THE ASSOCIATION BETWEEN AN INFANT AND YOUNG CHILD FEEDING INDEX, THE NUTRITIONAL KNOWLEDGE OF THE CARE-GIVER AND THE NUTRITIONAL STATUS OF CHILDREN 6-23 MONTHS IN THE UPPER-MANYA KROBO DISTRICT

BY

PROSPER CHAPU PAGUI

(10442656)

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DECLARATION

I, Prosper Chapu Pagui hereby declare that, this piece of work is the result of my own efforts and idea in the Department of Nutrition and Food Science, University of Ghana, under the supervision of Dr. Agartha Ohemeng and Dr. Gloria Ethel Otoo. No previous submission for a degree has been done here or elsewhere, besides the works of others which served as source of information and have been duly acknowledge by making reference to the authors.

PROSPER CHAPU PAGUI

(STUDENT)

SIGNATURE……..

DATE ……

DR. AGARTHA OHEMENG

(PRINCIPAL SUPERVISOR)

SIGNATURE……

DATE ……

DR. GLORIA ETHEL OTOO

(CO-SUPERVISOR)

SIGNATURE…….

DATE…….

DEDICATION

I dedicate this piece of work to the Holy Spirit of God. I am so grateful for your love, instruction, inspiration, guidance and your blessing upon my life. I love you with a passion.

Howbeit when He the spirit of truth is come, He will guide you into all truth: for He shall not speak of Himself; but whatsoever He shall hear that shall He speak: and He will show you things to come.

(Holy Bible; John 16:13)

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ACRONYMS AND ABBREVIATIONS

BMI: Body Mass Index

CWC: Child Welfare Clinic

DDS: Dietary Diversity Score

EAR: Estimate Average Requirement

SE: Standard Error

GDHS: Ghana Demographic and Health Survey

GHS: Ghana Health Service

GSS: Ghana Statistical Service

ICFI: Infant and Child Feeding Index

IYCF: Infant and Young Child Feeding

MNK: Maternal Nutritional Knowledge

NGO: Non-governmental Organization

NMCP: National Malaria Control Program

NMIMR: Noguchi Memorial Institute for Medical Research

SPSS: Statistical Package for the Social Sciences

UNICEF: United Nations Children Emergency Fund

UMKD: Upper Manya Krobo District

WB: World Bank

WHO: World Health Organization

OPERATIONAL DEFINITIONS

Anthropometry: The study and technique of taking body measurements, especially for use on a comparison or classification basis. It refers to the measurement of the human individual for the purposes of understanding human physical variations.

Complementary foods: Foods given to a child in addition to breast milk usually introduced between 4-6 months of age.

Household: Refers to the number of people who eat from the same pot

Knowledge: Refers to verbalized or demonstrated ability to reproduce from memory facts and principles.

Well nourished: Refers to the child who is not underweight, stunted or wasted.

Malnourished: Refers to the child who is underweight, stunted, wasted or has any two or all

Underweight: Refers to having low weight for age (below -2 SD) mainly due to chronic under nutrition or acute malnutrition.

Wasting: Refers to having low weight for length (below -2 SD) mainly due to acute malnutrition

Stunting: Refers to having low length for age (below -2 SD) mainly due to chronic malnutrition

ABSTRACT

The complexity in measuring feeding practices makes it difficult to study the relation between infant feeding practices and other characteristics. This cross-sectional study carried out in Upper Manya Krobo District (UMKD) among 260 children aged 6-23 months (mo) was aimed at understanding the association between infant and young child feeding index (ICFI), the nutritional knowledge of the care-giver and the nutritional status of children in UMKD. A structured questionnaire was used to collect data on caregiver's nutritional knowledge and child feeding practices were assessed through a single 24-hour recall and a 7-day food group frequency. ICFIs were constructed for children aged 6-8mo, 9-11mo and 12-23 mo and were divided into three categories. The association between child anthropometric indices (LAZ, WHZ, and WAZ) and ICFI were examined separately in each of the age groups. Generalized linear models were used to control for socio-demographic and economic factors. Adjusted mean HAZ in poor, average and good categories of ICFI were, respectively, -0.42, -0.17, and -0.04 ($p = 0.35$) among children aged 6-8 mo; -0.51, -0.44, and -0.89 ($p = 0.53$) among children aged 9-11 mo; -1.23, -1.13, and -0.85 ($p = 0.19$) among children aged 12-23 mo. There was also no association neither between ICFI and WLZ ($p = 0.12$, $p = 0.36$, and $p = 0.95$ respectively for children age 6-8 mo, 9-11 mo and 12- 23 mo.) nor for ICFI and WAZ ($p = 0.48$, $p = 0.36$, and $p = 0.72$, respectively for children aged 6-8 mo, 9-11 mo and 12-23 mo). Among the components of ICFI, food group frequency (past 7 days) was positively associated with child LAZ respectively for children aged 12-23mo ($p < 0.05$) and 6-8 mo ($p < 0.04$). Caregiver's nutritional knowledge was neither associated with child ICFI score ($p = 0.72$) nor with the nutritional status of children ($p = 0.33$). In conclusion, ICFI was independent of child anthropometric indices and caregiver's nutritional knowledge was not associated with ICFI and child nutritional status.

CHAPTER ONE

1.0 INTRODUCTION

1.1 Background

Optimal infant and young child-feeding (IYCF) practices are crucial for good nutritional status, growth, development, health, and ultimately the survival of infants and young children. Inappropriate infant and young child feeding practices such as, late initiation of breastfeeding, short duration of breastfeeding, and poor quality of complementary foods have been reported as main causes of childhood malnutrition (WHO, 2005).

Globally, 161 million children under-five in 2013 were estimated to be stunted, 99 million underweight and 51 million wasted (UNICEF/WHO/WB, 2014). The global trend in stunting prevalence has declined from 33% to 25% between 2000 and 2013, and underweight prevalence from 25% to 15% between 1990 and 2013. About one third of the world's stunted and underweight children live in Africa. Wasting prevalence was estimated in 2013 as 8% with about a third of these being severely wasted (3%), and nearly one third of these children live in Africa (UNICEF/WHO/ WB, 2014).

In Ghana, 19% of children below five years of age are stunted (below -2 SD), with 5% being severely stunted (below -3 SD) and children aged 18-23 months are more likely to be stunted compared to those below the age of 6 months (GDHS, 2014). About 5% of children in Ghana are wasted with less than 1% exhibiting severe forms of wasting, and children between the age of 6-11 months are the most likely to be wasted. Also, 11% of children under-five in Ghana are underweight (below -2 SD) with 2% classified as severely underweight (GDHS, 2014).

The relationship between the quality of infant feeding practices and the nutritional status of children is complicated and difficult to establish. This is mainly due to the different forms of feeding recommendations which are age-specific and the general lack of an appropriate tool for measuring feeding practices in children. Depending on the overall living conditions and socio-demographic context, the feeding practices of children may have different effects on the nutritional and general health status of children (Hatloy *et al.,* 2000).

Findings from studies which have investigated the association between infant and young child feeding index (ICFI) and the nutritional status of children have been inconsistent. Whereas some studies (Ruel & Menon, 2002; Sawadogo *et al*., 2006; Khatoon *et al*., 2011) found significant association between ICFI and child nutritional status, other studies (Ntab *et al*., 2005; Moursi *et al*., 2008) reported no correlation between ICFI and child nutritional status.

Previous studies in Ghana have examined the relationship between feeding practices and the nutritional status of children with focus on only some aspect of feeding such as breastfeeding (Armar-Klemesu, 2000), the time of introduction of complementary foods and its nutritional quality (Nti & Lartey, 2006). The need for a composite feeding index that expresses all the feeding practices of children in a single summary index is thus gaining importance across the globe and allows for the comparability of research data (Ruel & Menon, 2002).

Mothers are the providers of primary care for their children in developing countries and the quality of care infant's receive from their mothers is dependent on the nutritional knowledge and the health practices of their mothers (Glewwe, 1999). The nutritional knowledge of a mother in this context refers to her understanding of the different food types and combinations that influences health and promotes nutrition (Insel, 2003). Nutritional knowledge can be obtained through formal education, friends, family, mass media and

community health services (Glewwe, 1999). While nutritional knowledge acquired in schools and health facilities can mostly be regarded as good and can lead to good nutritional outcomes, the same cannot be said for mother's knowledge of nutrition acquired through friends and family that are based on culture and traditional beliefs. The later source of knowledge may lead to rather poor nutritional outcomes (Gittelsohn & Vastine, 2003).

The relationship between maternal nutritional knowledge and the nutritional status of children have been explored by several researchers and results have been inconsistent. Appoh and Krekling (2005) reported positive association between mother's knowledge of basic nutrition and the nutritional status of children in the Volta region of Ghana. Nonetheless Waihenya *et al*., (1996) found no association between mother's knowledge of nutrition and children's nutritional status in Nairobi. Mothers had access to nutrition education but no difference was observed in the nutritional status of their children and their overall nutritional knowledge. Waihenya and his colleagues estimated that a mothers knowledge of nutrition alone may not be adequate to guarantee better child nutritional outcomes. This suggests that depending on the socio-demographic setting and the socio-economic status of mothers or households, the impact of maternal nutritional knowledge on child nutritional status can vary considerably.

1.2 Study rationale

Complementary feeding practices in the Upper Manya Krobo District is less than ideal with about 14% of children introduced to complementary foods before the age of 3 months (Nti & Lartey, 2006) and these feeding practices have great implications for the nutritional and general health status of the children.

