrition rates among children.

The Lancet 2008 series focusing on maternal and child under nutrition identified the need to focus on children under two years. This is because of the fact that the first 1000 days of life, from conception to the child's second birthday, is a critical period during which good nutrition and healthy growth have lasting benefits throughout life (Black *et al*., 2008). Children aged 6-23 months are therefore recognized as a vulnerable group since it is at this age when complementary feeding is initiated. Inappropriate feeding practices include introduction to complementary foods earlier or later than recommended, poor observation of hygiene during feeding and lack of a balanced and diverse diet during complementary feeding. These inappropriate practices are major contributors to inadequate nutrient intake among infants and young children (Palwala *et al*., 2009).A study in Tanzania indicated low maternal education, young child's age, inadequate access to mass media, poor post-natal health care seeking and poverty as the major contributors to inappropriate complementary feeding practices (Victor *et al*., 2014).

The effects of under nutrition among children under two years due to inadequate nutrient intake cuts across different aspects of life including physical growth, mental development and ultimately socio-economic status in adulthood. Inadequate nutrition during the complementary feeding period is associated with growth faltering, increased risk for morbidity and mortality, delayed motor development, impaired cognitive development, and reduced educational attainments and social capacities (de Onis *et al*., 2012; Victora *et al*., 2010).

Victora *et al*. (2008) noted that the effects of under nutrition at two years were negatively associated with human capital, growth which leads to short stature in adulthood.

This was positively associated to child mortality, increased risk of infections and psychological and psychomotor development. Hence, this shows the importance of proper nutrition during 6 – 23-month period to healthy growth and development with a lasting effect through to adult life. Therefore, focusing on improving the feeding practices at this age is vital.

Appropriate IYCN practices majorly contribute to the proper nutritional status of children. The three core aspects of IYCN practices involve minimum meal frequency, minimum diet diversity and minimum acceptable diet (WHO, 2010). In Kenya, only 22% of children aged 6-23 months meet all the three requirements while 40% meet the requirements of a minimum diverse diet which is a diet comprising of at least four of seven food groups (KNBS & ICF, 2015). A diverse diet may be crucial for the growth of children aged 6-23 months. A study in Zambia supports this where it was determined that higher diet diversity of a child was positively associated with both HAZ and WHZ (Mallard *et al*., 2014).

2.4 Hygiene, Infection and Malnutrition Synergy

According to the Kenya Demographic and Health Survey (KDHS), there has been an increase of diarrhoea cases from 49% to 58% among children taken to the health provider for treatment (KNBS & ICF, 2015). In Kenya, the prevalence of diarrhoea is highest among children aged 6-11 months and 12 – 23 months at 27% and 24% respectively. This is attributed to the level of hygiene observed during complementary feeding. Hygiene practices during preparation, feeding and storage of complementary feeds is important since contaminated complementary feeds form part of the major route of transmission of diarrhoea among infants (MoPHS, 2007-2010).

Severe infections can lead to wasting which may have long-term consequences on linear growth especially when food available is insufficient to recover from the infection (Black *et al*. 2013). Poor water, sanitation and hygiene (WASH) conditions accounts for 6.6% of burden of disease and disability globally and 2.4 million deaths annually due to diarrhoea, subsequent malnutrition and its consequences (Pruss-ustun *et al*., 2008). According to The World Bank (2008), children in low-income countries are mostly affected by disease burden where 50% of childhood underweight may be through the synergistic relationship between childhood diarrhoea and under nutrition such that diarrhoeal cases increase chances of being undernourished.

In the Lancet Maternal and Child Nutrition Series, hygiene and sanitation interventions reduced diarrhoeal incidences by 30% that translated to a reduction of stunting by 2.4% at the age of 36 months among children (Bhutta *et al*., 2008). A large prospective cohort study in

Sudan showed that the risk of children being stunted was lowest in children from households with water and sanitation (Merchant *et al*., 2003).These show that improving WASH practices will reduce the incidences of childhood infections and subsequently malnutrition. Therefore, it is important to understand the causes of poor WASH practices in order to bridge that gap and to improve child health. This study will seek to compare WASH practices across the agro-ecological zones in order to determine whether interventions should be specifically designed with respect to agro-ecological zones.

2.5 Conceptual Framework of the Study

The conceptual framework of this study is based on the WHO conceptual framework on childhood stunting (WHO, 2013). The WHO framework portrays the context, causes and consequences of stunting with an emphasis on complementary feeding. The WHO framework depicts the complementary feeding period of a child's life as a critical period where stunted growth and development may arise. The framework outlines community and societal factors such as education, agriculture, political economy and WASH as the contextual causes of child malnutrition. Inadequate complementary feeding such as poor quality foods, inadequate practices and food and water safety are outlined as the immediate causes of child malnutrition. The consequence of these is stunted growth and development which affects health, development of the child and economic factors of the society at large (WHO, 2013).

For this study, the contextual cause of child malnutrition is outlined as the KAP regarding IYCN. Caregiver's KAP regarding IYCN will determine the quality of diets fed to children in terms of diversity and adequacy which thus constitute the immediate causes of malnutrition among children aged 6-23 months. The consequences of poor quality diets is under nutrition indicated by stunting, underweight and wasting which have both long term and short term effects on health.

The caregivers' KAP on IYCN was the independent variable of the study. The indicators that were assessed included the caregivers' KAP on young child feeding, breastfeeding practices, child health, diet diversity, water, sanitation and hygiene. The intermediate variable of the study was diet adequacy of children aged 6-23 months. The indicators for diet adequacy included child's diet diversity, meal frequency and acceptable diet. Nutritional status of the children was the outcome variable of the study. Child's weight and height were assessed in order to determine the nutritional status indicators such as stunting, wasting and underweight. Figure 1 shows the conceptual framework of the study.

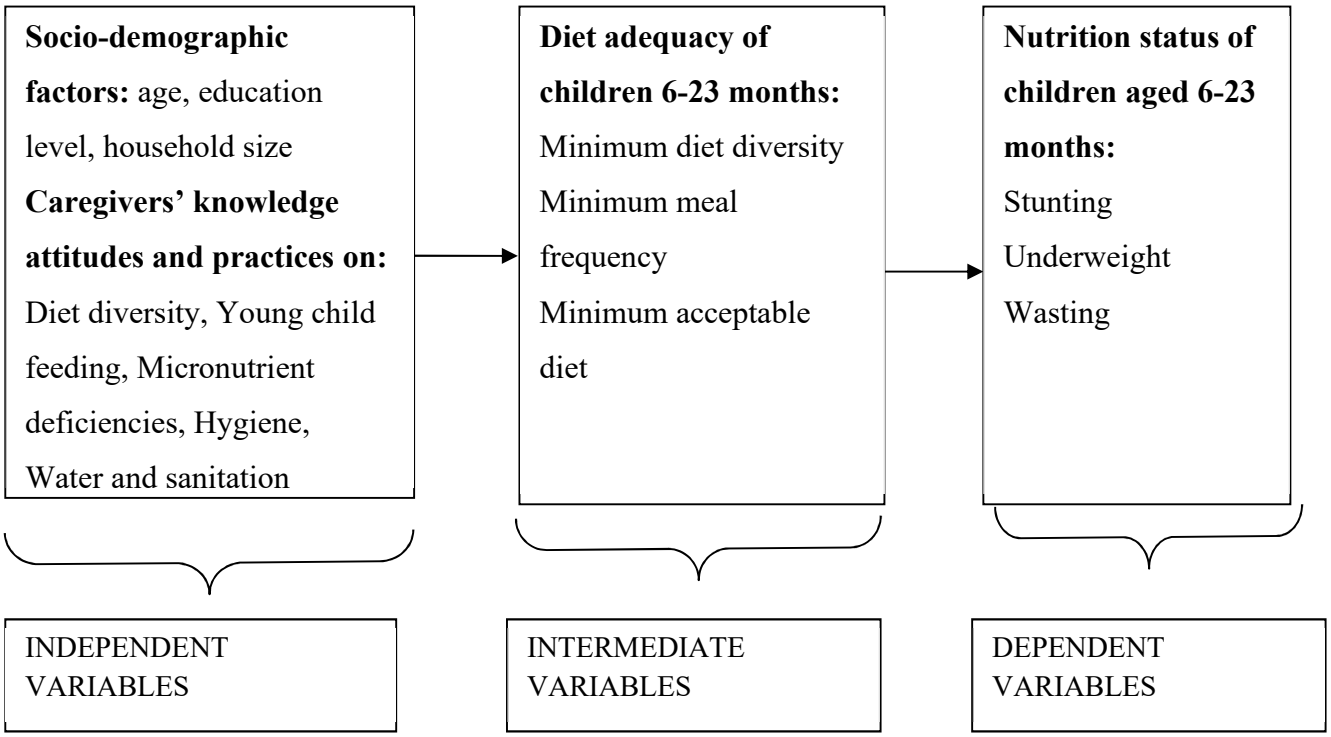

Figure1: Conceptual framework of this study based on WHO conceptual framework on childhood stunting (WHO, 2013)

CHAPTER THREE
METHODOLOGY

3.0 Introduction

This chapter describes the methods used to achieve study objectives. It presents the location of the study, research design, study population, sampling, instrumentation, validity and reliability of the instruments, data collection procedures and analysis.

3.1 Study Design

A cross-sectional research design was adopted for this study. This allowed for data on exposure and outcome to be assessed at one point in time.

3.2 Study Location

The study was carried out in Rongai Sub-county which lies in the peri-urban area of Nakuru town (Appendix I). It borders Nakuru Town Sub-county to the East, Molo Sub-county to the South, Koibatek Sub-county to the West and Laikipia Sub-county to the North. The sub-county lies between longitude 35° 27' and 35° 35' East and latitude 0° 12' and 1°10' at an altitude of 1800 – 2400m above sea level. Rongai Sub-county is administratively divided into four divisions namely Ngata, Rongai, Kampi ya Moto and Solai with 18 locations and 27 sub locations (Nakuru County Integrated Development Plan, 2013).

The county lies in two different agro-ecological zones (AEZs); Upper Midland II zone (low agricultural potential area) and Lower Highland II zone (high agricultural potential area) (Jaetzold *et al.,* 2006). The high agricultural potential area is characterised by an altitude of 1800-2400m, rainfall of 760-1270mm and temperatures of 15-20ºC. Low agricultural potential area is characterised by altitude of 1520-1890m, rainfall of 760mm and temperatures of 26-30ºC(Nakuru County Integrated Development Plan, 2013).Rongai sub-county presented the opportunity to assess differences that may arise in caregivers' KAP on IYCN, child diet adequacy and nutritional outcomes due to AEZs.

3.3 Target Population

This study targeted caregivers with children aged 6-23 months from households that practiced smallholder farming.

3.4 Inclusion and Exclusion Criteria

The study participants included caregivers and their children aged 6-23 months from households that practised smallholder farming in Rongai Sub-county. Having started complementary feeding formed part of the inclusion criteria for children. In the case where there were two children falling within the inclusion criteria, the younger of the two was selected as the study participant. Eligible subjects who declined consent were excluded from the study. Children with chronic or congenital illnesses at the time of the study (based on observation, child health records and caregivers' report) were not included. This is because these factors would have presented errors during data collection, analysis and interpretation.

3.5 Sampling Frame

The sampling frame included all households with caregivers and children aged 6-23 months, who practised smallholder farming and living in Kampi ya Moto and Menengai divisions of Rongai Sub-County. A comprehensive list of all households with children aged 6-23 months within the sub-location was generated with the help of community health volunteers, village elders, chiefs and assistant chiefs.

3.6 Sample Size Determination

The sample size for this study was calculated based on the prevalence of children aged 6-23 months in Rift Valley who met diet diversity requirements, 36.5% (KNBS & ICF, 2015). The sample size was then determined using Fischer's formula (Fischer *et al*., 1991) which is:

$$n = \frac{z^2 pq}{d^2}$$

Where: n= sample size desired

z = the standard normal deviate at 95% confidence level (1.96)

p = estimated prevalence of children 6-23 months with adequate diet diversity in Rift Valley which is 36.5% (KNBS & ICF, 2015).

$q = 1 - p$

d = desired level of precision (0.05)

$$n = \frac{1.96^2(0.365)(1 - 0.365)}{0.05^2}$$

~ 356

Attrition rate = 10% of 356

~ 35

Therefore $n \cong 391$

3.5 Sampling Procedure

A multi-stage sampling procedure was used to obtain an appropriate sample for the study. In the first stage, Rongai Sub-County was purposively selected since it lies in two different agro-ecological zones; low and high agricultural potential zones. In the second stage, two out of the four administrative divisions were purposively selected from the two different agro-ecological zones; Kampi ya Moto from low potential area and Menengai from high potential area. Four sub-locations were then selected randomly from each division. These included Kampi ya Moto, Makutano, Morop and Kapsetek sub-locations from low potential areas. The sub-locations from high potential areas were Ogilgei, Kamungei, Mangu, Mimwaita and Olrongai. The next stage involved generating a comprehensive list of all households with children aged 6-23 months within the sub-location with the help of community health volunteers, village elders, chiefs and assistant chiefs. Statistical Package for Social Sciences (SPSS) software was then used to randomly select a sample size of 391 households from the list of all households with children aged 6-23 months.

3.6 Data Collection Tools and Equipment

Data collection tools used included an introductory letter with consent form (Appendix II) which was used to introduce the researcher and seek consent from the respondent. The respondent was then required to sign the consent form. A socio-demographic and KAP questionnaire (Appendix III) was used to gather socio-demographic information together with information on the KAP regarding IYCN of the caregivers. A 24-Hour Food Recall tool (Appendix IV) was used to gather information on foods consumed by the child within the previous 24 hours. From the 24-Hour Food Recall, child diet diversity score (CDDS) was derived based on the CDDS tool (Appendix V).An anthropometry form (Appendix VI) was used to record the lengths and weights of the children. The equipment used in taking anthropometric measurements included, a Seca body weighing scale for measuring body weight and a Seca length mat for measuring child's length.

3.7 Data Collection Procedures

3.7.1 Socio-demographic, Knowledge, Attitudes and Practices Questionnaire

The caregiver's socio-demographic information such as age, marital status, education level and ethnicity was collected together with data on the KAP regarding IYCN. For the KAP section, questions on young child feeding, diet diversity, micronutrient deficiency and personal

hygiene of the children was used to gather information on the KAP of caregivers regarding IYCN. This questionnaire was adapted from FAO (2014) guidelines for assessing nutrition related KAP. The questionnaire was administered by the researcher who asked questions and recorded answers in the spaces provided using a pencil.

3.7.1.1 Assessment of Knowledge, Attitudes and Practices

Questions on KAP were awarded points and scored. Correct responses on knowledge and practices were given a score of 1 and incorrect responses were scored as 0. The sum of the scores from the questions was calculated to give a maximum score of 9 on IYCN, 5 on food based dietary guidelines and diet diversity, 8 on iron deficiency anaemia, 6 on vitamin A deficiency and 14 on water, sanitation and hygiene related questions on knowledge. For practices, the sum of the scores was calculated to give a maximum score of 11 on IYCN, 7 on food based dietary guidelines and diet diversity, and 13 on water, sanitation and hygiene related questions. The overall score was then classified into two levels namely; high and low knowledge levels, and poor and better practices. The levels were classified using cut-off points summarised in Table 1.Attitudes were assessed based on a three-point Likert scale which included positive, not sure and negative responses. Positive and negative attitudes were then presented as frequencies and percentages.