Research findings on the association between infant and young child feeding practices and the nutritional status of children are few and largely inconsistent. Available studies in Ghana on the relationship between child feeding practices and child nutritional status are few, and these studies focused on single feeding behaviours. Such approaches, while valuable in estimating the role of single feeding behaviours on child nutritional status do not allow for the holistic evaluation of how feeding practices as a whole influence the nutritional status of children. There is therefore the need for more research to establish the relationship between a composite feeding index (ICFI) and child nutritional status.

To the best of our knowledge no study has examined the association between IFCI and nutritional status of children in Ghana. Therefore, this study was to evaluate the impact of child feeding practices as a whole on child nutritional status in Ghana and also add to the body of literature existing on the relationship between ICFI and child nutritional status. The child feeding index when established will also allow for the comparability of research data on child feeding practices in Ghana with other children from different socio-demographic settings.

1.3 Research questions

1. What are the complementary feeding practices in the study area?
2. What is the relationship between caregiver's nutritional knowledge and child feeding index?
3. What is the association between infant and child feeding index (ICFI) and child nutritional status?
4. What is the association between caregiver's nutritional knowledge and child nutritional status?

1.4 Objectives

1.4.1 Main objective

The main aim of this study was to assess the association between a composite infant and young child feeding index, the nutritional knowledge of the care-giver and the nutritional status of children 6-23 months.

1.4.2 Specific objectives

1. To evaluate the complementary feeding practices in Anyaboni and Asesewa sub-districts of the Upper Manya Krobo District (UMKD)

2. To assess the relationship between nutrition knowledge of caregivers and child composite feeding index

3. To determine the association between child feeding index and the nutritional status of children aged 6-23 months in the two sub-districts.

4. To assess the association between the nutritional knowledge of caregivers and the nutritional status of their children aged 6-23 months.

CHAPTER TWO

2.0 LITERATURE REVIEW

2.1 Malnutrition among children under-five

Malnutrition has been responsible, directly or indirectly, for 60% of the 10.9 million deaths annually among children under-five (WHO/UNICEF, 2003). More than two-thirds of these deaths, which are often associated with inappropriate feeding practices, occur during the first year of life (WHO/UNICEF, 2003). Not more than 35% of infants worldwide are exclusively breastfed during the first four months of life; complementary feeding frequently begins too early or too late, and foods are often nutritionally inadequate and unsafe (WHO/UNICEF, 2003). Malnourished children who survive are more frequently sick and suffer the life-long consequences of impaired development (WHO, 2003). Overweight and obesity arising from poor feeding practices among children under-five years is also increasingly becoming a problem and has be shown to lead to nutrition related non-communicable diseases later in life (WHO/UNICEF, 2003).

In Ghana, malnutrition affects children across the entire country with children in rural areas more likely to be stunted than their urban counterparts (22% vs. 15%) and more male children are stunted than female children (20% vs. 17%). Stunting rates in Ghana ranges from 10% in the Greater Accra region to 33% in the Northern region and has decreased from 28% in 2008 to 19% in 2014. Levels of wasting has also decline during the same period (from 9% to 5%). The percentage of underweight children has also slightly decreased from 14% in 2008 to 11% in 2014. Levels of underweight among children under-five range from 6% in the Brong Ahafo region to 20% in the Northern region (GDHS, 2014).

2.2 Child morbidity and nutritional status

Infection is the main cause of childhood morbidity and mortality especially among children under-five in the world. Poor micronutrient deficiencies coupled with other environmental factors among children under-five have been identified as risk factors of infection-related morbidities (UNICEF, 2012; Sommer *et al*., 1984). According to the United Nations Children Emergency Fund, more than 8 million children under-five died in 2010 (UNICEF, 2012). Tragically more than 50% of these child deaths are preventable. The main causes of child deaths are neonatal, birth asphyxia, pneumonia, diarrhoea, HIV/AIDS, and prematurity (WHO, 2011).

The relationship between morbidity and the nutritional status of children have being documented by several researchers around the world. In India, Patel *et al.*, assessed the relation between breastfeeding practices, demographic variables and morbidities in children. The authors observed that, severe malnutrition (p- value = 0.018) increased diarrhoea rates among children less than five years. Children who were severely malnourished were more likely to have diarrhoea (OR= 1.853, 95% CI, 1.111-3.08; p-value = 0.018) and cough (OR= 2.135, 95% CI, 1.159-3.933; p-value = 0.015) episodes as compared to children who were normal.

In Malawi, Madise and Mpoma, in 1997 observed among Malawian children aged 12-59 months that, morbidity within the previous two weeks to the survey was associated with low weight-for-age Z-scores (p-value < 0.05). The number of days a child had diarrhoea was negatively associated with child nutritional status and associated with a decline in the Z-scores of about a 0.02 standard deviation for each additional day of diarrhoea. Children who had fever had lower Z-scores than those who did not (r = 0.17, p-value < 0.05).

Among Ethopian children aged 6-23 months, Fekadu *et al.*, 2015, who study the factors associated with nutritional status of infants in Somali region, Ethopia observed that, diarrhoea in the past 15 days among infants and young children were associated with higher odds of wasting (AOR = 2.13 (95% CI, 1.55-4.96) and underweight (AOR = 3.54 (95% CI, 1.17-7.72). The authors concluded that morbidity factors should be considered in efforts aimed at improving child nutritional status.

In Western Kenya, Walingo *et al.*, 2013 among preschool children age 12-60 months observed wasting to be significantly associated with morbidity among the children ($r^2 = 0.13$, p-value < 0.05). Nutritional status was also found to be the major determinant of morbidity among this population ($r^2 = 0.28$, p-value <0.05) and morbidity levels was observed to contribute to about 11.6% of underweight among this children.

2.2.1 Malaria among children under-five in Ghana

Malaria according to the Ghana Demographic and Health Survey report (GDHS) in 2008 is hyper-endemic in Ghana with seasonal variations and is responsible for about 30-40 percent of all outpatient attendance in public health facilities. An estimated 3 to 3.5 million cases of malaria are reported annually of which 900,000 of the cases are children below the age of five years. Malaria is also responsible for about 61 percent of hospital admissions of children under-five and 8 percent of pregnant women admission. Malaria is estimated to account for 22 percent of under-five mortality and 9 percent of maternal deaths (The Presidents malaria initiative, 2007).

Several governmental and non-governmental interventions and initiatives have been implemented to control and cure malaria in the country, among which included; The Roll Back Malaria Initiative, which targeted pregnant women and children under-five access to protective and curative measures such as, the insecticide treated bed nets (ITN) and prompt

effective treatment of Malaria, the President Initiative with funding from the US government in consultation with NMCP are also engage in several malaria prevention and control programmes (ITN's IRS, IPTp's and ACT) with the broad goal of reducing all malaria related mortalities by 50 percent in the country after full implementation (The Presidents malaria initiative report, 2008).

2.2.2 Diarrhoea among children under-five in Ghana

The World Health Organization defines diarrhoea as the passage of three or more loose or liquid stools in a day. Diarrhoea, usually a symptom of gastro-intestinal infection caused by a wide range of different bacterial, viral and parasitic organisms, is one of the leading causes of death in children under-five globally, and accounts for about 800, 000 child deaths each year (UNICEF/WHO, 2009).

Diarrhoea (severe) is characterized by the frequent passing of loose stools leading to dehydration which is a major cause of morbidity among young children. In Ghana, diarrhoea is common among children aged 12-23 months (33%) and highest (33%) among children in Northern region (GDHS, 2008). About 41% of children with diarrhoea seek medical care from health centres and rural children (43% versus 38%) with diarrhoea are slightly more likely to seek medical care as compared to urban children (GDHS, 2008). The Ghana Health Service (GHS) recommends the treatment of childhood diarrhoea with Oral Rehydration Salt (ORS) plus zinc tablets in other to reduce its duration and severity.

2.2.3 Pneumonia among children under-five in Ghana

Pneumonia is an acute respiratory infection that affects the lungs and limits oxygen intake due to fluid in the alveoli leading to painful breaths. According to the World Health Organization (WHO), pneumonia is the single leading infectious cause of death among children worldwide, accounting for 15% of all deaths of children under-five (WHO, 2014).

Pneumonia is responsible for an estimated 935,000 deaths of children under-five in 2013 alone and can be caused by viruses, bacteria and fungi (UNICEF/WHO, 2013). In Ghana, pneumonia accounts for about 4,300 deaths and 720,000 cases annually among children under-five years and early diagnosis and treatment with antibiotic can prevent large proportion of deaths due to pneumonia (GHS, 2012).

2.2.4 Fever among children under-five in Ghana

Fever is characterized by increase in body temperature above the normal set point (37°C). It is a symptom of malaria and other acute infections in children. These illnesses (malaria and other acute infections) contribute to high malnutrition and mortality. Fever is most common in Ghana among children aged 12-23 months (26%) and children with the infection in wealthier households are more likely to seek medical care at health facilities than children belonging to poorer households (80% versus 41%). Seeking treatment (52.6% versus 37.5%) for fever is respectively high in urban centres than rural (GDHS, 2008).

2.3 Infant and young child feeding practices (IYCF)

Optimal infant and young child-feeding (IYCF) practices are crucial for good nutritional status, growth, development, health, and ultimately the survival of infants and young children. The WHO and UNICEF recommend that children should be exclusively breastfeed for the first six months of life, colostrum is perfect for the baby, and breastfeeding should be initiated within an hour after birth (Bamji *et al*., 2008). Exclusive breastfeeding is the feeding of an infant with only breast milk. No other liquids or foods are given with the exception of oral rehydration solution, or drops/syrups of vitamins, minerals or medicine.

Breastfeeding is nearly ubiquitous in Ghana, with 98% of children ever breast fed and 52% of the children put to breastfeed within one hour of birth. About 63% of children are exclusively breastfeed with an average duration of four months and median breastfeeding duration of 20 months (GDHS, 2008). Breastfeeding is by far the most natural and ideal way to feed infants, and especially for the first six months of life is crucial for physical growth and development. It has also been related to improving cognitive outcome with lasting benefits, and its role of promoting both physical and cognitive development is thought to be greatest for disadvantage populations (Castillo *et al*., 1996).

Complementary feeding is the process that starts when breast milk alone is no longer sufficient to meet the nutritional needs of infants and therefore other foods are needed in addition to breast milk (WHO, 2014). That is, the transition from exclusive breastfeeding to family foods. Complementary feeding basically consists of family foods that are locally available for consumption and typically covers the period of 6-24 months which are critical periods of a child life. Complementary food must be timely, adequate, safe, and appropriate (WHO, 2014). Complementary foods must be introduce at the appropriate age when breast milk alone can no longer be sufficient to meet the nutrient requirement of the growing infant,

and it must be adequate both in nutrient quality and quantity to sufficiently supply all the additional nutrients the child requires for good health and nutrition. Complementary foods must also be prepared and handled in a hygienic way to prevent the transfer of pathogens and disease causing micro-organisms to the child and must be feed responsively using the principles of psycho-social care. The adequacy of complementary feeding does not only depend on the household food availability but also depends on the overall feeding practices of the caregiver. Appropriate feeding of infants requires that the caregiver is responsive to the hunger cues of the baby and encourages the child to eat without forcing the child (WHO, 2014).

In addition to breast milk, The WHO recommends that children between the ages of 6-8 months receive complementary foods 2-3 times a day and 3-4 times a day for children age 9-11 months and 12-24 months, with 1-2 additional nutritive snacks (Dewey, 2003). Feeding of children as recommended will enable them to meet their minimum meal frequency for the day. Without adequate meal frequency and diversity, infants and children are unable to meet their micronutrient and energy requirements from non-breast milk products (minimum acceptable diet) and as such, are vulnerable to malnutrition, especially stunting and micronutrient deficiencies and to increased morbidity and mortality.

The common complementary foods in Ghana include plain cereal porridge, fortified cereal porridge and canned baby foods. `*Koko*`, a thin low energy fermented cereal porridge is the main traditional food in Ghana used to wean children and the commonly used complementary diet (Nti & Lartey, 2006). Due to its low nutrient content efforts have been made by some researchers to improve the nutrient content of *koko* through fortification with groundnut paste, fish powder and legume flour (Annan and Plahar, 1995). Inappropriate introduction of complementary foods and poor feeding practices have been found to be associated with

inadequate growth, nutritional deterioration (wasting and stunting) and accounts for a remarkable amount of postnatal growth failure in Ghanaian children under five (GSS, 1998).

2.3.1 An infant and young child feeding Index (ICFI)

Studies on the association between the composite feeding index (ICFI) and child anthropometric indices across the globe have been few and findings from this studies have been general inconsistent. While some authors have found positive associations (Ruel & Menon, 2002; Khatoon *et al*., 2011; Sawadogo *et al*., 2006), others have reported no association (Moursi *et al*., 2008; Ntab *et al*., 2005). It is therefore expedient and needful that more research been conducted in this area in other to establish the exact association between the ICFI and child anthropometric indices.

An infant and a child feeding index is an age-specific scoring system that awards marks for positive feeding practices (Ruel & Menon, 2002). Ruel and Menon in 2002 pioneered the construction of an age specific composite feeding index with Demographic and Health Survey (DHS) data from Bolivia, Guatemala, Nicaragua, Peru and Colombia and tested the association between the ICFI and the nutritional status of children. A positive significant association was observed between ICFI and child height-for-age Z-score (HAZ) for all the seven data sets (ANOVA $p < 0.05$, in all the data sets). The variables used to construct the index included breastfeeding (whether or not the mother is currently breastfeeding the baby); the use of bottle feeds in the previous 24 hours; dietary diversity (the number of food groups the child had eaten from within 24 hours); food group frequency (the number of times the child had eaten from a particular food group within seven days) and meal frequency (the number of main meals and snacks the child had received within 24 hours). The ICFI index was made age specific for children 6-9, 9-12, and 12-36 months age groups and age specific feeding terciles were created. The scoring system of the infant and young child index (ICFI) gave a score of zero for negative feeding practices and a score of one for positive feeding

practices and practices that were especially important at a particular age group was given a score of two. The study took into account the main feeding practices of children and expressed them into a single summary index. This method allows the comparability of results from different demographic settings, locates targets for nutrition interventions, monitors interventions and promotes an exploratory diagnosis of a situation.

In Burkina Faso, Sawadogo *et al*. (2006) investigated the association between an infant and a young child feeding index and child nutritional status and reported a significant difference in the mean HAZ of the low, medium, and high categories of ICFI for all the three age group categories (6-11mo, 12-23mo, 24-36mo) of children investigated (adjusted mean HAZ in low, medium, and high categories of ICFI were, respectively, -1.67, -1.53, and -1.21 ($p = 0.003$) among children aged 6–11 mo; -2.54, -2.24, and -2.11 ($p = 0.0002$) among children aged 12–23 mo; and -2.18, -2.20, and -2.45 ($p = 0.05$) among children aged 24–35 mo). There was also a positive association between the ICFI and child weight-for-height Z-score (WHZ) in children 12-23months (p-value <0.05) but a negative association was observed for children 6-11 months (p-value = 0.02). The negative association observed for children aged 6-11 months was mainly due to a high mean WHZ in the poor category of the ICFI for that particular age group. With the exception of the WHZ in children age 6-11 months, the ICFI components (dietary diversity or variety score, and frequency of meals or snacks) supported the positive associations with anthropometric indices.

Evidence from 259 children aged 6-23 months who attended the paediatric outpatient department of the Dhaka Medical College Hospital in Bangladesh showed that a significant difference ($p < 0.05$) existed in the length-for-age Z-score (LAZ) among children aged 12-23 months who were in the upper ICFI terciles (-2.01) and those (of the same age category) who were in the middle or lower (-3.20) ICFI terciles (Khatoon *et al*., 2011). A significant positive correlation was also reported between ICFI and the LAZ among children aged 6-8-

months (r =0.24, p=0.01) and 12-23months (r =0.29, p=0.01) thus, better nutritional status was observed among children whose caregivers had higher scores in terms of appropriate feeding practices.

In rural Senegal, Ntab *et al*. (2005) found no association between the composite feeding index and child height-for-age Z-score (adjusted means: -1.01, -1.06, and -1.20 Z-scores for the 1st, 2nd, and 3rd tercile, respectively) or linear growth (6.2, 6.0, and 6.3 cm for the three terciles, respectively). Frequent consumption of fruit but not consumption of food from animal source was positively associated with linear growth of children (p= 0.027, in adjusted models). Continuing breastfeeding was however found to be positively associated with child linear growth.

Moursi *et al*. (2008) in a prospective cohort study of 363 children aged 6-17 months who were visited three times over a six months period and cross-sectional ICFIs (CS- ICFI) constructed for each of the visit in Madagascar found no significant association at each time point between the CS- ICFIs and LAZ of the children at the end of the study (p-value = 0.22, p-value = 0.08, p-value = 0.1 respectively for the 1st, 2nd and 3rd visit.). A longitudinal ICFI (L-ICFI) was constructed with the use of the three CS-ICFIs. There was no significant association between the L-ICFI and WLZ of children (p-value = 0.15). Nevertheless, the L-ICFI was found to be a good predictor of child growth (LAZ) with an adjusted difference of 0.5 in mean LAZ between children when moving from the low to the high categories of the L-ICFI.

2.4 Maternal nutritional knowledge and child nutritional status

Mothers are the main providers of care in the family and the quality of care that they provide is largely dependent on their knowledge of nutrition and health. Nutrition knowledge refers to the understanding of the different types of food and appropriate food choices and combinations that nourish the body and influence health (Insel, 2003). Nutrition knowledge can be acquired through schools, community health centres, families and friends and it affects food choices, preparations and food distribution among members of a household. Nutritional knowledge is a strong artillery for women against malnutrition, since increase in knowledge (educational level) will not only lead to improvements in incomes earn by women but will also improve household food security levels and the quality of care that women provides for themselves and other members of the household especially children (Glewwe, 1999).

Most of the studies that have used nutrition education as an intervention to improved complementary feeding have measured maternal knowledge and feeding practices. Gludan *et al*. (2004) investigated the effect of culturally appropriate nutrition education on infant feeding practices and growth in rural Sichuan. The researchers reported that after one year, mothers in the intervention group showed significantly higher nutritional knowledge (p-value < 0.005) for response to which type of food will help your child to grow well and better reported infant feeding practices (83% vs. 75%; p = 0.034) for rate of current breastfeeding than their control counterparts. Mothers in Peru who received education intervention fed their children with nutrient dense thick foods as lunch as compared to their control counterparts (31% *vs.* 20% p=0·03) at six months (Penny *et al.*, 2005). This study demonstrated that, children of mothers with adequate nutritional knowledge gain through nutrition education received nutritionally adequate meals and were less stunted at 18 months than children of mothers who have not receive nutrition education (5% *vs.*16%; adjusted odds ratio 3·04, 95% CI : 1.21–7.64).