Table 1: Summary cut-off points for assessing nutrition related knowledge and practices

	Knowledge cut-off points		**Practices cut-off points**	
Young child feeding	High	0-4	Adequate	0-3
	Low	5-9	Inadequate	4-7
FBDG & DD	High	0-2	Adequate	0-5
	Low	3-5	Inadequate	6-11
Iron deficiency anaemia	High	0-4	Adequate	-
	Low	5-8	Inadequate	-
Vitamin A deficiency	High	0-3	Adequate	-
	Low	4-6	Inadequate	-
Water, sanitation and personal hygiene	High	0-6	Adequate	0-6
	Low	7-14	Inadequate	7-13

FBDG & DD – food based dietary guidelines and diet diversity; Practices on iron deficiency anaemia and vitamin A deficiency were not assessed.

3.7.2 Qualitative 24-Hour Food Recall

The 24-hour food recall was conducted following the guidelines outlined by Gibson and Ferguson (2008). The caregiver reported all foods and beverages consumed by the child upon waking up and the last thing consumed before sleeping. Number of meals and snacks consumed was derived from this list from which meal frequency was determined.

The child's dietary diversity (CDD) was determined based on the information generated from the 24-hour food recall. All food items and beverages consumed by the child were aggregated into seven food groups namely: eggs; flesh foods, vitamin A rich fruits and vegetables; other fruits and vegetables; dairy products; legumes, nuts and seeds; and grains, roots and tubers (WHO, 2010). Food groups from which particular foods were consumed was scored 1 and those not consumed were scored 0.

3.7.2.1 Assessment of Child Diet Diversity

Child diet diversity score (CDDS) was determined by summing up the scores given to the food group and mean CDDS was then calculated. Children who consumed foods from at least four food groups were considered to have achieved minimum dietary diversity (MDD).Children who consumed at least two meals and one snack a day were considered to have achieved minimum meal frequency (MMF). Children who attained MDD and MMF concurrently were considered to have consumed a minimum acceptable diet (MAD) which is the marker of an adequate diet.

3.7.3 Anthropometric Measurements

Anthropometric measurements of children aged 6-23 months included weights and lengths that were taken by the researcher using Seca body weighing scales and Sec length mats respectively. Standard procedures outlined by Cogill (2013) were followed. The children's age was verified using birth certificate or the Mother and Child Health booklet. The procedure of taking the child's weight started by ensuring the child was in minimal clothing. The Seca weighing scale was placed on a levelled surface, zeroed and child placed on the pan. Weight was taken in kilograms (kg), recorded and corrected to 0.1kg. This measurement was done thrice and an average calculated. Measuring child's length involved placing the mat on a flat and stable surface. The child was placed on the mat in a recumbent position ensuring the head

was firmly touching the headpiece, the knees held firmly on the mat and the foot piece placed on the soles of the feet flatly. The length (cm) was read and recorded correct to 0.1cm. Length measurement was taken thrice and an average was calculated.

3.7.3.1 Assessment of Nutritional outcomes

Anthropometric measures of length/height and weight were converted to nutritional outcome indicators using the z-score system. Weight for height z-score (WHZ) indicated underweight, height for age z-score (HAZ) indicated stunting while weight for age z-score (WAZ) indicated wasting. The z-scores were categorised according to the WHO (1997) guidelines in order to determine the nutritional status of the children. For this study, children who scored a z-score of -2 and below were considered as undernourished while those with a z-score of -1.99 and above was considered to be well nourished.

3.8 Pre-test

A pre-test of the data collection tools was carried out in an area with similar characteristics as the actual study area. In this case Kakapo Village of Njoro Sub-county was selected for the pre-test as it portrayed similar agricultural practices as Rongai Sub-county. A sample of 40 randomly selected households, which was 10% of the actual sample size, was used for the pre-test. Ambiguous and unclear questions were modified before the actual data collection to enhance quality of tools and to ensure that they yielded same results consistently.

3.9 Validity and Reliability

3.9.1 Validity

Validity is defined as the degree to which a concept is accurately measured in a study (Haele & Twycross, 2015). The study achieved external validity by ensuring that the participants sampled were representative of that population through random sampling. Internal validity was achieved through content validity and face validity of tools used. Content validity of tools developed for this study was assessed by two research supervisors and other experts from the department of Human Nutrition, Egerton University. Face validity of the study tools was tested during the pre-testing phase to assess whether questions are well constructed, meaningful and understandable to the participants.

3.9.2 Reliability

Reliability is the degree to which an assessment tool produces stable and consistent results. After pre-testing, the reliability of the study tools was estimated using the Cronbach's coefficient test. The research tools were considered reliable (Cronbach's $\alpha<0.70$) and were therefore used in actual data collection (Fraenkel & Wallen, 2000).

3.10 Ethical Approval and Permissions

Authorisation to carry out the study was obtained from the Board of Post Graduate Studies of Egerton University. Ethical clearance was sought from the Egerton University Ethical Clearance Board (Appendix VII). With this ethical clearance, research permit (Appendix VIII) was acquired from the National Council of Science and Technology (NACOSTI). Permission from the relevant authorities at Sub County, location and sub location levels of the study area was sought prior to data collection. Informed consent was obtained from the participants before any data was collected. The participant was assured of confidentiality of the information that was provided during the study. An informed consent form (Appendix II) was provided for the participant to sign in agreement of participating in the study. Gathering of relevant information only commenced once the participant agreed to be part of the study.

3.11 Data Analysis

The data collected on socio-demographic characteristics, KAP, CDD and anthropometry was coded then entered in Statistical Package for Social Sciences (SPSS v20.0) software. The raw data was cleaned and checked for normality before any analyses was done. Descriptive tests were done for the socio-demographic data in order to give the characteristics of the population. The descriptive data were presented as frequencies and percentages. The CDD data was analyzed by calculating the total number of food groups consumed per child from which the mean child diet diversity scores (CDDS) and MDD was derived. Total number of meals and snacks was calculated to determine MMF per child. Minimum acceptable diet was then computed as a composite indicator of MDD and MMF. The MDD, MMF and MAD were presented as percentages.Nutritional outcomes assessed were analysed and presented as percentages.

For inferential statistics, chi-square test was used for categorical data to test for associations while t-test was used for continuous data to test for significant differences between two means. Binary logistic regression was used to determine associations between independent

and independent variables of the study. P value of <0.05 was considered statistically significant in all the analyses. Summary of data analysis as per study objectives is outlined in Table 2.

Table 2: Data analysis summary table

OBJECTIVE	VARIABLES		STATISTICAL ANALYSES
Assessment of KAP of caregivers with regard to IYCN practices	Socio-demographics, KAP on complementary feeding practices, KAP on dietary diversity guidelines, water, sanitation an hygiene		Range, frequencies, percentages, means, standard deviations and chi-square
Determine dietary diversity of children 6-23 months	Meal frequency, number of food groups consumed, minimum diet diversity		Descriptive: Frequencies, percentages, means, standard deviations
Assessment of nutrition status of children 6-23 months	WHZ, HAZ, WAZ		Percentages
Associations	**Independent**	**Dependent**	
Relationship between KAP and dietary diversity	Socio-demographics, KAP on complementary feeding practices, KAP on dietary diversity guidelines	Meal frequency, number of food groups consumed, minimum diet diversity	Binary logistic regression
Relationship between diet diversity and nutritional status of children 6-23 months	Meal frequency, number of food groups consumed, minimum diet diversity	Wasting, stunting, underweight	Binary logistic regression

KAP, Knowledge, attitudes and Practices; IYCN, Infant, young child nutrition; WHZ, Weight for height; HAZ, Height for age; WAZ, weight for age.

CHAPTER FOUR
RESULTS

4.0 Introduction

This chapter provides the results and discussion with reference to research objectives and questions as outlined in chapter one. These aspects include household socio-demographic characteristics; knowledge, attitude and practices (KAP) regarding infant and young child nutrition (IYCN);child dietary diversity; child nutrition status; caregiver's relationship between child dietary diversity and nutritional status and finally the relationship between KAP regarding IYCN and dietary diversity.

4.1 Socio-demographic Characteristics

Table 3 shows the socio-demographic characteristics of the study population.The response rate was 99% (n=388) with only three caregivers refusing to participate in the study. Majority (76.4%) of the interviewed caregivers were women who were married and mainly affiliated to Christianity (94%).There were more ($P<0.05$) Christians from the high potential areas (96.9%) compared to the low potential areas (89.9%).Overall; most of the households were mainly from Kalenjin (63.1%) and Kikuyu (20%) communities. Other ethnic groups included Kisii, Turkana, Luhya, Meru and Mijikenda. The interviewed caregivers were aged between 15 and 78 years with a mean age of 29.09 ± 9.17 years while children's mean age was15.58±5.63 months. The average total number of household members in low potential areas (5.78 ± 2.54) were significantly higher ($P<0.05$) than those from high potential area (4.98 ±2.35). Overall, each family has about five members (5.31 ± 2.461), and three children (2.80 ± 1.97). Most of the caregivers (42.5%) had attained primary education.

Table 3: Socio-demographic characteristics of the study population in low and high potential area of Rongai Sub-county

Characteristic	Total (n=388)		Low potential area (n=161)		High potential area (n=227)		χ^2 value P value
	%	n	%	n	%	n	
Status within HH†							
Wife	76.4	294	72.2	114	79.3	180	10.944
Daughter	18.7	72	19.0	30	18.5	42	0.090
House hold head	3.6	14	5.7	9	2.2	5	
Others e.g. in-laws	1.3	8	3.1	8	0	0	
Marital status†							
Married	76.4	295	71.7	114	79.7	181	5.801
Single	20.7	80	25.8	41	17.2	39	0.122
Widow	2.1	8	1.3	2	2.6	6	
Separated	1.3	3	0.4	2	0.8	1	
Religion†							
Muslim	6.0	23	10.1	16	3.1	7	7.996
Christian	94.0	361	89.9	143	96.9	218	0.005*
Ethnicity†							
Kalenjin	63.1	243	73.0	116	56.2	127	33.618
Kikuyu	20.0	77	11.9	19	25.7	58	0.001**
Others††	16.9	68	15.1	26	18.1	42	
Education†							
None	11.1	43	10.7	17	11.5	26	2.818
Primary	42.5	164	39.6	63	44.5	101	0.420
Secondary	32.4	125	37.1	59	29.1	66	
Tertiary	14.0	54	12.6	20	15.0	34	
Age in years (mothers)	29.09± 9.17		28.44 ± 8.51		29.55 ± 9.59		0.244
Children age (months)#	15.58±5.63		15.31 ± 5.60		15.76±5.65		0.447
HH members number#	5.31 ± 2.461		5.78 ± 2.54		4.98 ±2.35		0.002*
Total no. of children#	2.80± 1.97		2.81 ± 2.02		2.79 ± 1.93		0.904

†Characteristic of the mother/care giver; ††, other ethnic groups include Kisii, Turkana, Luhya, Meru and Mijikenda; HH – Household; *P<0.05, **P<0.01 significant by χ^2 test; #data are mean ± standard deviations; *P<0.05 significant using independent samples t-test.

4.2 Child health characteristics in Rongai sub-county

The health characteristics of children in Rongai sub-county is presented in Table 4. Out of the 388 children who were part of the study, 51.6% were male and 48.4 were female with no difference (P>0.05) between the numbers from high and low potential areas. There was also no difference (P>0.05) in the presentation of cough/cold, fever, shortness of breath, diarrhoea and parasites between the two agro-ecological zones. However, children who reported history of fever (45.9%), diarrhoea (37.1%) and diagnosed with parasites (6.3%) were more from low potential areas compared to 35.2%,26.9% and 12.3% respectively from high potential areas. Prevalence of children who were treated for parasites in the previous six months was low (19.1%). Overall, coughing/cold (69.4%) was the most prevalent illnesses reported in the sub-county. Only 3.9% of the children were taking nutritional supplements at the time of the study.

Table 4: Child health characteristics in low and high potential area of Rongai sub-county

Characteristic	Total (n=388)		Low potential area(n=161)		High potential area(n=227)		χ^2 value P value
	%	n	%	n	%	n	
Sex							
Male	51.6	199	47.2	75	54.6	124	2.081
Female	48.4	189	52.8	86	45.4	103	0.149
History of illness in the previous 2 weeks[†]							
Fever	39.6	153	45.9	73	35.2	80	4.449
Cough or cold	69.4	268	74.2	118	66.1	150	2.915
Fast breathing/shortness of breath	9.8	38	12.6	20	7.9	18	2.277
Diarrhoea	31.1	120	37.1	59	26.9	61	4.572
Diagnosed with parasites	9.8	38	6.3	10	12.3	28	3.850
Treated for parasites in the last 6 months	19.7	76	21.4	34	18.5	42	0.491
Taking vitamin or health supplements[††]	3.9	15	5.0	8	3.1	7	0.950

[†]responses are yes; [††]supplements e.g. multivitamins, vitamin A, omega 3 fatty acids, plumpy nuts, etc. P<0.05 significant by χ^2 test

4.3 Caregivers' knowledge on young child feeding, water, sanitation and personal hygiene, food based dietary guidelines and dietary diversity, iron and vitamin A deficiency

Table 5 shows caregivers' knowledge on young child feeding, water, sanitation and personal hygiene; food based dietary guidelines and diet diversity, iron deficiency anemia and vitamin A deficiency. Generally, there were no differences (P>0.05) in caregivers' knowledge indicators between the low and high potential areas. Most of the caregivers had low knowledge levels on young child feeding (83.3%), water and sanitation (92.7%); food based dietary guidelines and diversity (98.2%), iron deficiency anaemia (97.4%) and vitamin A deficiency (93.0%). On the contrary, caregivers' appeared to be more knowledgeable on personal hygiene (68%).

Table 5: Caregivers' knowledge on young child feeding, water and sanitation, personal hygiene, food based dietary guidelines and dietary diversity, iron, and vitamin A deficiency in low and high potential area of Rongai Sub-county

	Total (388)		Low potential area (161)		High potential area (227)		χ^2 value P value
	%	n	%	n	%	n	
Young child feeding							
Low	83.3	319	79.1	125	86.2	194	3.370
High	16.7	64	20.9	33	13.8	31	0.066
Water and sanitation							
Low	92.7	356	89.9	143	94.7	213	3.083
High	7.3	28	10.1	16	5.3	12	0.079
Personal hygiene							
Low	32.0	123	27.0	43	35.6	80	0.078
High	68.0	261	73.0	116	64.4	145	3.100
FBDG and DD[#]							
Low	98.2	377	98.7	157	97.8	220	0.484
High	1.8	7	1.3	2	2.2	5	0.487
Iron deficiency anaemia							
Low	97.4	373	96.8	153	97.8	220	0.324
High	2.6	10	3.2	5	2.2	5	0.569
Vitamin A deficiency							
Low	93.0%	357	91.8%	146	93.8%	211	0.544
High	7.0%	27	8.2%	13	6.2%	14	0.461

P<0.05significant by χ^2 test; [#]FBDG- food based dietary guidelines; DD-dietary diversity

4.4 Caregivers' attitudes on young child feeding, food based dietary guidelines and dietary diversity, iron, and vitamin A deficiency

Table 6 shows the caregivers attitudes towards young child feeding; foods based dietary guidelines and diversity, iron deficiency anaemia and vitamin A deficiency. Generally, the caregivers had negative attitudes towards young child feeding; food based dietary guidelines and diversity, and vitamin A deficiency. However, there were good indications in attitudes on iron deficiency anaemia where at least 41.4% had positive attitudes.