The relationship between maternal nutritional knowledge, education and child malnutrition has been widely documented by several researchers and findings from these studies have been inconsistent. While some authors (Appoh & Krekling, 2005; Ruel *et al*., 1992; Glewwe, 1999; Webb & Block, 2003) have reported positive associations, others (Waihenya *et al*., 1996; Grant & Stone, 1986) have reported no association between maternal nutritional knowledge and child nutritional status.

Ruel *et al*. (1992) found that maternal formal education was independently associated with child weight-for-age Z-score among mothers in the lower socio-economic group in Lesotho. In addition, Reed *et al*. (1996) in Benin found a positive association between maternal education and child nutritional status among mothers with adequate resources.

Webb and Lapping (2002) who explored the question 'are the determinants of malnutrition the same as those of food security?' argue that even though poverty has been identified as a major cause of malnutrition, the association between poverty and malnutrition in their estimation is oversimplified. Over the decades, poverty reduction strategies have been progressive but such economic gains have not translated into nutrition benefits and progress against malnutrition has been less than stellar.

Webb and Lapping in 2002, who investigated the association between maternal nutritional knowledge, education and child nutritional outcomes in six developing countries, have reported that maternal nutritional knowledge and maternal education are independently associated with child nutritional outcomes.

Results from positive deviant studies have also demonstrated that poverty does not necessary result in malnourished children. Positive deviance refers to the ability of some mothers to raise well-nourished children by undertaking good and healthy practices in areas where poverty and child malnutrition are high. These studies have shown that in the midst of

poverty and high malnutrition rates, some mothers successfully raise healthy children (Berggren & Wray, 2002; Mackintosh *et al*., 2002). The implications of these findings by Webb & Lapping, 2002, Berggren & Wray, 2002 and Mackintosh *et al*., 2002, suggest that it is the knowledge, attitudes and the practices of care by mothers and the way scanty resources are used rather than economic status that differentiate positive deviate mothers from other mothers.

In Ghana, Armar-Klemesu *et al.*, in 2000 who investigated the effect of maternal schooling on the care practices of mothers in Accra with children less than three years observed that poor maternal schooling was the main constrain to child feeding, preventive health seeking behaviour and the hygiene practices of mothers in Accra, but low socio-economic household status was not a predictor of child feeding practices. Appoh and Krekling (2005), who investigated whether maternal nutritional knowledge was associated with child nutritional status and whether any observed association was independent of maternal formal education (schooling) in the Volta region of Ghana showed that, maternal nutrition knowledge was independently, positively associated ($r=2.04$, p-value<0.001) with child nutritional status. However, maternal formal education was not associated with child nutritional status. These authors concluded that maternal practical nutritional knowledge is a more important determinant of child nutritional outcomes than maternal formal education.

In conclusion, feeding practices of children in the Upper Manya Krobo district are poor and available literature is inconsistent concerning the exact relation between the overall feeding practices of children and their nutritional status. It is also unclear what is the association between caregivers nutritional knowledge and the nutritional status of children, while some authors reported positive associations, others have reported no associations. Child composite feeding index and caregiver's nutritional knowledge have not been well investigated. This currents study provides information on the knowledge gap between composite feeding index

and maternal nutritional knowledge, and also provides additional evidence of the relationship between maternal nutritional knowledge and child nutritional status.

CHAPTER THREE

3.0 METHODOLOGY

3.1 Study area

The study was conducted in two sub-districts of the Upper Manya-Krobo District (UMKD) of the Eastern region. UMKD is one of the twenty-one districts of the Eastern region of Ghana. It was established in 2008 and covers a land size of about 885 sq. kilometres, representing 4.8% of the total land mass of the Eastern region. The district lies on Longitude 0° and Latitude 6°15′ north of the equator and shares boundary with the Volta Lake to the north, Fanteakwa district to the west, Asuogyaman district to the east, Yilo Krobo district in the south-west and Lower Manya Krobo in the south-east (UMKD Health Report, 2011).

The district capital is Asesewa and the district has a population size of about 72,092 people according to the 2010 population and housing census. The inhabitants are mostly farmers and traders and those that live around the VoltaLake are fishermen and fish mongers. Roots and tubers (cassava, sweet potatoes and yam) are the major crops cultivated (GSS, 2010).

The District Health Management Team (DHMT) has subdivided the district into six sub-districts namely, Asesewa, Sekesua, Anyaboni, Djaman, Akateng and Otrokper to facilitate effective health care delivery. The district has one hospital (government), four health post, and two Community-based Health Planning Services (CHPS) zones. (Appendix III).

Several governmental and non-governmental institutions operate in the district. For instance the University of Ghana in collaboration with Global Livestock-collaborative support program (GL-CRSP) and with funding from the United States Agency for International Development (USAID) built a Nutrition Research and Training Centre at the district capital, Asesewa. The Centre currently serves as a training and research place for researchers,

students, community members in Ghana and also serves as dietetics training centre for both Ghanaian and international students.

Another institution operating in the district is Plan Ghana; a child centred non-governmental organization (NGO). Plan Ghana has been operating for about 22 years in the district and has been involved in the construction of schools for deprived communities, offering scholarships to needy pupils and the provision of play items for pupils in schools. A number of first generation schools in the district's rural communities were constructed by Plan Ghana.

Other institutions operating in the district include, District Assembly Office, District Council, a Police Station, the National Health Insurance Scheme (NHIS), the Upper Manya Krobo Rural Bank, a Magistrate Court, Ghana Fire Service and a Senior High School that admits both males and females students.

3.2 Study design

The study was a cross-sectional survey conducted in Asesewa and Anyaboni sub-districts of the Upper Manya Krobo District of the Eastern Region.

3.3 Study population

The study participants included caregivers with children 6-23 months in selected communities in the two sub-districts. Recruitment of study participants were done at the child welfare clinic (CWC) centres. The child age group 6-23 months was sub-divided into 3 groups of 6-8 months, 9-11 months, and 12-23 months to account for the difference in feeding recommendations, to facilitate the award of scores and to compare the differences between them in relation to their feeding practices.

3.4 Sample size determination and sampling procedure

The formula below by Magnani, 1997 was used to calculate the sample size. The sample size was calculated using an estimated stunting prevalence of 20% among children less than two years (Nti & Lartey, 2006).

$$N = \frac{Z^2 \times P\,(100-P)}{D^2}$$

Where:

N = the minimum required sample size

Z = the critical value for the 95% confidence level (1.96).

P = the proportion or estimated prevalence of stunting in Asesewa district (20%)

D = the margin of error or level of precision (5%).

N= Two hundred and forty-six respondents (246).

Two hundred and sixty respondents were recruited and included in the study (260) to cater for incomplete data.

Asesewa and Anyaboni sub-districts were selected because they were easily accessible by the means of transport that was available to the researchers and thirteen communities were randomly selected for the study from a list of 103 communities. All the communities (103) in the two sub-districts were assigned numbers on pieces of papers. The papers were folded and kept in a basket. Selection without replacement method was used to pick the thirteen communities. All communities had an equal probability of being selected. All caregivers in each of these communities who were present at CWC and consented were recruited into the study.

All the CWC were visited once each month for three months before the sample size of 260 was achieved. Table 3.0 below shows the sub-districts, communities and the number of participants selected from each community.

Table 3.1: Number of participants recruited in each community selected for the study

Sub-district	**Number of Participants**
Asesewa Sub-district	
Aboasa	19
Odometa	20
Dzomoa	4
Akohia	12
Battorkope	24
Anyaboni Sub-district	
Anyaboni quarters	69
Akokomasisi	35
Akokomakpeti	22
Fantem	18
Kpesibe	4
Pourkper	19
Korlewa	7
Sawa	7
Total	**260**

3.4.1 Inclusion and exclusion criteria

3.4.1.1 Inclusion criteria

- For a person to be eligible to participate, she was the caregiver/mother of a child that was 6-23 months and living in the study community for at least one year.

3.4.1.2 Exclusion criteria

- A child was excluded if he/she has a medical condition that interferes with feeding (e.g. cleft palate) and/or the measurement.

3.5 Recruitment and training of field assistants

Two female field assistants with secondary level education were trained for data collection. The field assistants were natives of UMKD and spoke the Krobo language fluently and were well informed of the customs and practice of the people. They were trained on how to administer the research questionnaires first in the English and then in the local language (Krobo) and how to record mothers' responses to the questions asked. They were also trained on how to seek consent, how to administer the 24 hour recall questionnaire and the standard procedures for taking anthropometric measurement. Inconsistencies in the questionnaire administration were identified and corrected during the training session. The training lasted for five days.

3.6 Ethical considerations

Ethical clearance was sought from the Institutional review board (IRB) of the Noguchi Memorial Institute for Medical Research of the University of Ghana, Legon, Ghana. The study was thoroughly explained to the caregivers of the children and they were only recruited into the study after they had given their consent and thumb printed or signed an informed consent form. (Appendix I).

3.7 Data collection

A total of 260 caregivers/mothers with children aged 6-23 months living in the selected communities of the two sub-districts participated in the study. The study was thoroughly explained to the care-givers in the local Krobo language. The questionnaire which were in six parts collected information on socio-demographic characteristic of both caregiver and child, child morbidity, household characteristics(participants), complementary feeding practices(children), caregivers nutritional knowledge, dietary assessment(child) and anthropometric assessment of both caregiver and child. The data collection started in November, 2014 and ended in February, 2015. (Appendix II).

3.7.1 Caregiver, infant and household characteristics

A semi-structured questionnaire was used to obtain data on both caregiver/mother and infant socio-demographic characteristics. The socio-demographic data collected included mother's age, marital status, level of education, occupation, religion, ethnicity, area of residence, child age and sex. In addition, information about the number of people in each household, household possessions and the income of the household was also collected.

3.7.2. Child morbidity information

Caregivers/mothers were asked whether or not the child fell sick, the type of illness, the number of times, and the duration of the illness within two weeks prior to the interview. They were also asked if and where they sought medical care when child was sick. Common illnesses or symptoms that a child may have had including fever, malaria, diarrhoea, difficult/fast breathing and cough were collected.

3.7.3 Dietary assessment

Dietary data of all the children were collected using a 24 hour dietary recall and a seven day food group frequency questionnaire. The dietary data collected on the food group consumed within 24 hours was used to estimate the minimum dietary diversity (WHO) score of the children and data on the number of times the children were offered foods was used to estimate the minimum meal frequency (WHO) of the children. Minimum acceptable diet was estimated using the minimum dietary diversity and the minimum meal frequency.

3.7.3.1 Dietary diversity and frequency (24 hours)

A single 24-hour recall was used to collect dietary information on the different number of food groups the child has eaten from within the 24-hour period prior to the interview. The mothers/caregivers were asked to recall all the foods and drinks given to the infants during the previous day and also the number of times they fed their children the previous day. The

weights or quantities of the foods consumed by the children were estimated using household measures and in instances where mothers were unable to estimate the quantity of the food (for foods not prepared at home or purchased food items) consumed with a household measure, it was estimated in cost or amounts and the same foods were purchased from food vendors and then weighed (using an Ohaus CS 2000 compact scale). The quantities of the foods (excluding breast milk) consumed were converted to nutrient intake levels (for energy, protein, carbohydrate, iron and vitamin A) using food composition table (West Africa foods composition table and the RIING data base).

3.7.3.2 Food group frequency (for the past seven 7 days)

Information about the number of times a child has eaten from a particular food group during the past seven days was collected using a food group frequency questionnaire. The seven food groups included; grains/roots/tubers; legumes/nuts; dairy; flesh foods; eggs; vitamin A-rich fruits and vegetables; other fruits and vegetables (FAO, 1982). Mothers were asked to recall the number of days in a week that children ate from each of the seven food groups.

3.7.3.3 Breastfeeding and bottle feeding

Information on whether the child was currently breastfeeding, how soon the child was put to breast after birth and the number of times the child was breast fed (day and night) within the past 24 hour period was collected using a semi-structured questionnaire. Mothers were also asked whether or not they fed their children from bottles.

3.7.4 Caregiver's nutritional knowledge

A structured questionnaire was used to take data on maternal nutritional knowledge. Mother's/caregiver's were asked questions about breastfeeding, colostrum, complementary feeding and food sources of certain vitamins and macronutrients. Mothers were also tested on their knowledge of the signs and symptoms of certain nutritional deficiencies. A nutritional knowledge scale (low, medium and high) was constructed based on caregivers responses to the questions asked. In all, caregivers responded to seventeen questions and depending on the number of correct responses, a caregiver was either categorized as having low (0-8 correct responses), medium (9-10 correct responses) or high (11-17 correct responses) nutritional knowledge.

3.7.5 Anthropometric measurement

3.7.5.1 Infant's length

The recumbent length of children was taken using an infantometer (UNICEF model, item no. 0114500). Children's head was held vertically against the head plate with the back, body and legs straight and flat in the centre of the measuring board, the knees straightened, the heels and feet firmly positioned by the researcher vertically against the footplate. The length of the children was measure to the nearest 0.1cm.

3.7.5.2 Infant's weight

Infants' weight was taken using a Seca digital infant weighing scale. The children were weighed with minimal clothing or naked. The weight of the children was recorded to the nearest 0.1kg.

3.7.5.3 Mid-upper arm circumference (MUAC)

Mid-upper arm circumference was taken using the left arm. The arm was bent at the elbow to make a right angle. With the tape placed at zero and on the tip of the shoulder, the tape was

pulled to the tip of the elbow. The midpoint of the arm was marked with a pen. The arm was then straightened, and the tape placed around the marked area the reading was taken twice to get an average (Cogill Bruce, 2001).

3.7.5.4 Caregiver's weight and height

Caregiver weight was measured using a digital scale (Seca) and height using a stadiometer. The weight of the women was recorded to the nearest 0.1kg and the height to the nearest 0.1cm

3.8 Quality control measure

Field assistants were adequately trained on how to administer the research questionnaire and on how to take anthropometric measurements. The questionnaire was pretested for consistency and the weighing scales were calibrated before use. Interviews were conducted in the local languages of mothers and the questionnaire was vetted at the field to ensure that all responses were valid and errors identified were corrected.

3.9 Data analysis

Data was entered, cleaned and analyzed using SPSS version 16.0. Means and standard deviations were used to describe continuous variables whiles frequencies and proportions were used to describe categorical variables. The WHO Anthro software was used to convert the weight and length of the infants to the growth indices: weight-for-age, weight-for-length and length-for-age Z-scores. Infants with Z-scores below -2 standard deviation of the median reference length-for-age (LAZ), weight-for-length (WLZ) and weight-for-age (WAZ) were classified as stunted, wasted and underweight, respectively.

Independent sample t-test and analysis of variance was used for (normally distributed continuous variables) for comparison between two and three groups respectively and Pearson's chi-square for categorical variables. Multinomial regression analysis was used to

determine the relation between ICFI and maternal nutritional knowledge while binary logistic regression analysis was used to determine the association between the nutritional status of the child and maternal nutrition knowledge. Generalized linear model was used to determine the association between ICFI and child nutritional status. Table 3.1 below shows the dependent and independent variables used in the regression analysis. Statistical significance was at p-value less than 0.05. .

Table 3.2: Variables included in the logistic regression model to determine factors associated with child nutritional status, ICFI and MNK

Type of Variable	Variable		Coding
Dependent Variable	Child nutritional status		Well-nourish=0, Malnourish=1
Independent Variable	Maternal Age		≥30=0, 15-29=1
	Level of Education		[a]Educated=0, None=1
	Marital status		Married=0, [b] Not Married=1
	Maternal Height		
	Maternal nutritional knowledge		High=0, °Low =1
Dependent Variable	ICFI Score		Poor=1, Average=2, Good=3
Independent variable	Maternal nutritional knowledge		High=0, Average=1, Low=2
	Child Age		>1year=0, ≥1year =1
	Child Sex		Female=0, Male=1
	Maternal marital Status		Married=0, Not Married=1
	Level of education		Educated=0, None=1
	Household size		<7 persons=0, ≥7 persons=1
	6-8 months model	**9-11 months model**	**12-23 months model**
Dependent Variable[a]	Length for age	Length for age	Length for age
	Weight for length	Weight for length	Weight for length
	Weight for Age	Weight for Age	Weight for Age
Independent Variable	ICFI (poor=0, Average=1, good=2)	ICFI (poor=0, Average=1, good=2)	ICFI (poor=0, Average=1, good=2)
	Child age (6mo=0, 7-8mo=1)	Child age(<11mo=0, ≥11mo=1)	Child age(<18mo=0, ≥18mo=1)
	Sex (Female=0, Male=1)	Sex (Female=0, Male=1)	Sex (Female=0, Male=1)
	Marital status	Marital status	Marital status
	(Not married=0, Married=1)	(Not married=0, Married=1)	(Not married=0, Married=1)
	Level of education	Level of education	Level of education
	(None=0, Educated=1)	(None=0, Educated=1)	(None=0, Educated=1)
	Household size	Household size	Household size
	(<7 persons=0, ≥7person=1)	(<7 persons=0, ≥7person=1)	(<7 persons=0, ≥7person=1)

[a]Educated includes; primary, secondary and tertiary schools. [b] Includes; single, widowed, divorced. °Low includes; low and median knowledge. [a]Dependent variables for model 1, 2 and 3. All independent variables were put into each model for all the child age groups. Malnourished: child has at least one of the following nutritional deficiencies (stunting, wasting or underweight). Well-nourished: child do not have any of the following nutritional deficiencies (stunting, wasting or underweight).

3.9.1 Construction of the feeding index (ICFI)

The infant and young child feeding index (ICFI) was constructed based on the principle proposed by Ruel and Menon in 2002 and was used as a composite index to investigate the association between an infant and young child feeding practices and the nutritional status of children aged 6-8 months, 9-11 months, and 12-23 months. The components that was used to create the index includes the following: breastfeeding status (if the child was breastfeed within the previous 24 hour period to the interview), bottle feeding (whether the mother fed the child from the bottle with a nipple within the previous 24 hours), dietary diversity (whether the child had received food from different food groups in the previous 24 hours), food group frequency (the number of times and days the child had eaten from any food group within a week), and meal frequency (the number of times the child was offered solid or semi-solid foods within a day including meals and snacks).