Table 6: Caregivers' attitudes on young child feeding, food based dietary guidelines and dietary diversity, iron, and vitamin A deficiency in low and high potential area of Rongai Sub-county

	Total (n=388)		Low potential area (n=161)		High potential area (n=227)		χ^2 value P value
	%	n	%	n	%	n	
Young child feeding							
Negative	100.0%	384	100.0%	159	100.0%	225	-
Positive	-	-	-	-	-	-	
FBDG and DD[#]							
Negative	100.0%	384	100.0%	159	100.0%	225	-
Positive	-	-	-	-	-	-	
Iron deficiency anaemia							
Negative	58.6%	225	56.0%	89	60.4%	136	0.767
Positive	41.4%	159	44.0%	70	39.6%	89	0.381
Vitamin A deficiency							
Negative	100.0%	384	100.0%	159	100.0%	225	-
Positive	-	-	-	-	-	-	

$P<0.05$ significant by χ^2 test; [#]FBDG- food based dietary guidelines; DD-dietary diversity

4.5 Caregivers' child feeding practices

Figure 2a presents the caregivers' child feeding practices. Overall, the average age at which complementary feeding started was 17.93 ± 9.16 weeks (Figure 2A) while less than half (46.8%) introduced complementary foods at the recommended age of six months (Figure 2B).

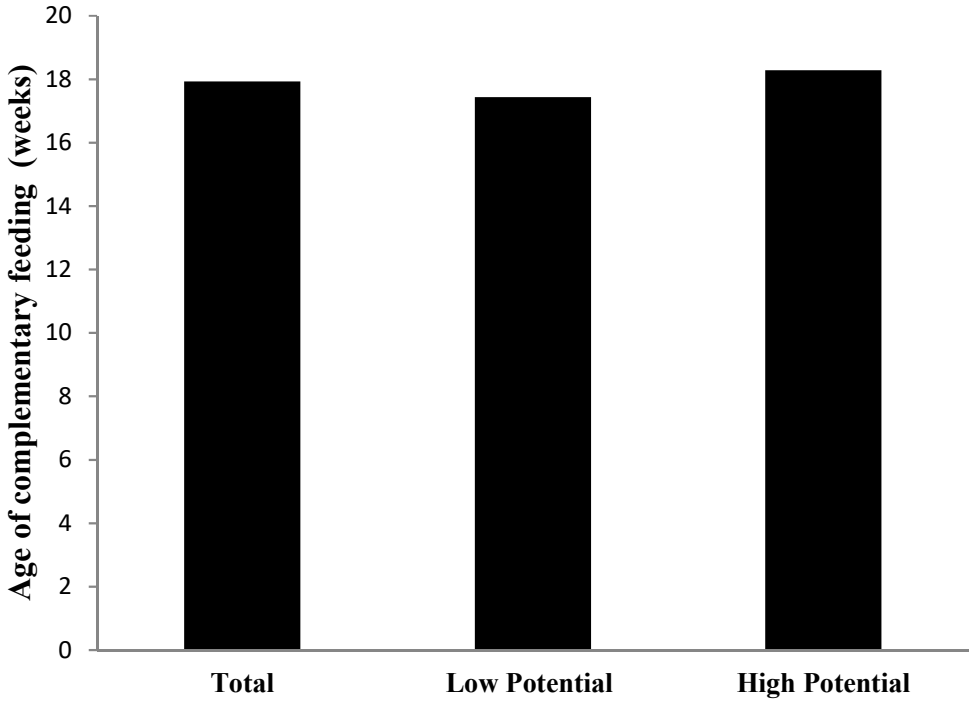

Figure 2a: Age in weeks at which complementary feeding was initiated in low and high potential areas of Rongai Sub-county. P>0.05using independent samples t-test

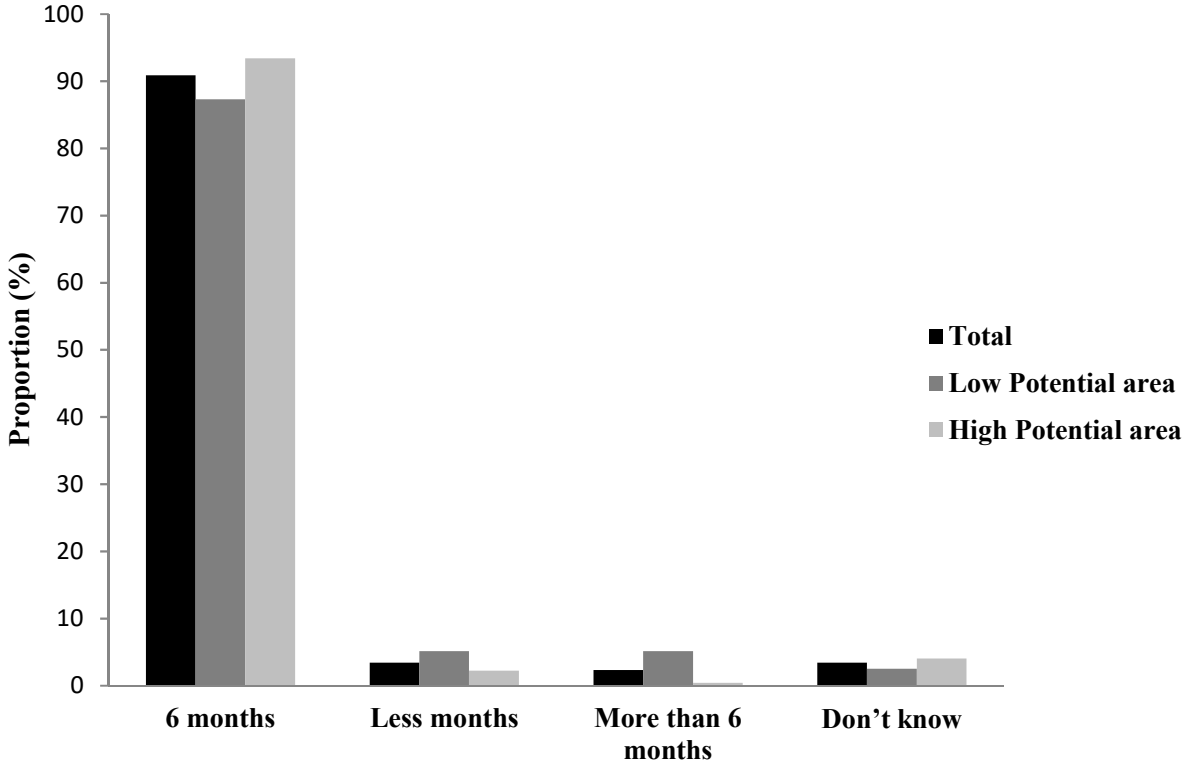

Figure 2b: Caregivers' knowledge on the recommended age at which complementary feeding should be started in low and high potential areas of Rongai Sub-county. P<0.05 significant by χ^2 test

Similar to age of introduction of complementary foods, there was no difference (P>0.05) between the two agro-ecological zones in other practices such as feeding child with family foods and the modifications done to the food (Table 7a). Most of the caregivers (74%) prepared special meals for their children. However, those who did not prepare special meals cited that the child was old enough to eat the family food as their main reason. This was commonly reported in high potential area (35.1%) whereas caregivers from low potential area cited lack of food (13.6%) as the main reason for not preparing special meals for their children.

Table 7a: Infant feeding practices in low and high potential areas of Rongai Sub-county

			Agro-ecological Zones				
	Total (n=388)		**Low potential (n=161)**		**High potential (n=227)**		**χ^2 value P value**
Age in months#	15.58±5.63		15.31 ± 5.60		15.76±5.65		0.447
	%	**n**	**%**	**n**	**%**	**n**	
Complementary feeding†							
< 6 months	44.4	167	47.7	74	42.1	93	1.658
At 6 months	46.8	176	45.2	70	48.0	106	0.436
>6 months	8.8	33	7.1	11	10.0	22	
Sometimes given family food(Yes)	89.4	345	86.2	137	91.6	208	2.943 0.086
Family food modified (Yes)	78.9	295	81.0	124	77.4	171	0.731 0.393
Foods added to child food							
Milk	71.4	155	76.1	70	68.0	85	6.244
Soup	5.5	12	3.3	3	7.2	9	0.620
Milk and soup	14.7	32	13.0	12	16.0	20	
Others††	8.4	18	7.6	7	8.8	11	
How was the food modified							
Mashed	93.2	259	93.0	107	93.3	152	0.005
Chopped	6.8	19	7.0	8	6.7	11	0.946

Any special meal for the child[##](Yes)	74.4	287	76.7	122	72.7	165	0.801 0.371
Reason for not preparing special food for the child[†††]							
Lack of time	1.5	4	2.7	3	0.7	1	1.798 0.180
No food	9.2	24	13.6	15	6.0	9	4.491 0.034*
Do not know how to do it	1.5	4	0.0	0	2.6	4	2.959 0.085
Child old enough to eat family food	27.6	72	17.3	19	35.1	53	10.124 0.001**
Main snacks given to child							
Starchy staples	43.4	164	43.9	68	43.0	96	14.698
Animal source proteins	22.0	83	18.1	28	24.7	55	0.040*
Milk	10.3	39	7.1	11	12.6	28	
Vegetables	9.8	37	13.5	21	7.2	16	
Cakes/biscuits/sweets	9.0	34	8.4	13	9.4	21	
Tea, fruits, porridge/Weetabix	5.5	31	9.0	20	3.1	11	

*P<0.05significant by χ^2 test; #data are mean ± standard deviations; ##special meal is a meal which was not consumed among other family members and was prepared specifically to feed the child; †analysis done on 376 respondents; ††including avocado, egg, margarine and glucose; †††responses are yes**;** age range for complementary feeding 1-32 weeks.

Majority of the children also used separate feeding equipment (87.6%) to observe hygiene (Table 7b). Among the children, 75.6% were still breastfeeding alongside being complementary fed. Most of the caregivers (49.5%) fed their children slowly and patiently in order to ensure that they ate the required portion of food. When the child refused to eat a particular type of food, caregivers mainly tried that food after a few days (26.2%). Although most caregivers from high agricultural potential areas enriched their children's food (15.9%) as compared to low potential area (8.3%), they forced them to feed (16.%).

Table 7b: Infant feeding practices in low and high potential areas of Rongai Sub-county

	Total (n=388)		Agro-ecological Zones				χ^2 value P value
			Low potential (n=161)		High potential (n=227)		
	%	n	%	n	%	n	
How child received food							
Ate by him/herself	16.7	64	20.4	32	14.2	32	11.367
Fed by caregiver	74.7	286	76.4	120	73.5	166	0.003*
Feed by someone else	8.6	33	3.2	5	12.4	28	
Child uses separate equipment (Yes)	87.6	338	88.7	141	86.8	197	0.308 0.579
Reasons for separate equipment							
Hygiene	52.0	178	46.9	68	55.8	110	8.464
Cultural reasons	12.0	41	17.2	25	8.1	16	0.076
Common practice	13.2	45	11.7	17	14.2	28	
Others	22.7	78	24.1	35	21.8	43	
Active participation in feeding							
(Yes)	33.2	128	30.2	48	35.2	80	1.077
Feeds child slowly and patiently							
(Yes)	49.5	191	44.0	70	53.3	121	3.221
Minimize destruction							
(Yes)	6.2	24	6.9	11	5.8	13	0.217
Breast feeding children							
(Yes)	75.6	292	74.2	118	76.7	174	0.302
Ensure child eats food portion †							
Active participation in feeding	33.2	128	30.2	48	35.2	80	1.077 0.299

Feeds child slowly and patiently	49.5	191	44.0	70	53.3	121	3.221 0.073
Minimize distractions	6.2	24	6.9	11	5.8	13	0.217 0.641
When child refuse food							
Do not give the child that food	19.4	75	18.9	30	19.8	45	0.055 0.815
Try again after a few days	26.2	101	21.4	34	29.5	67	3.200 0.074
Combine with other foods	12.8	49	8.3	36	15.9	13	4.789 0.029*
Force the child to eat that food	13.8	53	9.4	15	16.8	38	4.282 0.039*

*P<0.05significant by χ^2 test; †analysis done on 376 respondents

Table 8 shows the caregivers' practices on young child feeding, water, sanitation, personal hygiene and dietary diversity. In general, caregiver's practices were poor in young child feeding, water and sanitation, personal hygiene; food based dietary guidelines and diet diversity. More caregivers (P<0.05) from the low potential areas had adequate young child feeding (42.8%) and water and sanitation (13.8%) practices compared to high potential areas where only 28.4% and 5.3% had adequate young child feeding, water and sanitation practices respectively.

Table 8: Caregivers' practices on young child nutrition low and high potential areas of Rongai sub-county

	Total (388)		Low potential area (161)		High potential area (227)		χ^2 value P value
Practice	**%**	**n**	**%**	**n**	**%**	**n**	
Young child feeding							
Inadequate	65.6	252	57.2	91	71.6	161	8.472
Adequate	34.4	132	42.8	68	28.4	64	0.004*
Water and sanitation							
Inadequate	91.1	350	86.2	137	94.7	213	8.347
Adequate	8.9	34	13.8	22	5.3	12	0.004*
Personal hygiene							
Inadequate	61.5	236	66.0	105	58.2	131	2.402
Adequate	38.5	148	34.0	54	41.8	94	0.121
FBDG and DD#							
Inadequate	100.0	384	100.0	159	100.0	225	-
Adequate	-	-	-	-	-	-	

*P<0.05 significant by χ^2 test; #FBDG- food based dietary guidelines; DD-dietary diversity; 10 questions - score of 5 and above was considered better practices.

4.6 Child Dietary Patterns

The proportion of children consuming foods from the seven food groups are presented in Table 9. Overall, most consumed foods were grains, roots and tubers (99.5%) and dairy foods (87.5%). Eggs (3.1%) and flesh foods (4.7%) were the least consumed foods. More (P<0.05) children from high potential area (85.7%) consumed other fruits and vegetables as compared to those from low potential area (77. 6%).

Table 9: Proportion of children aged 6-23 months who consumed foods from different food groups in low and high potential area of Rongai Sub-county

	Total (n=388)		Agro-Ecological zones				P value
			Low potential area (n=161)		High potential area (n=227)		
	%	n	%	n	%	n	
Food group							
Grains, roots and tubers	99.5	383	99.4	160	99.6	223	0.814
Legumes, nuts and seeds	21.0	81	20.5	33	21.4	48	0.825
Flesh foods	4.7	18	4.3	7	4.9	11	0.796
Dairy foods	87.5	337	89.4	144	86.2	193	0.337
Eggs	3.1	12	3.1	5	3.1	7	0.991
Vitamin A rich fruits and vegetables	56.6	218	57.1	92	56.2	126	0.862
Other fruits and vegetables	82.3	316	77.6	125	85.7	191	0.042*

*P<0.05significant by χ^2test

The snacking pattern, number of meals and dietary diversity scores of children in low and high potential area are illustrated in Figure 3.There was no difference (P>0.05) in the number of snacks consumed per day among children in low (2.47 ± 1.559) and high agricultural potential area (2.32 ± 1.183). The number of main meals given to children was different (P<0.001) between the low (3.23±0.811) and the high (2.92±0.718) agricultural potential area. In addition, the total number of meals consumed was different (P<0.001) between the two area. Children from low potential area had more meals (5.71±1.739) compared to those from high potential area (5.19±1.231). Overall, mean CDDS was 3.54±1.01 with no difference between low (3.52 ± 1.00) and high (3.57 ± 1.04) agricultural potential area (P>0.05).