The scoring system for each of the above components was dependent on the age of the child and the current WHO feeding recommendations for that particular age group. The principle was to award zero for negative practices, one for positive practices, and two for practices that were particularly important for certain age groups, for example breastfeeding for children 6-12 months.

Currently breastfeeding received a score of two for children 6-8 months, 9-11 months and one for children aged 12-24 months, avoidance of bottle feeding which is regarded as a positive practice received a score of one and those who practice bottle feeding received a score of zero for any age group because bottle feeding is regarded as a bad practice by WHO.

The dietary diversity index was created based on whether the child had received food from any food group within a 24 hour period to the interview. The seven food groups used included; grain/roots/tubers, legumes and nuts, dairy products, flesh foods, eggs, vitamin A

rich fruits and vegetables, other fruits and vegetables. The current WHO recommendations require that children 6 - 23 months should receive foods from at least four or more food groups each day to meet their minimum dietary diversity. Based on this recommendation, a score of zero was awarded for all the age groups if 0-3 food groups were eaten in a day, one was awarded if four food groups were eaten, and a score of two was awarded for children aged 6-8 months and 9-11 months if more than four food groups were consumed. But a score of three was awarded for children aged 12-23 months if more than four food groups were consumed in a day; this was because of the beneficial importance of food diversity particularly for children of this age group. This is the period where WHO recommends increased consumption of varieties of food and gradual transition to family foods. During the latter part of this age group where the mother prepares to stop breastfeeding an increased in the varieties of food consumed will help children to meet their nutritional needs.

Table 3.3: Description of the scoring system used to create the feeding index

Variable	**Scores**		
	6-8 months	**9-11 months**	**12-23 months**
Breastfeeding	Yes=2 No=0	Yes=2 No=0	Yes=1 No=0
Bottle-feeding	Yes=0 No=1	Yes=0 No=1	Yes=0 No=1
Dietary Diversity (24 hours)			
Poor	0-3 food-groups=0	0-3 food-groups=0	0-3 one food-group=0
Average	4 food-groups=1	4 food-groups=1	4 food groups=1
Good	>4 food-groups=2	>4 food groups=2	> 4 food-groups=3
Food-group Frequency (Past 7 days)			
Poor	0 (no food in previous week)=0	0 or 1 = 0	0 through 3= 0
Average	1 or 2 =1	2 through 4=1	4 through 6=1
Good	3 or higher =2	5 or higher =2	7 or higher =2
Feeding Frequency			
Poor	0-1 time = 0	0-2 times = 0	0-2 times = 0
Average	2 times =1	3 times =1	3 times =1
Good	3 or more times = 2	4 or more times = 2	4 or more = 2
Total score(Min/Max)	0/9	0/9	0/9

The seven-day food-group frequency index also used the same food groups as stated earlier. For each of the food groups a score ranging from 0-2 was awarded. If a particular food-group was not eaten for the whole week, a score of zero was awarded and if consumed for 1-3 days, a score of one was awarded, and if consumed for 4 or more days a score of two was awarded for all the age groups. All the scores of the seven food groups was summed to give a total score ranging from 0-14. This was regrouped to give new scores ranging from 0-2 to reflect their age specific distributions as shown on Table 3.3 above. That is for instance for children aged 6-8 months, a score of zero from this total score was still awarded zero in the new scoring system, a score of 1-2 in the total score was considered as one in the new score, and a score of three or higher in the total score was considered two in the new score. The details of the scoring for the other age groups are shown on Table 3.3 above.

The WHO recommends that children aged 6-8 months who are breastfeeding should receive complementary foods at least two times in a 24 hour period and at least three times for children 9-23 months of age. Based on this recommendation a score of zero was awarded for children aged 6-8 months who receive complementary foods 0-1 times a day, one when fed two times a day and a score of two when feed more than two times in a day. And for children aged 9-11 months, a score of zero was awarded if the feeding was done 0-2 times in a day, a score of one when complementary foods were received three times a day and a score of two when foods were received for more than three times a day.

The score of all the various components that made up the ICFI index was summed to give a total score ranging from 0–9 as shown Table 3.3 and this was categorized into age specific feeding groups to characterize poor, average and good feeding practices. That is, a score ranging from 0-5 was classified as poor feeding practice, a score of 6 was classified as average and a score of 7-9 was classified as good feeding practice for all the child age groups. The details of the scoring system specific for each of the age-groups are shown on Table 3.3.

CHAPTER FOUR

4.0 RESULTS

4.1 Socio-demographic characteristics of children and caregivers

A total of 260 children participated in the study, of which 51.9 percent were males and 48.1 percent were females (Table 4.1). The mean age of the children was 13.7±5.5 months and the children were categorized into three age groups (6-8mo, 9-11 mo, and 12-23mo) and did not differ significantly in the proportion of children who were males.

The youngest caregiver was 15 years and the mean age of caregivers that participated in the study was 26.3±7.2years. About 90% of the caregivers were married and 13.8% of them have never been to school. The dominant occupations of caregivers in the area were farming (46.9%) and trading (43.5%). Majority of the caregivers were Krobos (78.5%). Other ethnic groups included Ewe, Akan, and Fulani. About 97% of the caregivers identified themselves as Christians.

Mothers/caregivers of the three child age categories did not differ significantly in relation to marital status, level of education, occupation, ethnicity and religion. However, caregivers of children aged 9-11 months were significantly different in age as compared to caregivers of children aged 12-23 months (p-value = 0.02) [but not 6-8 months (p-value = 0.48)]. Table 4.1 below shows details of the main characteristics of the study participants.

Table 4.1: Main characteristics of the study participants

Characteristic	Total Sample	Child Age Groups (mo)			p-Value[a]
		6-8 (n=63)	9-11 n=(47)	12-23 (n=150)	
Child Characteristic					
Age (mo)	13.7±5.5	6.75±0.80	10.1±0.88	17.82±3.26	<0.01
Sex (no/%)					
Male	135(51.9)	31(49.2)	26(55.3)	78(52)	0.81
Female	125(48.1)	32(50.8)	21(44.7)	72(48)	
Caregivers Characteristic					
Age (yrs)	26.3±7.2	25.5±6.3[1′2]	24.5±5.20[1]	27.2±7.9[2]	0.05*
Parity	2.74±1.80	2.57±1.78	2.40±1.46	2.91±1.87	0.18
Number of children <2yrs	1.10±0.20	1.04±0.21	1.04±0.20	1.06±0.24	0. 87
Age group(no/%)					
15-20	68 (26.2)	18(28.6)	13(27.3)	37(24.7)	0.18
21-29	112(43.1)	26(41.3)	26(55.3)	60(40.0)	
≥30	80(30.7)	19(30.2)	8(17.4)	53(35.3)	
Marital Status					
Single	22(8.5)	5(8.0)	4(8.5)	13(8.7)	0.56
Married	234(90)	58(92.0)	43(91.5)	133(88.7)	
Widow/Divorced	4(1.6)	0(0)	0(0)	4(2.6)	
Education					
None	36(13.8)	7(11.1)	4(8.5)	25(16.7)	0.23
Primary	210(80.8)	50(79.4)	40(85.1)	120(80.0)	
SHS/Tertiary	14(5.4)	6(9.5)	3(6.4)	5(3.3)	
Occupation					
Trader	113(43.5)	30(47.6)	20(42.6)	63(42)	0.48
Farmer	122(46.9)	25(39.7)	21(44.6)	76(50.7)	
Others[b]	25(9.6)	8(12.7)	6(12.8)	11(7.3)	
Ethnicity					
Ewe	41(15.8)	11(17.4)	4(8.5)	26(17.3)	0.59
Krobo	204(78.5)	49(77.8)	39(83)	116(77.3)	
Others (Akan, Fulani)	15(5.7)	3(4.8)	4(8.5)	8(5.3)	
Religion					
Christian	252(96.9)	63(100)	45(95.6)	144(96.0)	0.12
Others[c]	8(3.1)	0(0)	2(4.4)	6(4.0)	

[a]ANOVA for continuous variables. Post hoc: LSD Test, Means on the same row with different superscript are significantly different. Pearson's chi-square for categorical variables; statistical significance is at $p<0.05$.

SHS; senior high school

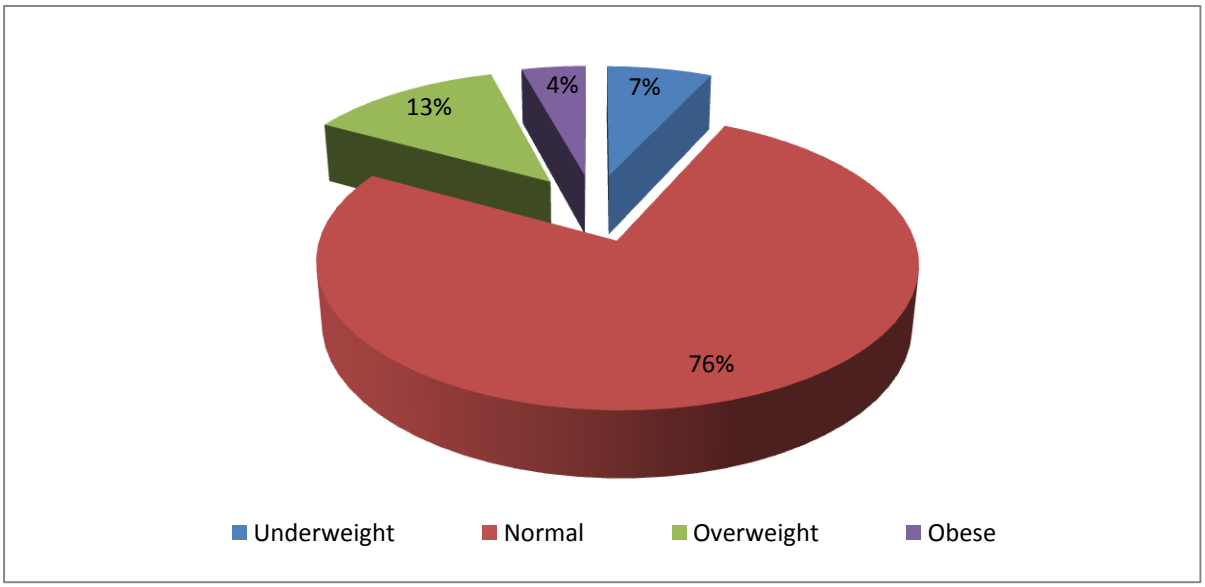
[b] Others; refers to hairdresser, teacher, student and housewife.

[c] Others; refers to muslin's and traditionalists.

4.2 Nutritional status of study mothers/caregivers

The mean BMI of the caregivers was 22.6±3.5. The mean height of the caregivers was 158.3±5.9 and the mean weight was 56.6±4.0. About 7% of the caregivers were underweight, 13% were overweight and 4% were obese while 76% of the caregivers had normal BMI. Caregivers of the three child age-groups were not significantly different in relation to their BMI classification (p-value = 0.98). Figure 4.1 below shows caregivers BMI categories.

Figure 4.1: Pie chart showing caregivers BMI Categories



4.3 Income and household characteristics

Table 4.2 shows that, on average there were 6 ± 3 persons in each household. There were no statistical differences in the household size and the number of rooms occupied by household members (p-value = 0.35 and 0.36, respectively) among the three child age groups. Only 8.5% of care-givers earned more than GH¢100.00 a month as income. As many as 209 of households owned their place of dwelling (house) and majority (85.0%) of households live in houses built with mud. The main source of fuel for cooking in the study area was firewood (87%) and well over 86% of households use pit latrines for sewage disposal. The main source of drinking water for the people was well/borehole and about 63.7% of households dump their refuse around the house while only 5.4% of households bury or burn their refuse (Table 4.2).

Table 4.2: Household characteristics of study participants

Characteristic	**Total Sample**	**Child Age Groups (mo)**			**P-Value[1]**
		6-8	**9-11**	**12-23**	
	Mean± SD	**Mean ± SD**	**Mean ± SD**	**Mean ± SD**	
Household size	6.0±3.0	5.6±2.6	6.4±3.7	5.9±2.8	0.35
Number of rooms they Occupy	2.3±1.6	2.4±1.6	2.4±1.9	2.2±1.43	0.36
	N (%)	n (%)	n (%)	n (%)	**P-Value[2]**
Monthly Income					
Less than GH¢ 50	151(58.1)	39(62)	23(48.9)	89(59.2)	0.19
Between GH¢ 51 - GH¢ 100	87(33.5)	16(25.3)	22(46.9)	49(32.8)	
Between GH¢101- GH¢150	14(5.4)	5(7.9)	1(2.1)	8(5.3)	
≥ GH¢400	8(3)	3(4.8)	1(2.1)	4(2.7)	
Type of Dwelling					
Mud	221(85)	55(87.3)	39(83.0)	127(84.7)	0.89
Block	38(14.6)	8(12.7)	8(17.0)	22(14.7)	
Wood	1(0.4)	0(0)	0(0)	1(0.6)	
Ownership of House					
Yes	209(80.4)	56(88.9)	36(76.6)	117(78)	0.15
No	51(19.6)	7(11.1)	11(13.4)	33(22)	
Type of Fuel Used in Cooking					
Gas	2(0.8)	2(3.2)	0 (0)	0(0)	0.11
Charcoal	31(12)	9(14.3)	7 (14.9)	15(10.1)	
Firewood	236(87.2)	52(82.5)	40(85.1)	134(89.9)	
Type of Toilet facilities					
Pit	224(86)	58(92.1)	40(85.1)	126(84.6)	0.60
KVIP	31(12)	5(7.9)	6(12.8)	20(13.4)	
Bush	4(1.5)	0(0)	1(2.1)	3(2.0)	
Source of Drinking Water					
Well/Borehole	154(59.2)	32(50.8)	31(66.0)	91(60.7)	0.45
River/stream	105(40.4)	31(49.2)	16(34.0)	58(38.7)	
Other(Sachet Water)	1(0.4)	0(0)	0(0)	1(0.7)	
Disposal of Refuse					
Buried/Burn	14(5.4)	3(4.8)	1(2.1)	10(6.7)	0.34
Dumped around House	165(63.7)	38(60.3)	30(63.9)	97(65.1)	
Dumped far from the House	71(30.5)	22(34.9)	15(31.9)	42(28.2)	
Collected by a garbage collector	1(0.4)	0(0)	1(2.1)	0(0)	

[1]ANOVA for continuous variables, [2]Pearson's chi-square for categorical variables; statistical significance is at p<0.05.1USD=3.50Gh¢ at the time of data collection.

KVIP; Kumasi ventilated improved pit.

4.4 Child morbidity (Surveillance)

Finding of the study revealed that about 66% of the children had been sick in the last two weeks prior to the interview. Out of the number of children who were sick, only 34% of the caregivers sought medical treatment from a health facility, but the rest resorted to self-medication and traditional treatment. In all about 7% of the children had malaria, 18% had diarrhoea, 23% had fever, 43% had pneumonia and 11% had other sicknesses such as burns, rashes and catarrh. The three groups of children were not different in the number of cases of the different illnesses.

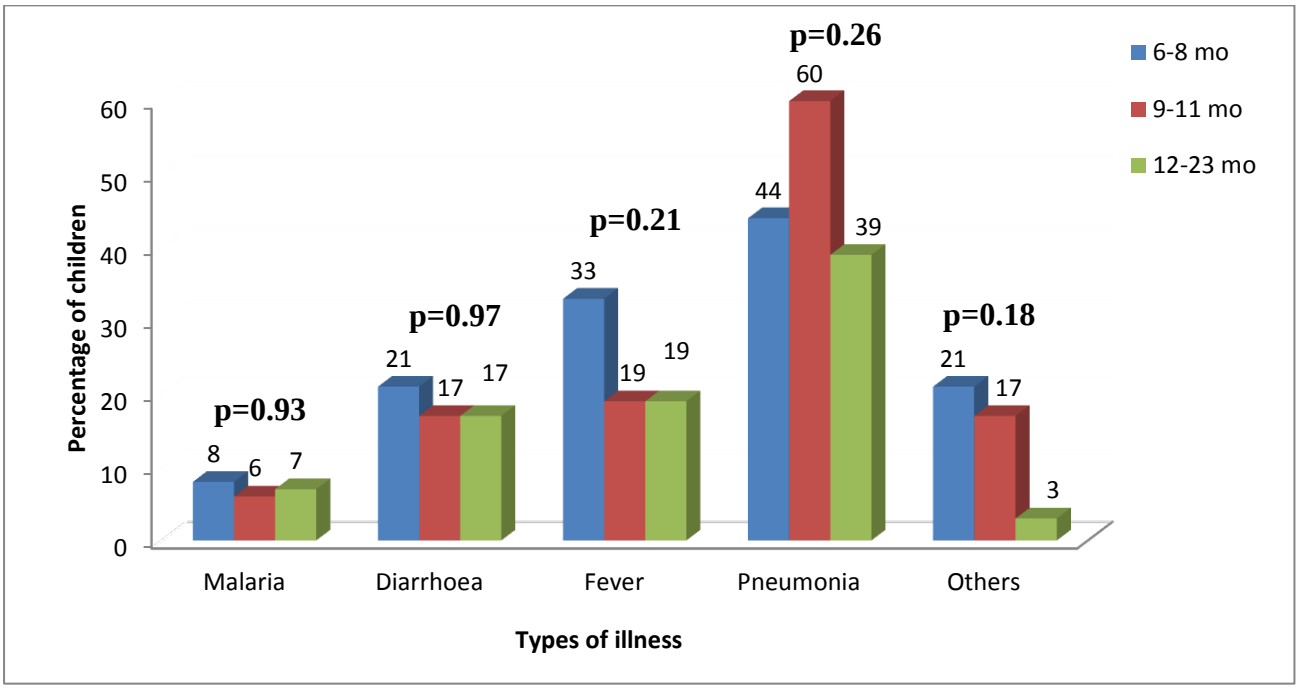
The average number of days that an episode of diarrhoea and pneumonia lasted was 5.6 ± 3.4 and 5.9 ± 2.9 days, respectively. Children aged 12-23 months spend significantly less days during diarrhoea episode as compared to children 6-8 months and 9-11 months (p-value = 0.002), while children aged 6-8 months spent significantly more days during pneumonia episode as compared to children aged 9-11 months and 12-23 months (p-value = 0.005)(Table 4.3). In all, malaria episodes among the children lasted on average for 4.9 ± 2.9 days and fever lasted for 4.4 ± 2.7 days. (Figure 4.2).