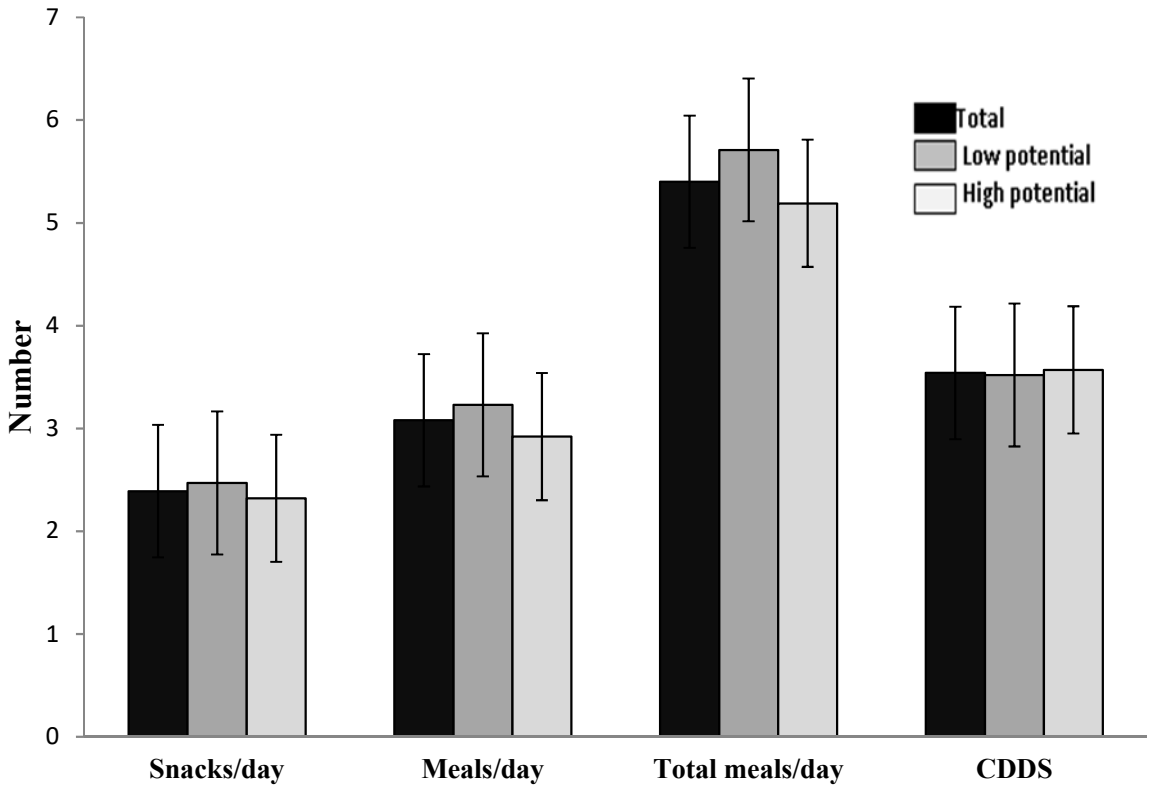

Figure 3: The minimum number of snacks per day, meals taken, and dietary diversity score for children 6-23 months old in low and high agricultural potential area of Rongai Sub-County.**P<0.01 significant by independent samples t-test; DDS, dietary diversity score

Furthermore, the proportions of children who met minimum diet diversity (MDD), minimum meal frequency (MMF) and minimum acceptable diet (MAD) in low and high potential area is illustrated in Figure 4. Overall, more than half (56.9%) of the children consumed a diverse diet (>four food groups) with no difference (P>0.05) between low (57.1%) and high potential area (56.7%). Generally, most (81.8%) of the children attained MMF requirement with majority being from low potential area(91.1%) compared to high potential area(75.2%).Only 34.1 % of children attained MAD with no difference (P>0.05) between high (35.8%) and low (31.6%) potential area.

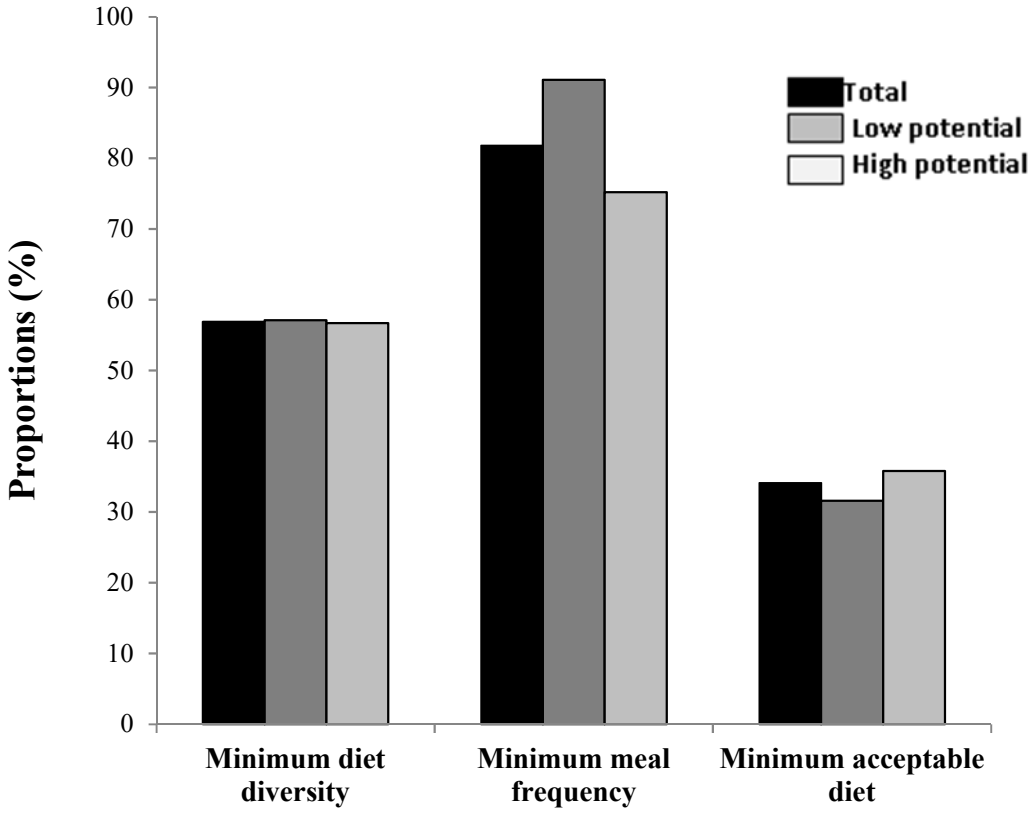

Figure 4: Proportion of children meeting minimum dietary diversity, minimum meal frequency and minimum acceptable diet in low and high agricultural potential area of Rongai Sub-county. $^{*}P<0.05$ significant by χ^2test

4.7 Child Nutritional Status

Table 10 shows comparison of the nutritional status of children 6-23 months across the two agro-ecological zones. Nutritional status was determined based on the z-score system. Overall, 23.4% of the children were stunted, 9.2 % were underweight and 6.2% were wasted. There was no difference (P>0.05) in the anthropometric indices across the agro-ecological zones.

Table 10: Nutritional status of children 6-23 months in low and high potential area of Rongai Sub-county

Anthropometric indices	Total (n=388)		Agro-Ecological zones				χ^2 value	P value
			Low Potential area (n= 161)		High Potential area (n=227)			
	%	n	%	n	%	n		
Stunting	23.4	71	26.2	34	21.4	37	0.940	0.332
Underweight	9.2	30	11.3	15	7.8	15	1.158	0.282
Wasting	6.2	17	8.6	10	4.5	7	1.979	0.159

$P<0.05$ significant using χ^2test

4.8.1 Association of caregivers' knowledge, attitudes and practices on infant and young child nutrition with diet adequacy

Tables 11a, b and c present the various aspects of KAP assessed and their association with MDD, MMF and MAD of children compared across the two agro-ecological zones. As shown (Table 11a, b and c), caregivers from low potential areas who had better attitudes on iron deficiency anaemia were more likely to feed their children a diverse diet [AOR=2.038, 95% C.I; (1.007±4.125) P<0.005] and an acceptable diet [AOR=2.100, 95% C.I; (1.019±4.328) P<0.005]. Children from high potential areas were more likely [AOR=2.419, 95% C.I; (1.045±5.599) P<0.005] to meet MMF if their caregivers were knowledgeable on infant and young child feeding (Table 10b). In low potential areas, children were more likely [AOR=5.284, 95% C.I; (1.271±21.968) P<0.005] to attain MMF if caregivers had high knowledge on vitamin A deficiency.

Table 11a: Association of caregivers' knowledge, attitudes and practices on infant and young child nutrition with minimum dietary diversity in low and high potential areas of Rongai sub-county

	Low Potential				High Potential			
Variable	**B**	**AOR**	**C.I (95%)**	**P value**	**B**	**AOR**	**C.I (95%)**	**P value**
Knowledge on IYCN (high)	-0.509	0.601	0.247±1.466	0.263	0.274	1.316	0.571±3.032	0.519
Knowledge on iron deficiency anaemia (high)	-2.259	0.104	0.009±1.154	0.065	1.424	4.153	0.413±41.734	0.226
Knowledge on vitamin A deficiency (high)	-0.938	0.391	0.110±1.389	0.147	-0.045	0.956	0.303±3.013	0.939
Knowledge on water and sanitation (high)	0.460	1.583	0.427±5.866	0.492	0.046	1.047	0.304±3.599	0.942
Attitude on iron deficiency anaemia (better)	0.712	2.038	1.007±4.125	0.048*	-0.201	0.818	0.461±1.453	0.493
Practices on IYCN(better)	0.544	1.723	0.824±3.605	0.148	-0.216	0.806	0.434±1.498	0.495
Practices on personal hygiene (better)	-0.968	0.380	0.185±0.780	0.008	-0.060	0.941	0.536±1.654	0.834

*P<0.05 significant using binary logistic regression; IYCN-infant and young child nutrition; B-estimated coefficient; AOR-adjusted odds ratio; C.I-confidence interval

Table 11b: Association of caregivers' knowledge, attitudes and practices on infant and young child nutrition with minimum meal frequency in low and high potential areas of Rongai sub-county

	Low Potential area				High Potential area			
Variable	**B**	**AOR**	**C.I (95%)**	**P value**	**B**	**AOR**	**C.I (95%)**	**P value**
Knowledge on IYCN (high)	0.126	1.134	0.290±4.431	0.857	0.883	2.419	1.045±5.599	0.039*
Knowledge on vitamin A deficiency (high)	1.665	5.284	1.271±21.968	0.022*	-0.355	0.701	0.165±2.981	0.631
Attitude on iron deficiency anaemia (better)	0.055	1.056	0.325±3.436	0.928	-0.466	0.627	0.309±1.275	0.198
Practices on IYCN(better)	0.950	2.585	0.751±8.899	0.132	0.696	2.005	0.994±4.043	0.052
Practices on personal hygiene (better)	0.842	2.321	0.701±7.687	0.168	-0.571	0.565	0.276±1.159	0.119
Knowledge on personal hygiene (high)	1.347	3.844	0.464±31.837	0.212	0.361	1.435	0.694±2.970	0.330

*P<0.05significant using binary logistic regression; IYCN-infant and young child nutrition; B-estimated coefficient; AOR-adjusted odds ratio; C.I-confidence interval

Table 11c: Association of caregivers' knowledge, attitudes and practices on infant and young child nutrition with minimum acceptable diet in low and high potential areas of Rongai sub-county

	Low Potential area				High Potential area			
Variable	**B**	**AOR**	**C.I (95%)**	**P value**	**B**	**AOR**	**C.I (95%)**	**P value**
Knowledge on IYCN (high)	-0.225	0.799	0.335±1.904	0.612	0.265	1.304	0.527±3.224	0.566
Knowledge on vitamin A deficiency (high)	-0.558	0.572	0.162±2.020	0.386	1.277	3.586	0.755±17.024	0.108
Knowledge on personal hygiene (high)	0.492	1.635	0.751±3.561	0.216	0.172	1.187	0.652±2.161	0.575
Knowledge on water and sanitation (high)	0.558	1.747	0.438±6.970	0.430	1.568	4.796	0.581±39.602	0.146
Practices on personal hygiene (better	-0.411	0.663	0.312±1.411	0.286	-0.346	0.707	0.388±1.291	0.260
Practices on water and sanitation (high)	-0.007	0.993	0.347±2.843	0.990	0.601	1.824	0.456±7.290	0.395
Attitude on iron deficiency anaemia(better)	0.742	2.100	1.019±4.328	0.044*	-0.170	0.844	0.462±1.541	0.581

*P<0.05significant using binary logistic regression; IYCN-infant and young child nutrition; B-estimated coefficient; AOR-adjusted odds ratio; C.I-confidence interval

4.8.2 Association of responsive feeding indicators with diet adequacy

Tables 12 presents the factors that were associated with minimum diet diversity (MDD), minimum meal frequency (MMF) and minimum acceptable diet (MAD) of children compared across the two agro-ecological zones of Rongai Sub-County. In low potential area, children who were fed slowly were more likely to attain adequate MDD [AOR=3.46, 95% C.I; (1.31 – 9.10) P<0.05].Children whose mothers/caregivers had high education level [AOR= 3.797, 95% C.I; (1.47 – 9.75) P<0.05] and those who were from households with high income level [AOR=3.07, 95% C.I; (1.16 – 8.14) P<0.05]were more likely to be fed a diverse diet. Furthermore, those who achieved MMF were more likely to consume a MDD [AOR=6.81, 95% C.I; (1.13 – 41.11) P<0.05].

In contrast, children from high potential area who achieved MMF were less likely to consume a MDD [AOR=0.42, 95% C.I; (0.19 – 0.96) P<0.05] (Table 4b).Children from the low potential area whose diets were diverse were more likely to attain MMF by [AOR=5.76, 95% C.I; (1.17 – 28.32) P<0.05]. On the contrary, children from high potential area who consumed a diverse diet were less likely to achieve MMF [AOR=0.39, 95% C.I; (0.20 – 0.76) P<0.05]. Children from high potential area who were actively fed were less likely to achieve MMF [AOR=0.51, 95% C.I; (0.26- 0.99) P<0.05]. Male children from high potential were more likely to be fed more frequently than their female counterparts [AOR=2.04, 95% C.I; (1.07 – 3.88) P<0.05]. Mothers/caregivers from high potential area with high education level were more likely to feed their children with an acceptable diet [AOR=1.87, 95% C.I; (1.01 – 3.46) P<0.05].

Table 12: Factors associated with child diet diversity, meal frequency and acceptable diet in low agricultural potential area of Rongai Sub-County

	Adequate Minimum Diet Diversity [a]							
	Low Potential Area				High Potential Area			
Variables	**B**	**AOR**	**C.I (95%)**	**P value**	**B**	**AOR**	**C.I (95%)**	**P value**
Special meals prepared for child(Yes)	-0.35	0.69	0.25-1.88	0.479	0.03	1.03	0.50-2.11	0.935
Feeds child slowly (Yes)	1.24	3.46	1.31-9.10	0.012*	-0.12	0.88	0.44-1.75	0.729
MMF (Adequate MMF)	1.91	6.81	1.13-41.11	0.036*	-0.84	0.42	0.19-0.96	0.041*
Mother/caregiver education level (High)	1.33	3.79	1.47-9.75	0.006*	0.20	1.22	0.61-2.43	0.557
Child eats family foods (Yes)	0.95	2.59	0.56-12.01	0.223	-0.45	0.63	0.19-2.07	0.452
Marital status (Married)	-0.18	0.83	0.29-2.32	0.724	-0.87	0.41	0.17-0.97	0.054
Lack of food (Yes)	-0.28	0.75	0.19-2.88	0.675	0.95	2.60	0.53-12.58	0.234
HH income (High)	1.12	3.07	1.16-8.14	0.024*	0.34	1.40	0.65-3.03	0.386

	Adequate Minimum Meal Frequency[b]							
	Low Potential Area				High Potential Area			
Variables	**B**	**AOR**	**C.I (95%)**	**P value**	**B**	**AOR**	**C.I (95%)**	**P value**
Child eats family food (Yes)	0.58	1.79	0.38-8.39	0.459	-0.53	0.58	0.15-2.22	0.433
Active feeding (Yes)	0.38	1.47	0.34-6.39	0.604	-0.66	0.51	0.26-0.99	0.049*
MDD (Adequate MDD)	1.75	5.76	1.17-28.32	0.031*	-0.92	0.39	0.20-0.76	0.005*
Special meals prepared for child (Yes)	-1.53	0.21	0.02-1.89	0.167	-0.62	0.53	0.24-1.18	0.122
Child gender (Male)	-0.50	0.60	0.18-1.95	0.402	0.71	2.04	1.07-3.88	0.029*
Feeds child slowly(Yes)	0.17	1.18	0.32-4.34	0.796	-0.49	0.60	0.31-1.17	0.138
Child age group(6-11 months)	0.68	1.98	0.57-6.84	0.278	-0.06	0.94	0.45-1.93	0.870

	Adequate Minimum Acceptable Diet[c]							
	Low Potential Area				Low Potential Area			
Variables	**B**	**AOR**	**C.I (95%)**	**P value**	**B**	**AOR**	**C.I (95%)**	**P value**
HH income (High)	0.26	1.30	0.59-2.83	0.507	-0.56	0.56	0.28-1.14	0.112
Mother/caregiver education level (High)	0.46	1.59	0.77-3.31	0.207	0.62	1.87	1.01-3.46	0.045*
HFIAS(Food Secure)	-0.19	0.82	0.39-1.72	0.612	0.35	1.42	0.78-2.59	0.251
IYCF practices (Better)	-0.26	0.76	0.37-1.58	0.474	-0.36	0.69	0.38-1.26	0.231
Lack of food (Yes)	-0.50	0.60	0.19-1.90	0.389	0.75	2.13	0.41-10.99	0.363
Child still breastfeeding (Yes)	0.38	1.46	0.64-3.33	0.366	-0.09	0.90	0.45-1.83	0.790
Number of children in household[#]	-0.07	0.92	0.76-1.11	0.427	-0.03	0.96	0.80-1.14	0.671
Child age group(6-11 months)	0.19	1.21	0.53-2.77	0.637	-0.29	0.74	0.37-1.45	0.386

*P<0.05; B – estimated coefficient; AOR – Adjusted Odds Ratio; MMF – Minimum meal frequency; MDD – Minimum diet diversity; HH – Household; HFIAS – Household food insecurity access scale; IYCF – Infant and young child feeding;#Data is continuous; [a]Adjusted for: prepares special meals for child, feeds child slowly, MMF, education level, child eats family foods, marital status, lack of food and HH income; [b]Adjusted for child eats family food, active feeding, MDD, prepares special meals for child, child gender, slow feeding, child age group; [c]Adjusted for HH income, education level, HFIAS, IYCF practices, lack of food, still breastfeeding, children in HH, child age group.

Table 13a and 13b describe associations between diet adequacy and nutritional outcomes of children. Diet adequacy indices, MDD, MMF and MAD, were not significantly associated with any of the nutrition outcomes of children from low potential areas (Table 12a). However, children from high potential areas whose diets met the MDD [AOR=0.129, 95% C.I; (0.027±0.609) P<0.05], MMF [AOR=0.244, 95% C.I; (0.076±0.785) P<0.05] and MAD [AOR=5.417, 95% C.I; (1.350±21.732) P<0.05] (Table 12b) requirements were more likely to have better underweight outcomes.

Table 13a: Association between diet adequacy and nutritional outcomes of children from low potential areas

	Stunting			
	B	**P value**	**AOR**	**95% C.I**
MDD (adequate)	-0.895	0.097	0.409	0.142±1.177
MMF (adequate)	1.466	0.173	4.331	0.526±35.666
MAD (adequate)	0.402	0.468	1.495	0.505±4.429
	Wasting			
MDD (adequate)	1.138	0.196	3.120	0.557±17.486
MMF (adequate)	18.808	0.999	-	-
MAD (adequate)	0.016	0.985	1.016	0.203±5.097
	Underweight			
MDD (adequate)	0.371	0.585	1.449	0.382±5.492
MMF (adequate)	0.446	0.683	1.562	0.184±13.294
MAD (adequate)	0.144	0.837	1.155	0.291±4.588

*P<0.05significant using binary logistic regression; MDD-minimum diet diversity; MMF-minimum meal frequency; MAD- minimum acceptable diet; B-estimated coefficient; AOR-adjusted odds ratio; C.I-confidence interval

Table 13b: Association between diet adequacy and nutritional outcomes of children from high potential areas

	Stunting			
	B	**P value**	**AOR**	**95% C.I**
MDD (adequate)	-0.637	0.319	0.529	0.151±1.852
MMF (adequate)	-0.417	0.399	0.659	0.250±1.736
MAD (adequate)	0.605	0.397	1.832	0.451±7.441
	Wasting			
MDD (adequate)	-0.725	0.612	0.484	0.029±7.956
MMF (adequate)	0.269	0.820	1.309	0.129±13.230
MAD (adequate)	0 .841	0.571	2.319	0.127±42.459
	Underweight			
MDD (adequate)	2.046	0.010*	0.129	0.027±0.609
MMF (adequate)	1.410	0.018*	0.244	0.076±0.785
MAD (adequate)	1.690	0.017*	5.417	1.350±21.732

*P<0.05significant using binary logistic regression; MDD-minimum diet diversity; MMF-minimum meal frequency; MAD- minimum acceptable diet; B-estimated coefficient; AOR-adjusted odds ratio; C.I-confidence interval

CHAPTER FIVE
DISCUSSION

5.1 Socio-demographic status of the study population

A total of 388 caregiver and child pairs of Rongai sub-county participated in this study. The caregivers' KAP levels were assessed together with child diet adequacy and child anthropometric measurements. More of the study participants (n=227) resided in the high potential areas compared to those from the low potential areas (n=161). This could be due to the high agricultural productivity of land in high potential areas thus attracting population seeking to practice agriculture as a source of livelihood.

Education achievement has been observed to have an influence on attitudes and practices of caregivers (KNBS & ICF, 2015; Victor *et al*., 2012). In this study, 42.5% of the caregivers had attained primary level of education with a majority (44.5%) of them form the high potential areas. This was higher than Nakuru County education level statistics as documented in the Kenya Demographic and Health Survey (KDHS) where only 30.1% of caregivers had primary school education (KNBS & ICF, 2015). These differences were attributed to the different categorization of education levels. In the current study, caregivers were considered to have primary education whether or not they completed the primary level of study. On the other hand, the KDHS separated caregivers who completed and those who did not complete primary education thus the low prevalence.

Households in the study area had an average of five members. The mean household size in the study area was higher than the national level of 3.9 (KNBS & ICF, 2015). Low potential areas had significantly more members than in high potential areas (Table 3). This could possibly be because children are viewed as security measure for old age (Alam, 2012). Family size influences household's members' wellbeing, especially in the context of developing countries where the family resources are very limited. Large family size increases constraints of available resources especially when resources are limited (Wu & Li, 2012). This in turn would affect the quality of complementary feeding for the children in the household.

5.2 Caregivers' knowledge, attitudes and practices regarding young child feeding

Knowledge about dietary needs is important for good health and overall nutritional status. The caregivers generally had low knowledge levels on infant and young child nutrition (IYCN). Poor knowledge levels suggest lack of sufficient nutrition and health education of the caregivers. Since most of them in this study had low educational level, this could possibly have an effect on their knowledge, attitudes and practices regarding IYCN (Imdad *et al*., 2011).

Despite the high coverage (98.3%) and content explanation (61%) of the maternal and child health (MCH) booklet in Nakuru county, (Kibaru & Otara, 2016), caregivers in Rongai sub-county had low IYCN knowledge levels. This indicates that it is important to have continued nutrition education to ensure that the women understand the nutrition messages and are able to translate to practice.

Nonetheless, a higher percentage had high knowledge on personal hygiene where the caregivers understood the critical times when they needed to wash their hands. This is attributed to the intense campaigns on proper personal hygiene practices such as hand washing in order to prevent infections. Poor IYCN knowledge levels observed could have translated to poor attitudes that caregivers had regarding IYCN. Inadequate child feeding practices and poor-quality complementary foods are some factors that influence infant and young child growth negatively (de Onis *et al*., 2012). It is recommended that complementary feeding should start at the age of six months (WHO, 2010). Nevertheless, many caregivers did not comply with this recommendation by initiating complementary feeding before six months of age. Similar to national average age of 4.4 months (KNBS & ICF, 2015), most caregivers introduced complementary foods at 4.5 months. Early return to work may compel caregivers to start complementary feeding earlier than the stipulated six months of age. A study in India reported that maternal unemployment contributed to longer breastfeeding duration as compared to mothers who were employed (Singh *et al*., 2012). Likewise, a study in Ethiopia demonstrated that unemployed mothers had a higher chance of initiating complementary feeding on time. This is because they had no need to return to work as their employed counterparts (Shumey *et al*., 2013). A higher prevalence (80%) of timely initiation of complementary feeding over time reported in Ethiopia was attributed to the effort of health extension workers (Mekbib *et al*., 2014). Therefore, involving health extension workers in the study area to educate caregivers on timely initiation of complementary foods and ways to ensure these foods are nutritious and properly prepared could improve complementary feeding practices in (Mekbib *et al*., 2014).

Most of the caregivers in low agricultural potential area cited lack of food as a reason for not preparing special meals for their children (Table 7a). This describes the food insecurity and poor economic status of households in this area, which limit their financial access to food. The lack of food could also be explained by the timing of the study, which was done during the lean season when food availability was a challenge to most households in low potential area.Feeding infants directly is one of the responsive feeding practices that ensure optimal complementary feeding (Engle *et al*., 2000). Caregivers from high potential area considered their children old enough to feed themselves (Table 7b) which is contrary to the recommended

practice. These caregivers also force-fed their children when they refused to eat which is contrary to outlined responsive feeding recommendations (PAHO/WHO, 2003). These poor practices reflect on caregivers' low knowledge levels on infant and young child feeding. In contrast, caregivers from high potential area combined that particular food with other foods in order to encourage consumption, which is in line with responsive feeding practice recommendation of experimenting with different food combinations, texture and taste when child refuses many foods (Pelto *et al*., 2003).

5.3 Diet adequacy of children

Diet adequacy was indicated by minimum acceptable diet (MAD) which is a composite of minimum diet diversity (MDD) and minimum meal frequency (MMF).This study demonstrated no difference in MAD and MDD between the two agro-ecological zones. This could be attributed to a lack of knowledge of translating farm produce to diets (Gitagia *et al*., 2019). The proportion of children who attained MDD (Figure 4) was slightly higher (56.9%) than the Kenya national figure of 41% (KNBS & ICF, 2015). The MDD was not different across the two agro-ecological zones. This was similar to the findings from another study conducted in Eastern Kenya where differences in agro-ecological zones did not affect child diet diversity (Bukania *et al*., 2017). However, it was noted that food consumption patterns were not very different from the national trends with diets mainly from starchy staples and dairy products and less consumption of eggs and flesh foods (Table 9). In Kenya, children's diets are mainly based on starchy staples (80%) and dairy products (90.5%) with little of high biological value proteins such as eggs (17%) and flesh foods (21%) (KNBS & ICF, 2015).

The food consumption patterns of children in the present study is also similar to that of Southern Benin where starchy staples were widely consumed (99.2%) while only 2.1% of the children consumed eggs (Mitchodigni *et al*., 2017). The same consumption pattern was also observed in Western Kenya (Waswa *et al*., 2015). In the present study, the sample size of the children who consumed fleshy foods was however very small hence a difference in consumption between the agro-ecological zones could not be clearly reflected. The low consumption of fleshy foods is a poor complementary feeding practice since infants and young children require fleshy foods for optimal growth and development. Consumption of meats is associated with reduced chances of wasting (Krebs *et al*., 2011).

The consumption of plant protein was also relatively low (21%) which was similar to national figure of 20.5% (KNBS & ICF, 2015). The high intake of starchy staples is because most of the households in the study area mainly produce starchy staples in their farms. This

could also be explained by poor caregiver knowledge on the importance of a diversified diet for the children. Although the current study did not quantify the amount of milk consumed by children, the high intake of dairy products is attributed to the fact that more than half of the households practiced dairy farming, which facilitated access to milk (Gitagia *et al*., 2019). Low consumption of fleshy meats could be ascribed to their relatively high cost making these food groups less accessible to most households due to poor economic status as reported by other studies (Kuchenbecker *et al*., 2017). Caregivers from this study cited that due to the high market value of eggs, they would rather sell the eggs so as to purchase vegetables that will feed the whole family for two meals. This necessitates behaviour change communication intervention to encourage incorporation of high biological value foods like eggs and fleshy meats as part of the child's diet.

Furthermore, most of children in this study met the requirements of up to 2-4 main meals with at least 1 snack per day (Figure 3) as recommended by the WHO guidelines (WHO, 2010). Interestingly, more children from low potential area (91.1%) met higher meal frequency per day compared to those from high potential area (75.2%) (Figure 3). A possible reason for this is that more caregivers in the high potential area are formally employed thus requiring them to be away from home for long periods and having less time to feed their children frequently. However, the type of caregiver employment was not investigated in this study. The proportion (81.8%) of children meeting MMF in the current study was almost comparable to another study in Nairobi, Kenya with 76% of the children attaining MMF (Macharia *et al*., 2018).

While a higher proportion of children achieved MDD and MMF, only a small proportion of them achieved MAD (Figure 4). This shows that although many of the children were frequently fed, their diets were not diverse to enable them achieve MAD. This could contribute to their diets not meeting the nutrient requirements during the complementary feeding period and eventually lead to poor nutritional status. Thus, the caregivers need to be educated on the importance of diversified diets to children and ways to ensure that complementary diets meet the MDD requirements.

5.4 Nutrition status of children

The anthropometric indices in the study compare well with the national figures (KNBS & ICF, 2015). The prevalence of underweight children was however slightly lower than the national figures (Table 10). There were no differences in the under nutrition rates across the agro-ecological zones. Notably, stunting and wasting levels were more prevalent in low

potential areas and slightly lower than the prevalence in Nakuru County within which the study area was situated. The higher proportion of wasted, underweight and stunted children in low potential area could be attributed to limited access to health care services due to poor terrains observed during data collection. Similarly, a study in Eastern Kenya compared the child nutritional status across the agro-ecological zones of the area. Under nutrition rates were slightly more prevalent in low potential areas compared to high potential areas but with no differences observed in the nutritional indices studied (Bukania *et al*., 2014).

5.5 Factors associated with dietary intake and diversity

Some of the factors that were associated with MDD of children across the two agro-ecological zones included education level, household income, slow feeding and MMF. Paying attention during feeding while doing it slowly, patiently and encouraging the child to eat without forcing them could be a factor contributing towards consuming a diverse diet. This is in line with the principles of responsive feeding which include feeding infants directly, assisting older children when feeding themselves together with feeding patiently and slowly without force feeding (Engle *et al.,* 2000).

Caregiver educational level is recognized as an important factor that contributes to diet diversity of a child. This was reflected in the present study where caregivers from low potential area with high education level were more likely to feed their children a diverse diet (Table 11a). This could be explained by the fact that educated caregivers are more likely to know more about child feeding practices and understand messages on the same. Previous studies in Ethiopia, Western Kenya, Nairobi and Tanzania reported similar findings (Kimani-Murage *et al*., 2011; Oduor *et al*., 2018; Shumey *et al*., 2013; Victor *et al*., 2012). In the present study, high household income in low potential area increased chances of meeting MDD requirement for children as it improves economic access to a variety of foods in household. This concurs with findings from a study done in Ethiopian (Solomon *et al*., 2017) where households with high income were more likely to feed their children with a diverse diet. Achieving MMF was also associated with MDD where children who met the MMF requirement from low potential area had an increased chance of achieving MDD while those from high potential area had a reduced chance of achieving MDD (Table 11a and 11b). Most caregivers from low potential areas reported feeding their children themselves which would allow them to ensure that the frequent meals that child consumes are diverse. This also explains why children from low potential area who ate a diverse diet were more likely to attain MMF.

On the contrary, caregivers from high potential area reported that someone else other than them fed that child (Table 8b) therefore there is a possibility of attention not given on diversity of child's diet. Additionally, a common child feeding practice observed in this study area was preparation of porridge for child in morning in large amounts, and used to feed the child on demand throughout the day. This means that the child will then be fed by whoever is left in charge of feeding him/her, which is commonly the older sibling. This would therefore contribute to meal frequency but not diversity and thus a possible explanation for children not consuming a diverse diet in high potential area although they achieved MMF (Table 11b). This finding is however contrary to a study in Western Kenya which showed that households in high agricultural potential area often meet MMF requirement due to readily available food compared to low potential area (Waswa *et al*., 2015).

Other factors that were associated with MMF included active feeding and child's gender. Male children from high potential area were more likely to be fed frequently than their female counterparts. This could be explained by common traditional practice that discriminate on female feeding with sense that male child needs more food than female as observed in a study in Eastern Ethiopia (Semahegn *et al*., 2014).

5.6 Association between child diet adequacy and nutritional status

The study findings demonstrated a positive association between MDD, MMF and MAD with weight for length z-scores of children from high potential areas. This concurs with other studies from Ghana (Darapheak *et al*., 2013; Saaka *et al*., 2015) where MDD and MMF influenced weight for length z-scores of children. This association was not observed in low potential area thus elaborating the different dynamics existing across agro-ecological zones. The lack of any association in low potential areas could be explained by low economic status which limit access to an adequate diet as it was determined that economic status influenced intake of adequate diet in Ethiopia (Solomon *et al*., 2017).

Earlier studies have determined a positive association between diet adequacy indicators (MDD and MMF) and nutritional status of children in Burkina Faso, Bangladesh, Ethiopia and Zambia and in a meta-analysis of 11 demographic and health data (Arimond & Ruel, 2004; Disha *et al*., 2012; Prosper *et al*., 2006; Rah *et al*., 2010). Another study in Bangladesh observed positive stunting outcome among infants whose diets met the MAD requirement (Owais *et al*., 2016). In contrast, there were no association between diet adequacy indicators and stunting or wasting in both agro-ecological zones in the current study. The findings showed that MDD, MMF and MAD positively influence childhood underweight therefore interventions

should emphasize diet adequacy in order to improve nutritional outcomes of children. This further clarifies the different dynamics existing across the agro-ecological zones since diet adequacy associated differently with nutritional outcomes.

CHAPTER 6
CONCLUSIONS AND RECOMMENDATIONS

6.1 Introduction

This chapter presents the conclusions and recommendations made from the study findings. It also gives suggestions for further research in this area.

6.2 Conclusions

From the study results, the following conclusions were made:

i) Caregivers' knowledge on infant and young child nutrition (IYCN) was low across the two agro-ecological zones.

ii) Attitudes on IYCN were similarly poor due to the low levels of knowledge on IYCN.

iii) Practices on IYCN varied across the two agro-ecological zones.

iv) Majority of the children met the minimum diet diversity (MDD) requirement of consuming foods from at least four out of seven food groups.

v) Minimum meal frequency (MMF) was well adhered to and was significantly different across the agro-ecological zones.

vi) Minimum acceptable (MAD) was poorly attained implying a challenge in meeting MDD and MMF requirements concurrently.

vii) There were no significant differences under nutrition rates of children between the two agro-ecological zones.

viii) Positive attitudes towards iron deficiency anaemia increased chances of attaining MDD and MAD in low potential areas while high knowledge on IYCN increased chances of attaining MMF in high potential areas

ix) MDD, MMF and MAD were all associated with childhood underweight in the high potential areas only.

6.3 Recommendations

The following are recommendations made based on the study findings:

i) The Rongai sub-county nutrition department to carry out nutrition and health education interventions to promote caregivers' knowledge on IYCN.

ii) There is need for behaviour change communication interventions through the sub-county health and nutrition team, to promote proper responsive feeding practices among caregivers.

iii) Community nutrition team of Rongai sub-county need to conduct participatory cooking trainings and demonstrations on preparation of diverse complementary meal using locally available foods.

iv) The recommended interventions should be designed specifically to the agro-ecological zones since factors concerning IYCN have been observed to vary across the two agro-ecological zones of Rongai sub-county.

v) Nakuru county government and other stakeholders need to develop policies that target alleviating the risks and/or under nutrition in Rongai sub-county.

6.4 Suggestions for further research

The following research areas should be considered to better understand dynamics of the relationship between caregivers' KAP regarding IYCN, dietary adequacy and nutritional status;

i) Assessment of seasonal variation in dietary adequacy of children aged 6-23 months in the two agro-ecological zones of Rongai sub-county.

ii) Investigate whether access to health facilities would impact nutritional outcomes of children in Rongai sub-county.

iii) Assessment of the impact of nutrition education and behaviour change communication interventions on caregivers' KAP regarding IYCN.

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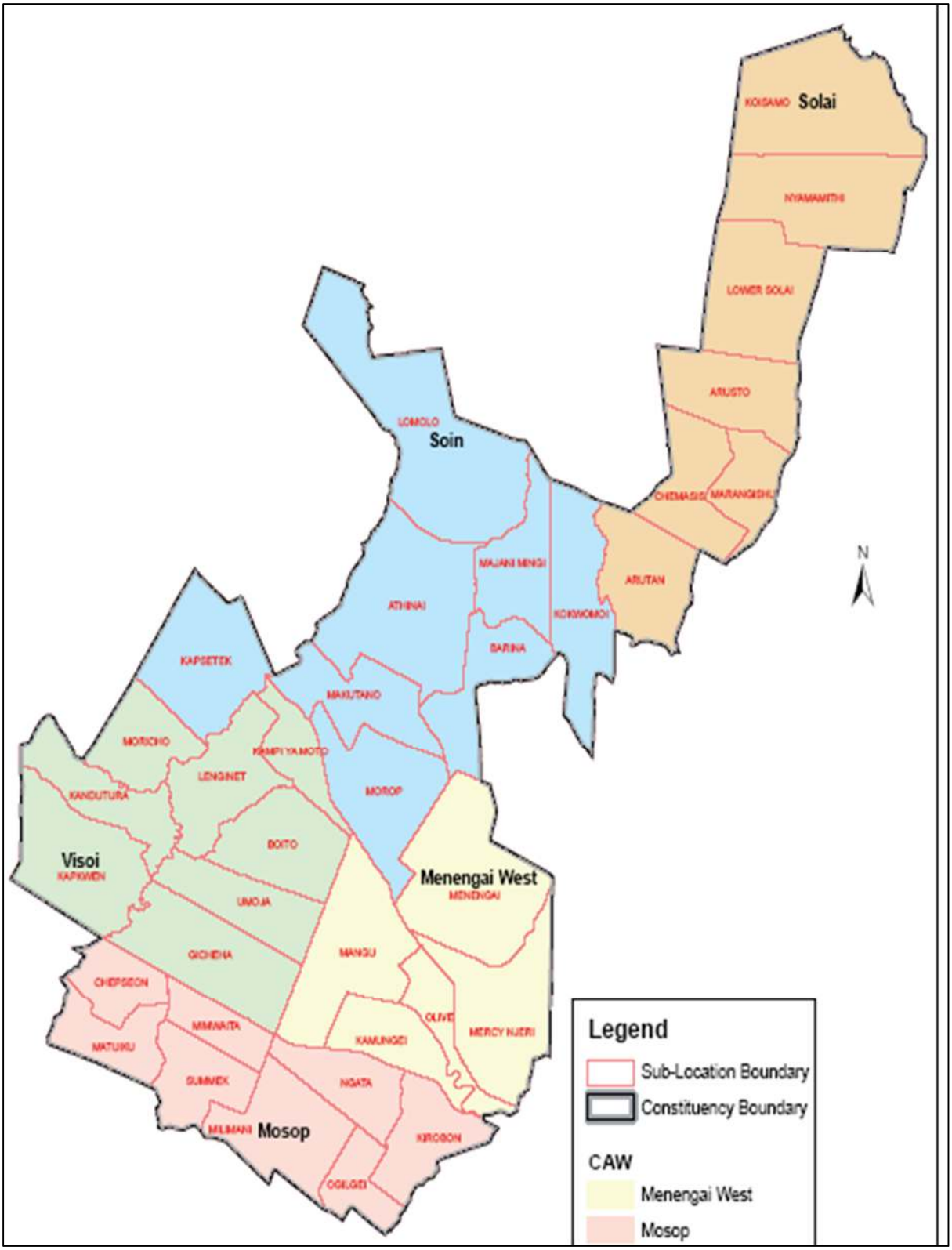
APPENDIX I

Map of Rongai Sub County, Nakuru County



(Nakuru County Integrated Development Plan, 2013).

APPENDIX II

Contribution of Caregivers' Young Child Nutrition Knowledge, Attitudes and Practices to Diet Adequacy and Nutritional Status of Children Aged 6-23 Months in Rongai Sub-county

Introductory letter and Consent form

Hello, my name is Sharon Kemboi. I am a student at Egerton University conducting a study on the knowledge, attitudes and practices of caregivers of children aged 6-23 months regarding infant and young child nutrition. Your household has been selected to represent the households in the village forth is study. I will ask the caregiver of the child between 6 and 23 months questions about the foods she and her child consume and how she thinks about diets and nutrition of the child.

This study carries no harm to you, your household or the community. Your participation in this study is voluntary and there was no direct benefit. However, the information that was gathered from this research was used by others stakeholders including the government to formulate other projects and to improve the quality of services offered to you in this village. Any records relating to you and your household were strictly confidential. Your names and those of your household members will not be used in any reports from the study.

This study does not interfere with your rights in any way; you can decide to participate in this study or not to. You are also free not to answer any questions and to withdraw from the interview at any stage of the interview.

If you have any further questions regarding this study and your rights as a participant, you can contact the concerned through the information contained in this form.

If you agree to participate please sign below.

Participant

Name_____ Sign _____

Date_____

Study coordinator

Name_____ Sign _____

Date_____

Cell phone: _____

APPENDIX III

Contribution of Caregivers' Young Child Nutrition Knowledge, Attitudes and Practices to Diet Adequacy and Nutritional Status of Children Aged 6-23 Months in Rongai Sub-county

Socio-demographic and KAP questionnaire for caregivers

I am going to ask you some questions about nutrition of children from 6-23 months old. Please let me know if you need me to clarify any of my questions. Feel free to ask any question you may have.

1. General Information

1.1 Household ID		1.3 Location	
1.2 Date of interview		1.4 Sub-location	
		1.5 Village	

2. Mother or Primary Care Giver

2.1	What is your name?	
2.2	How old are you? (*record age in years*)	
2.3	Marital Status 1= married 2= Single 3= window 4= Separated	
2.4	Relationship to H/H Head 1= wife 2=Daughter 3= Other----------Specify 88	
2.5	What is your religion? 1=Muslim 2= Christian 99 Others-Specify----------	
2.6	What is your ethnicity? 1= Kalenjin 2=Kikuyu 3=Kisii 88 Others Specify--------	
2.7	How many years of education did you complete? 1=None 2=Primary 3= Secondary 4=Tertiary 88=Others, Specify----------	
2.8	Are you lactating? *1= yes; 2 = no*	
2.9	Are you pregnant? *1= yes; 2 = no*	
2.10	If yes, how many months? 1= 1st trimester, 2= 2nd trimester 3=3rd trimester	
2.11	How Many Children do you have?	

3. Child aged6-23 months

The mother was asked to recall the food consumed by the child 6-23 months old in the last 24 hours. If there is more than one child in this age group, ask her to refer to the youngest.

3.1	What is the child's name? *(record)*	
3.2	Do you know the date of birth of (*name of child*) or have it written down? (Yes=1, No=2)	
3.3	*If known*, What is the date of birth? (*DD/MM/YYYY)*	
3.4	If date of birth given, was it verified on a written record such as a health card or birth certificate? (Yes=1, No=2)	
3.5	*If date of birth is unknown,* Please estimate in the nearest full month the age of the child (record child age in months)	
3.6	What is the sex of the child? (Male=1;Female=2)	

4. Health

Child's Health		
	Question	Code
4.1	Has [*child's name*] experienced fever in the past two weeks? (Yes=1;No=2)	
4.2	Has [*child's name*] experienced cough or cold in the past two weeks? *(Yes=1;No=2)*	
4.3	Has [*child's name*] experienced Fast breathing or shortness of breath in the past two weeks? *(Yes=1;No=2)*	
4.4	Has [*child's name*] experienced diarrhoea in the past two weeks? (Yes=1;No=2)	
4.5	Has [*child's name*] been diagnosed with parasites in the last 6 months? *(Yes=1, No=2)*	
4.6	Has [*child's name*] been treated for parasites in the last 6 months? (Yes=1, No=2)	
4.7	Are you currently giving your child any vitamin or health supplements (powders, liquids, sprinkles etc)? *(Yes=1, No=2)*	
4.8	If yes, what are they? (record)	

5. Feeding young children (6–23 months)

PRACTICES

5.1	At what age did you start giving (name of child) other liquids or semi-solid/solid foods apart from breast milk? (Please verify by asking other household members) Record age in months in the column on the right If weeks record: _____weeks Don't know = 88	
5.2a	Do you sometimes give (name of child) any foods from the family pot? 1= yes ; 2= no =>Q	
5.2b	*If yes:* Did you do anything to the food from the family pot to make it suitable for (name of child)? 1= yes; 2= no =>Q	
5.2c	*If yes:* What do you do to the food from the family pot to make it suitable for (name of child)? This refers to whether anything was added and whether the food was mashed, chopped etc. Probe the mother to find out what she did to the food before feeding it to the child. What did you add? _____ 7.2d What else was done to the food? (E.g. mash, chop etc.)?_____	
5.3	**Do you USUALLY prepare special meals for your child?** Special meal is a meal which was not consumed among other family members and was cooked to feed the child only**.** 1= yes =>Q; 2= no	
5.3	*If no,* why don't you prepare extra foods for your child? Do not read out the list, probe for further responses. More than one answer is possible. RECORD 1=yes, 2= no	
	Lack of time	
	No food	
	Don't know how to do it	

	Child is old enough to eat family food	
	Other (specify)	
	88= don't know	
5.4	Was (name of child)'s intake of solid, semisolid or soft food yesterday different from usual? 1= yes; 2= no; 88= don't know	
5.5a	Did you prepare any special meals for (name of child) yesterday? 1= yes =>Q; 2= no	
5.5b	**If no, What prevented you from preparing any special meals for (name of child) yesterday?** Do not read out the list, probe for further responses. More than one answer is possible. RECORD 1=yes, 2= no	
	Lack of time	
	Do not know how to do it	
	No food available	
	Child old enough to eat family food	
	Other (Specify):_____	
5.6	How did (name of child) receive the food yesterday? 1= The child ate by him/herself 2= The child was fed by me 3= The child was fed by someone else *99= Other (specify)* _____	
5.7a	Does (name of child) use a separate bowl/plate/cup for feeding? 1=yes; 2=no=>Q	
5.7b	If yes, why do you think it is important for (name of child) to use a separate bowl/plate/cup for feeding? Record response 88= do not know	
5.7c	*If no,* please name the reason why (name of child) does not use a separate bowl/cup when feeding. Record response	

5.8a	Is (name of child) still being breastfed? 1= yes =>Q; 2= no	
5.8b	If (name of child) is not breastfed anymore, at what age (in months) did (name of child) stop breastfeeding? Record age in months 88= don't know	
5.8.c	Why did you stop breastfeeding (name of child)? 1= not enough breast milk 2= no time to breastfeed 3= baby refused to breastfeed 4= wanted to stop (child old enough) 5= next pregnancy 6= breastfeeding younger child 7= feel too weak 99=other (specify)___	
5.9	Was (name of child) breastfed yesterday during the day and/or at night? 1= yes; 2= no =>27	
5.10	What do you usually do to ensure that (name of child) eats his portion of food? Do not read out the list, probe for further responses. More than one answer is possible. RECORD 1=yes, 2= no	
	Actively participates in the feeding	
	Feeds child slowly and patiently	
	Minimize distractions	
	99=Other (Specify):_____	
7.11	What do you usually do when (name of child) refuses to eat a particular food? Do not read out the list, probe for further responses. More than one answer is possible. RECORD 1=yes, 2= no	
	Do not give the child the particular food again until child is much older	

	Try giving the particular food again after a few days	
	Combine the particular food with other foods	
	Force the child to eat the particular food	
	Other (Specify):_____	

KNOWLEDGE

5.12	How long is it recommended that a woman breastfeeds her child? Probe if necessary: Until what age is it recommended that a mother continues breastfeeding? 1 = Six months or less 2 = 6–11 months 3 = 12–23 months 4 = 24 months and more (correct response) 5 = Other (specify: _____) 88 = Don't know	
5.13	At what age should babies start eating foods in addition to breast milk? 1 = At six months 2 = Other 88 = Don't know	
5.14	Why is it important to give foods in addition to breast milk to babies from the age of six months? 1 = Breastmilk alone is not sufficient (enough)/cannot supply all the nutrients needed for growth/from six months, baby needs more food in addition to breastmilk 2 = Other 88 = Don't know	
5.15	Please look at these two pictures of porridges. Which one do you think should be given to a young child? (Show the images/pictures of thick and watery/thin porridges and tick one of the options here below depending on the respondent answer**.)**	

	1 = Shows the thick porridge 2 = Shows the watery 88 = Does not know	
5.16	Why did you pick that picture? 1 = Because the first porridge is thicker than the other 2 = Because the thick porridge is more nutritious/because it is prepared with different types of foods or ingredients (food diversity) 3 = Other (specify_____) 88 = Don't know	
5.17	To feed their children, many mothers give them porridge. Please tell me some ways to make porridge more nutritious or better for your baby's health. Probe if necessary: Which foods or types of food can be added to rice porridge to make it more nutritious? First record the exact answer hereunder and then fill in for the options below if foods from this group have been cited = 1; or not = 2 _____ _____	
	Animal-source foods (meat, poultry, fish, liver/organ meat, eggs, etc.)	
	Pulses and nuts: flours of groundnut and other legumes (peas, beans, lentils, etc.), sunflower seed, peanuts, soybeans	
	Vitamin-A-rich fruits and vegetables (carrot, orange-fleshed sweet potato, yellow pumpkin, mango, papaya, etc.)	
	Green leafy vegetables (e.g. spinach)	
	Energy-rich foods (e.g. oil, butter/ghee)	
	Other	
	Don't know	
5.18	Whom do you ask for advice when you have a question about feeding your child? Do not read out the list, probe for further responses. More than one answer is possible. RECORD 1= yes, 2= no	

	Health professional (Health worker, hospital	
	Mother	
	Mother in law	
	Grandmother	
	Friend/neighbour	
	99=Other (specify	
5.19	Who decides how you feed your child? Do not read out the list, probe for further responses. More than one answer is possible. RECORD 1=yes, 2= no	
	Myself	
	Husband/partner	
	Mother	
	Grandmother	
	Mother in law	
	99= Other (specify	
5.20	In the past month did you see or hear any message about complementary feeding? 1=yes; 2=no =>Q7	
5.21	*If yes,* where did you see or hear it? Do not read out the list, probe for further responses. More than one answer is possible. RECORD 1=yes, 2= no	
	Health institution (Health centre, hospital, dispensary, clinic)	
	Radio	
	Television	
	99 =Other (specify)	

ATTITUDES

5.22a	Are you confident that you can prepare food for your child? 1 = Not confident 2 = Ok/so-so 3 = Confident	

5.22b	*If Not confident:* Can you tell me the reasons why you do not feel confident? _____ _____	
5.23	How good do you think it is to give different types of food to your child each day? 1 = Not good 2 = You're not sure 3 = Good	
5.23	*If not good:* Can you tell me the reasons why it is not good? _____ _____	
5.24a	Is it difficult for you to give different types of food to your child each day? 1 = Not difficult 2 = So-so 3 = Difficult	
5.24b	*If Difficult:* Can you tell me the reasons why it is difficult? _____ _____	
5.25a	How good do you think it is to feed your child several times each day? 1 = Not good 2 = You're not sure 3 = Good	
5.25b	*If not good:* Can you tell me the reasons why it is not good? _____ _____	
5.26a	How difficult is it for you to feed your child several times each day? 1 = Not difficult 2 = So-so 3 = Difficult	
5.26b	*If Difficult:* Can you tell me the reasons why it is difficult?	

	_____ _____	
5.27a	How good do you think it is to continue breastfeeding beyond six months? 1 = Not good 2 = You're not sure 3 = Good	
5.27b	*If Not good:* Can you tell me the reasons why it is not good? _____ _____	
5.28a	How difficult is it for you to continue breastfeeding beyond six months? 1 = Not difficult 2 = So-so 3 = Difficult	
5.28b	*If Difficult:* Can you tell me the reasons why it is difficult? _____ _____	

6. Food based dietary guidelines and dietary diversity

KNOWLEDGE

6.1a	Have you ever seen the following? (Show picture of food pyramid) 1=yes; 2=no	
6.1b	*If yes,* what does it communicate (tell us)? Record responses Food pyramid: _____	
6.2	How many food groups do you know (from the pyramid or circle)? Please cite them as well as 3 example foods per group 6.2.1.food group: Example foods: 1=1 example 2=2 examples 3=3 examples	

	6.2.2. food group: Example foods: 1=1 example 2=2 examples 3=3 examples 6.2.3.food group: Example foods: 1=1 example 2=2 examples 3=3 examples 6.2.4. food group: Example foods: 1=1 example 2=2 examples 3=3 examples 6.2.5.food group: Example foods: 1=1 example 2=2 examples 3=3 examples 6.2.6. food group: Example foods: 1=1 example 2=2 examples 3=3 examples	
6.3	Have you heard about the term "diverse diet?" 1=yes; 2=no =>Q	
6.3	**Where did you hear about a "diverse diet"?** Do not read out the list, probe for further responses. More than one answer is possible. RECORD 1=yes, 2= no	
	Health institution (Health centre, hospital, dispensary, clinic	
	Extension/community workers	
	Radio	
	Television	
	From the elder (traditions)	
	99 =Other (specify)_____	
6.4	What types of food would you give to your child in one day so that it is diverse? Record the response: 1. _____ 2. _____ 3. _____	

	88= do not know	

ATTITUDES

6.4a	How important is it to have a diversified diet? 1 = Not important 2 = You're not sure 3 = Important	
6.4b	*If Not important:* Can you tell me the reasons why it is not important? _____ _____	
6.5a	How confident do you feel in preparing a diversified diet for your child 1 = Not confident 2 = Ok/so-so 3 = Confident	
6.5b	*If Not confident:* Can you tell me the reasons why you do not feel confident? _____ _____	
6.6	What are some of the challenges you face when trying to feed (name of child) a diversified diet (different types of foods) in this period? Do not read out the list, probe for further responses. More than one answer is possible. RECORD 1=yes, 2**=no**	
	Foods are not available => GO TO Q8.7	
	Lack of money to buy the different foods	
	Lack of time to prepare the foods	
	Do not know how to prepare some foods	
	Other (Specify)_____	
6.7	If "Foods are not available": Which foods are not available in this period? More than one answer is possible. Please specify the type of foods. RECORD 1=yes, 2=no Food group	

	Staples (type of food: _____) Vegetables (type of food: _____) Fruits (type of food: _____) Pulses, nuts, seeds (type of food: _____) Animal source foods (type of food:_____ Fats and oils(type of food: _____)	

PRACTICES

6.8	How many main meals and snacks do you usually give (name of child) each day?	
6.9	No. of meals per day	
6.10	No. of snacks	
6.11	Total meals	
6.12	What type of snacks do you usually buy/give (name of child) between meals? Record the responses 1. _____ 2. _____ 3. _____	
6.13	Do you currently feed your child any vegetables? 1= yes; 2= no =>Q ;88=don't know If No, go to 8.13e	
6.13	*If yes,* which vegetables do you feed your child on? List all the responses 1. _____ 2. _____ 3. _____	

6.13c	Why do you feed your child vegetables? Do not read out the list, probe for further responses. More than one answer is possible. RECORD 1=yes, 2= no	
	I was told by the health worker	
	It is good for my child	
	Everybody does it	
	88= don't know	
	99= Other (specify)_____	
6.13d	What factors do you consider when choosing vegetables for your child? Do not read out the list, probe for further responses. More than one answer is possible. RECORD 1= yes, 2= no	
	Price	
	Availability	
	Taste	
	Freshness	
	Colour	
	Texture	
	99= Others (Specify)_____	
6.13e	*If no,* why don't you feed your child any vegetables? Do not read out the list, probe for further responses. More than one answer is possible. RECORD 1=yes, 2= no	
	They are not safe	
	Texture is not appropriate for children	
	Taste is not appropriate for children	
	They are expensive	
	Not available	
	99= Others (Specify)_____	
6.14a	Do you currently feed your child any fruits? 1= yes; 2= no ;88=don't know If NO go to 8.14e	
6.14b	*If yes,* which fruits do you feed your child on? List all the responses 1. _____	

	2. _____ 3. _____	
6.14c	Why do you feed your child fruits? Do not read out the list, probe for further responses. More than one answer is possible. RECORD 1=yes, 2= no	
	I was told by the health worker	
	It is good for my child	
	Everybody does it	
	88= don't know	
	99= Other (specify)_____	
6.14d	What factors do you consider when choosing fruits for your child? Do not read out the list, probe for further responses. More than one answer is possible. RECORD 1= yes, 2= no	
	Price	
	Availability	
	Taste	
	Freshness	
	Colour	
	Texture	
	99= Others (Specify)_____	
6.14e	*If no,* why don't you feed your child any fruits? Do not read out the list, probe for further responses. More than one answer is possible. RECORD 1=yes, 2= no	
	They are not safe	
	Texture is not appropriate for children	
	Taste is not appropriate for children	
	They are expensive	
	Not available	
	99= Others (Specify)_____	
6.15a	Do you currently feed your child any animal source foods? 1= yes; 2= no 88=don't know If NO go to 8.15e	

6.15b	*If yes,* which animal source foods do you feed your child on? List all the responses 1. _____ 2. _____ 3. _____	
6.15c	Why do you feed your child animal source foods? Do not read out the list, probe for further responses. More than one answer is possible. RECORD 1=yes, 2= no	
	I was told by the health worker	
	It is good for my child	
	Everybody does it	
	88= don't know	
	99= Other (specify)_____	
6.15d	What factors do you consider when choosing animal source foods for your child? Do not read out the list, probe for further responses. More than one answer is possible. RECORD 1= yes, 2= no	
	Price	
	Availability	
	Taste	
	Freshness	
	Colour	
	Texture	
	99= Others (Specify)_____	
6.15e	*If no,* why don't you feed your child any animal source foods? Do not read out the list, probe for further responses. More than one answer is possible. RECORD 1=yes, 2= no	
	They are not safe	
	Texture is not appropriate for children	
	Taste is not appropriate for children	
	They are expensive	
	Not available	
	99= Others (Specify)_____	

7. Iron-deficiency anaemia

KNOWLEDGE

7.1	Have you heard about the nutrient called iron*1=yes; 2=no*	
7.2	What are the health risks for infants and young children of a lack of iron in the diet? 1= Delay of mental and physical development 2 = Other (specify_____) 88 = Don't know	
7.4	Have you heard about iron-deficiency anaemia? *1=yes ; 2=no ; 88 = Don't know/no answer*	
7.5	What causes anaemia? Do not read out the list, probe for further responses. More than one answer is possible. RECORD 1=yes, 2= no	
	Lack of iron in the diet/eat too little, not much	
	Sickness/infection (malaria, hookworm infection, other infection such as HIV/AIDS)	
	Heavy bleeding during menstruation	
	Other (specify_____)	
	88 = Don't know	
7.6	How can anaemia be prevented? Do not read out the list, probe for further responses. More than one answer is possible. RECORD 1=yes, 2= no	
	1= Eat/feed iron-rich foods/having a diet rich in iron	
	2 = Eat/give vitamin-C-rich foods during or right after meals	
	3 = Take/give iron supplements if prescribed	
	4 = Treat other causes of anaemia (diseases and infections) – seek health-care assistance	
	5 = Continue breastfeeding (for infants 6–23 months old)	
	6 = Other(specify_____)	
	88 = Don't know	
7.7	Can you list examples of foods rich in iron?	

7.8	When taken during meals, certain foods help the body absorb and use iron. What are those foods? 1 = Vitamin-C-rich foods, such as fresh citrus fruits (orange, lemons, etc.) 2 = Other (specify_____) 88 = Don't know	
7.9	Some beverages decrease iron absorption when taken with meals. Which ones? Do not read out the list, probe for further responses. More than one answer is possible. RECORD 1=yes, 2= no	
	Coffee	
	Tea	
	Other	
	Don't know =88	

ATTITUDES

7.10a	How likely do you think your child is to be iron-deficient/anaemic? OR How likely do you think you are to be iron-deficient/anaemic? 1 = Not likely 2 = You're not sure 3 = Likely	
7.10b	*If Not likely:* Can you tell me the reason why it is not likely? _____	
7.11a	How serious do you think iron-deficiency/anaemia is? 1 =. Not serious 2 = You're not sure 3 = Serious	
7.11b	*If Not Serious:* Can you tell me the reason why it is not serious? _____	
7.12a	How good do you think it is to prepare meals with iron-rich foods such as beef, chicken or liver? 1 = Not good 2 = You're not sure	

	3 = Good	
7.12b	*If Not good:* Can you tell me the reasons why it is not good? _____	
7.13	How difficult is it for you to prepare meals with iron-rich foods? 1 = Not difficult 2 = So-so 3 = Difficult	
7.13	*If Difficult:* Can you tell me the reasons why it is difficult? _____	
7.14a	How confident do you feel in preparing meals with iron-rich foods? 1 = Not confident 2 = Ok/so-so 3 = Confident	
7.14b	*If Not confident:* Can you tell me the reasons why you do not feel confident? _____	

8. Vitamin A deficiency

KNOWLEDGE

8.1a	Have you heard about vitamin A deficiency or lack of vitamin A? Yes = 1; No = 2; Don't know/no answer = 88	
8.1b	**If Yes: Can you tell me how you can recognize someone who lacks vitamin A in his or her body?** Do not read out the list, probe for further responses. More than one answer is possible. RECORD 1=yes, 2= no	
	Weakness/feels less energetic	
	Be more likely to become sick (less immunity to infections)	
	Eye problems: night blindness (inability to see at dusk and in dim light), dry eyes, corneal damage, blindness	
	Other (specify:_____)	
	Don't know = 88	

8.2	**What causes a lack of vitamin A in the body?** Do not read out the list, probe for further responses. More than one answer is possible. RECORD 1=yes, 2= no	
	Poor variety of foods	
	Eat too little food/not eat much (poor intake)	
	Other (specify:_____)	
	Don't know = 88	
8.3	**How can one prevent a lack of vitamin A in the body?** Do not read out the list, probe for further responses. More than one answer is possible. RECORD 1=yes, 2= no	
	Eat/feed vitamin-A-rich foods – having/giving a diet rich in vitamin A	
	Eat/feed foods fortified with vitamin A	
	Give vitamin A supplements	
	sprinkles	
	Other (specify:_____)	
	Don't know = 88	
8.4	When taken during meals, certain foods help the body absorb and use Vitamin A. What are those foods? 1 = Oils 2=Margarine/Butter 3 = Other (specify_____) 88 = Don't know	
8.5	Can you list examples of foods rich in vitamin A? *Probe if necessary:* Do you know of any animal-source foods, vegetables or fruits that are rich in vitamin A?	

ATTITUDES

8.2a	How likely do you think your child is to lack vitamin A in his/her body? OR How likely do you think you are to lack of vitamin A in your body?	

	1 = Not likely 2 = You're not sure 3 = Likely	
8.2b	*If Not likely:* Can you tell me the reason why it is not likely? _____	
8.3	How serious do you think a lack of vitamin A is? 1 = Not serious 2 = You're not sure 3 = Serious	
8.3	*If Not Serious*: Can you tell me the reason why it is not serious? _____	
8.4a	How good do you think it is to prepare meals with vitamin-A-rich foods such as carrots, green leafy vegetables, orange fleshed sweet-potatoes or liver? 1 = Not good 2 = You're not sure 3 = Good	
8.4b	*If Not good:* Can you tell me the reasons why it is not good? _____	
8.5a	How difficult is it for you to prepare meals with vitamin-A-rich foods? 1 = Not difficult 2 = So-so 3 = Difficult	
8.5b	*If Difficult:* Can you tell me the reasons why it is difficult? _____	
8.6a	How confident do you feel in preparing meals with vitamin-A-rich foods? 1 = Not confident 2 = Ok/so-so 3 = Confident	
8.6b	*If Not confident:* Can you tell me the reasons why you do not feel confident? _____	

9. Personal hygiene

PRACTICES

9.1	Could you please describe step by step how you wash your hands? _____ Once you have written the answer, enumerator to check with yes or no, the following answer options. More than one answer is possible. RECORD 1=yes, 2= no	
	Washes hands in a bowl of water (sharing with other people) — poor practise	
	With someone pouring a little clean water from a jug onto one's hands — appropriate practise	
	Under running water — appropriate practise	
	Washes hands with soap or ashes	
	Other (specify _____)	
	Don't know/no answer =88	

KNOWLEDGE

9.2	Food poisoning often results from contact with germs from faeces. What can you do to avoid sickness from germs from human or animal faeces? *Do not read out the list, probe for further responses. More than one answer is possible. RECORD 1=yes, 2= no*	
	Wash hands (after going to the toilet and cleaning the baby's bottom)	
	Remove faeces from the home and surroundings (use a latrine, teach small children to use a potty and put children's faeces in the latrine, and clean up faeces from animals)	
	Other (specify _____)	
	Don't know/no answer =88	
9.3	There are key moments when you need to wash your hands to prevent germs from reaching food. What are these key moments? *Do not read out the list, probe for further responses. More than one answer is possible. RECORD 1=yes, 2= no*	

	After going to the toilet/latrine	
	After cleaning the baby's bottom/changing a baby's nappy	
	Before preparing/handling food	
	Before feeding a child/eating	
	After handling raw food	
	After handling garbage	
	Other (specify _____)	
	Don't know/no answer =88	

10. Water and sanitation

10.1	What is the main source of water used by your household for drinking, cooking and hand washing? 1=Piped water into dwelling; 2 = Piped into yard or plot; 3= Public tap/standpipe: 4= Tube well/borehole; 5 =Dug well protected; 6 = Dug well unprotected; 7 = Water from protected spring;8= water from unprotected spring; 9 = rainwater collection; 10= Tanker-truck; 11 = Cart with small tank/drum; 12= Surface water (river, stream, dam, lake, pond, canal, irrigation channel); 13= Bottled water; 14 =Other (specify) _____ Don't know = 88	
10.2	How do you treat the item you use to collect water? Did you treat it in any way to make it clean? 0 = no treatment 1 = Use of water and soap (clean container) 2 = Other Don't know/no answer = 88	
10.3	Could you describe how you store water? 1 = Clean container or jar 2 = Covered container or jar 3 = Clean and covered container or jar 4 = Other Don't know/no answer =88	
10.4	Do you treat your water in any way to make it safe to drink?	

	1= Yes; 2= No; Don't know/no answer =88	
10.5	**What do you usually do to the water to make it safer to drink?** Do not read out the list, probe for further responses. More than one answer is possible. RECORD 1=yes, 2= no	
	Boil it	
	Add bleach/chlorine	
	Strain it through a cloth	
	Use a water filter (ceramic, sand, composite, etc.)	
	Use solar disinfection	
	Let it stand and settle	
	Other (specify_____)	
	Don't know/no answer=88	

KNOWLEDGE

10.6	If you know that the water you are going to use for cooking or drinking is not safe or does not come from a safe source, what should you do? *Do not read out the list, probe for further responses. More than one answer is possible. RECORD 1=yes, 2= no*	
	Boil it	
	Add bleach/chlorine	
	Strain it through a cloth	
	Use a water filter (ceramic, sand, composite, etc.)	
	Use solar disinfection	
	Let it stand and settle	
	Other (specify_____)	
	Don't know/no answer	

APPENDIX IV

Contribution of Caregivers' Young Child Nutrition Knowledge, Attitudes and Practices to Diet Adequacy and Nutritional Status of Children Aged 6-23 Months in Rongai Sub-county

Qualitative 24-hour recall

Interview Date:		Day of the week for recall:	
Caregiver:		Childs Name:	
		Recall number: 1 2	
Was yesterday a celebration or feast day where the child ate unusual foods?1=Yes 2= No			|_|
Did the child feel unwell yesterday?1=Yes 2= No			|_|

Quick list for the Index child

Time	Dish/food

Age in month's _____ Recall No._____ Day of recall_____

Page _____of _____

Time	[1]Meal code	[2]Place of preparation	Dish		Ingredients				[3]Preparation method	Total Quantity cooked		Quantity of food served		Plate waste		Quantity consumed	
			Description of dish/food	Description	Quantity	Unit	[4]Source	[5]Wild		Quantity	Unit	Quantity	Unit	Quantity	Unit	Quantity	Unit
A	B	C	D	E	F	H	I	J	K	L	M	N	O	P	Q	R	S

APPENDIX V

Contribution of Caregivers' Young Child Nutrition Knowledge, Attitudes and Practices to Diet Adequacy and Nutritional Status of Children Aged 6-23 Months in Rongai Sub-county

Child Dietary Diversity Questionnaire Household ID----------Date----------

Meal code: 1=before breakfast 2=breakfast 3=midmorning 4=lunch 5=afternoon 6=dinner/supper 7=before sleep 8=during night
Place: 1=home 2=outside home
Preparation 1=raw 2=boiled 3=steamed 4=fried 5=roasted 6=others (specify)
Source: 1=own production 2=purchase 3=gifts/aid 4=others (specify)
Wild: 1=yes 2=no

I would like to ask you about the types of food the child ate yesterday during the day and night in the home. Start with the first food eaten in the morning.

Q NO	Food Group	Examples	YES(1) /NO (0)
1	Grains, roots and tubers	Bread, biscuits or any food made from millet, sorghum, maize, rice, wheat White potatoes, white yams, cassava or foods made from roots Pumpkin, carrots, squash, sweet potatoes (orange fleshed) (insert local foods e.g.ugali, rice porridge)	
2	Legumes, nuts and seeds	Beans, lentils, green grams, groundnuts, cashew nuts, pumpkin seeds, sunflower seeds and any other legumes, nuts and seeds available.	
3	Dairy products	Milk, cheese, yoghurt, ghee, *maziwa mala* and any other milk products	
4	Eggs		
5	Flesh foods	Beef, pork, lamb, goat, rabbit, wild game, chicken, duck or other birds. Liver, kidney, heart or other organ meats or blood based foods	
6	Vitamin A rich fruits and vegetables	Ripe mangoes, papayas, pumpkin, dark green vegetables such as spinach, kales and other locally available vitamin A –rich fruits and vegetables.	
7	Fruits and vegetables	leafy vegetables, including wild ones locally available such as cassava leaves and other fruits including wild ones	

APPENDIX VI

Contribution of Caregivers' Young Child Nutrition Knowledge, Attitudes and Practices to Diet Adequacy and Nutritional Status of Children Aged 6-23 Months in Rongai Sub-county

Anthropometric Measurements Recording Form

HOUSEHOLD I.D_____

Child

Date of birth _____ Source _____ (1. Record 2. Recall)

Gender _____

	1st reading	2nd reading	3rd reading
Height (cm)			
Weight (Kg)			

Oedema present _____ (1. Yes. 2. No)

Notes:

_____

_____

_____

_____

_____

APPENDIX VII

Ethical Clearance from Egerton Research Ethics Committee

EGERTON **UNIVERSITY**

TEL: (051) 2217937
FAC: 051-221792

P. O. BOX 536
EGERTON

Ref: EU/DVRE/009

20th November 2015

Dr. Maureen Cheserek
Food & Nutrition Dept.
EGERTON UNIVERSITY

RE: APPLICATION FOR ETHICAL APPROVAL OF RESEARCH PROJECT

Reference is made to your application for Ethical clearance of your Research Project entitled "***Agrobiodiversity and dietary diversity for improved nutrition status of mother infant dyads in Rongai Sub-county*** The Egerton University Research Ethics Committee met on 10th November 2015 and considered your application.

It was observed that:

1. A similar topic had been cleared earlier by the EUREC (REF: - EU/DVC/RE/009 of 22nd July 2013).
2. Methodology: there is inconsistency in the sample size. It is not clear whether the FGD of 10 groups and approx. 10 individuals includes the 800 indicated in section 4(b). There is also mention of 400 HH in section 4.4.
3. There is no evidence of intrusive and extractive sampling as the study is limited to interviews. There is need for an informed consent/assent as appropriate (This form is not attached in the application form)
4. The application should also be explicit in ensuring privacy and confidentiality of the information collected.

It was decided that the Project be approved for implementation.

Please further note that the Standard Operating Procedures (SOPs) requires that you submit progress reports of your study to the Committee. You are also required to obtain Research permit from NACOSTI.

Prof. J. K. Kipkemboi
CHAIRMAN – RESEARCH ETHICS COMMITTEE

cc. DVC (R&E)] to see in file
Director Research]

JKK/pao

APPENDIX VIII: Research Authorization from National Commission for Science, Technology and Innovation

NATIONAL COMMISSION FOR SCIENCE, TECHNOLOGY AND INNOVATION

Telephone: +254-20-2213471, 2241349, 310571, 2219420
Fax: +254-20-318245, 318249
Email: secretary@nacosti.go.ke
Website: www.nacosti.go.ke
When replying please quote

9th Floor, Utalii House
Uhuru Highway
P.O. Box 30623-00100
NAIROBI-KENYA

Ref: No. **NACOSTI/P/16/48994/9498**

Date: **15th February, 2016**

Dr. Maureen Jepkorir Cheserek
Egerton University
P.O. Box 536-20115
EGERTON.

RE: RESEARCH AUTHORIZATION

Following your application for authority to carry out research on ***"Agrobiodiversity and dietary diversity for improved nutritional status of mother infant dyads in Rongai Sub County"*** I am pleased to inform you that you have been authorized to undertake research in **Nakuru County** for a period ending **15th February, 2017.**

You are advised to report to **the County Commissioner and the County Director of Education, Nakuru County** before embarking on the research project.

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

DR. M. K. RUGUTT, PhD, HSC.
DIRECTOR-GENERAL/CEO

Copy to:

The County Commissioner
Nakuru County.

The County Director of Education
Nakuru County.

APPENDIX IX

Publication

Original Research

Food and Nutrition Bulletin
2020, Vol. 41(2) 186-199

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SAGE

Variation in the Factors Associated With Diet Quality of Children Aged 6 to 23 Months in Low and High Agroecological Zones of Rongai Subcounty, Kenya

Sharon Kemboi, BSc[1], Dorothy Mungiria-Mituki, PhD[1], Rose Ramkat, PhD[2], Celine Termote, PhD[3], Namukolo Covic, PhD[4], and Maureen Jepkorir Cheserek, PhD[1]

Abstract

Background: Adequate quality complementary diets and appropriate feeding practices are important for proper growth and development of young children.

Objective: To assess factors associated with diet diversity, meal frequency, and acceptable diet of children aged 6 to 23 months in two agroecological zones of Rongai subcounty, Kenya.

Methods: A cross-sectional study was conducted among 384 mothers/caregivers with children aged 6 to 23 months. A structured questionnaire was used to assess sociodemographic characteristics and child feeding practices. Diet diversity, meal frequency, and acceptable diet were derived from a 24-hour recall of child's food intake. Factors associated with diet quality were determined using binary logistic regression.

Results: Mean child diet diversity score was 3.54 ± 1.0 of 7 food groups, with 56.8% of the children achieving minimum dietary diversity. A majority of the children (81.8%) received minimum meal frequency (MMF), with significant ($P < .05$) difference between low (91.1%) and high (75.2%) agricultural potential areas. Children who received minimum acceptable diet (MAD) were only 34.1%. Mother/caregiver education level positively ($P < .05$) associated with minimum diet diversity in low potential area (adjusted odds ratio [AOR] = 3.79, 95% CI: 1.47-9.75) and with MAD in high potential area (AOR = 1.87, 95% CI: 1.01-3.46). Other factors associated with MDD, MMF, and MAD included

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