Table 4.3 Duration of illness among the three child age groups

Illness duration (days)	Total Sample Mean ± SD	6-8 mo Mean ± SD	9-11 mo Mean ± SD	12-23 mo Mean ± SD	P-value[1]
Malaria duration	4.89 ± 2.89	3.40 ± 0.89	5.67 ± 2.30	5.36 ± 3.47	0.420
Diarrhoea duration	5.57 ± 3.41	6.69 ± 3.55[1]	8.38 ± 4.90[1]	4.15 ± 1.83[2]	0.002*
Pneumonia duration	5.88 ± 2.90	6.95 ± 2.99[1]	6.22 ± 2.22[1,2]	5.0 ± 2.80[2]	0.050*
Fever duration	4.42 ± 2.77	4.14 ± 2.81	4.48 ± 3.27	4.53 ± 2.58	0.830
Other Sicknesses duration	6.52 ± 4.61	6.23 ± 3.88	8.50 ± 5.15	6.19 ± 4.73	0.430

[1]ANOVA for continuous variables; Post hoc: Turkey's test, Means on the same row with different superscript are significantly different. Mean difference is significant at 0.05 level.

Figure 4.2: Bar chart showing percentage of children and sicknesses those children had the previous two weeks to the interview.



[1]Pearson's chi-square for categorical variables; statistical significance is at $p<0.05$

4.5 Breastfeeding and complementary feeding practices

Most of the children who participated in the study were currently breastfeeding (87.7%). Breastfeeding was almost universal for children less than one year (98.2%), and as expected, significantly more children 6-11 months were still breastfeeding as compared to children 12-23 months (p-value < 0.001)(Table 4.4).

With regard to time of initiation of breastfeeding, 82.3% of the women reported to have started breastfeeding in less than one hour after birth while the remaining 16.7% started breastfeeding after one hour of birth. Breastfeeding was done on demand and majority of the children (70.4%) were breast fed for not less than ten times in a 24 hour period. The three child age groups were different in the number of times that they were breast fed in a day (p-value = 0.003), that is children 6-8 months and 9-11 months were more likely to be fed more times as expected with breast milk as compared to children 12-23 months. The mean number of months that mothers intended to breastfed their children before stopping was 24.7 ± 5.8 months. In addition, more than a third (37.2%) of the children received foods from bottles.

Majority (78.8%) of the children were introduced to complementary foods at the age of six months, and about 13% of the children received food items before the age of six months while the remaining 8.5% of the children started receiving complementary foods after the age of six months. The main complementary food used by mothers (73.3%) at the start of complementary feeding was *koko* (a low nutrient dense fermented cereal porridge). However, 13.8% of the mothers fed *cerelac*, 6.7% fed *tom brown*, and the remaining 6.2% fed other foods such as *rice porridge*, *banku*, and ice *kenkey* at the start of complementary feeding.

In all, about 56.2% of the children did not eat from the minimum required number of food groups (minimum dietary diversity) recommended by WHO during the 24 hours prior to the interview and significantly more children aged 12-23 months met the minimum dietary

diversity compared to children aged 6-8 months ($p<0.001$), but not 9-11 months (p-value = 0.64).

However, a high percentage of the children (82.7%) met the minimum meal frequency recommendation (WHO). Minimum acceptable diet which is a composite measure of child minimum dietary diversity and minimum meal frequency was met by 37.7% of the children while the remaining 62.3% of the children did not meet their minimum acceptable diet recommendation. There was no statistical significance between three age groups in relation to meeting their minimum meal frequency (p-value=0.16) but a large number of children aged 12-23 months significantly met their minimum acceptable diet recommendation as compared to children aged 6-8 months (p-value <0.001).(Table 4.4).

Table 4.4: Breastfeeding and complementary practices of study children

Variable	Total Sample N (%)	Child Age Groups 6-8	9-11	12-23	p-value
Currently breastfeeding					
Yes	228(87.7)	62[1]	46[1]	120[2]	<0.01*
No	32(12.3)	1	1	30	
Time of initiation of breastfeeding					
≤ 1 hour after birth	214(82.3)	54	39	121	0.67
>1 hour after birth	46(17.7)	9	8	29	
No. of times child was breastfed in last 24hr					
0 times	30(11.5)	1[1]	1[1]	28[2]	0.03*
1-5 times	23(8.8)	5	4	14	
6-9 times	24(9.2)	7	3	14	
≥ 10 times	183(70.4)	50	39	94	
Practice bottle feeding					
Yes	97(37.3)	24	22	51	0.28
No	163(62.7)	39	25	99	
Age of start of complementary feeding					
< 6 months	33(12.7)	9	9	15	0.51
6 months	205(78.8)	50	34	121	
> 6 months	22(8.5)	4	4	14	
Food given at the start of complementary feeding					
"Koko"	190(73.1)	46	30	114	0.43
"Cerelac"	36(13.8)	9	12	15	
"Tom brown"	16(6.2)	4	2	10	
Others (rice water, etc)	18(6.9)	4	3	11	
Minimum Dietary Diversity					
Adequate	114(43.8)	15[1]	21[1] □ [2]	78[2]	0.01*
Inadequate	146(56.2)	48	26	72	
Minimum Meal Frequency					
Adequate	215(82.7)	51	35	129	0.16
Inadequate	45(17.3)	12	12	21	
Minimum Acceptable Diet					
Adequate	98(37.7)	8[1]	18[2]	72[2]	<0.01*
Inadequate	162(62.3)	55	29	78	

Pearson chi square test for categorical variables. Post hoc: Turkey's test, Numbers on the same row with different superscript are significantly different. Statistically significant at p<0.05

4.6 Energy and nutrient intake levels

Table 4.5, below shows the percentage of children in the three child age categories who have met their EAR. More than 50% of children in age groups 9-11 months and 12-23 months met their EAR for energy, protein and carbohydrate. However, only 22.2%, 42.9% and 28.6% of the children aged 6-8 months met their EAR for energy, protein and carbohydrate respectively. Less than 10% of children aged 6-8 months and 9-11 months met their EAR for Vitamin A while as many as 59.3% of children 12-23 months met their EAR for Vitamin A.

Significant differences were observed in the percentage of children meeting their EAR among the three child age categories in all the nutrients (Figure 4.4). More children in the older age group met their EAR as compared to children in the younger age groups. Figure 4.4 shows the percentage of children in each of the child age categories that have not met their EAR for energy, protein, carbohydrate, iron and vitamin A. The percentage of children not meeting their EAR decreased with increasing child age.

Table 4.5: Energy and nutrient intake levels of children

6-8 months

Nutrient	Mean±SD	EAR	Percent % (n) of children meeting EAR
Energy	463.37±451.74	750	22.2(14)
Protein	13.34±16.70	11	42.9(27)
Carbohydrate	68.7±63.4	95	28.6(18)
Iron	4.17±4.68	11	11.1(7)
Vitamin A	92.67±149.57	500	1(1.6)

9 - 11 months

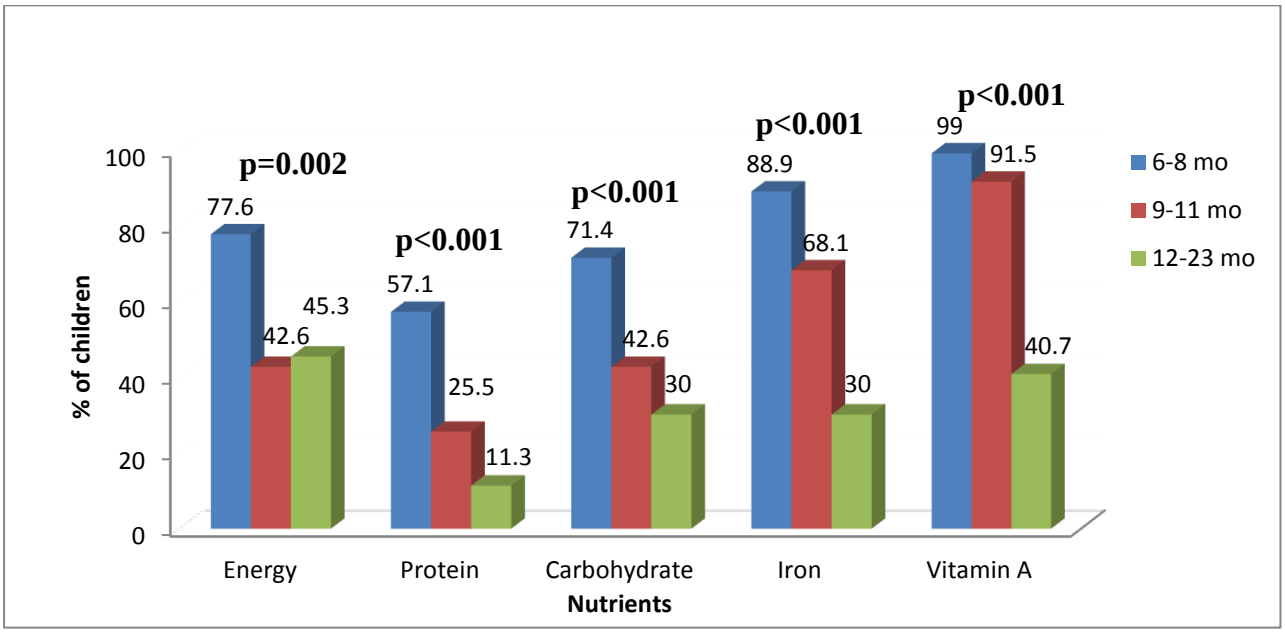
	Mean ± SD	EAR	Percent % (n) of children meeting EAR
Energy	914.42±615.85	750	57.4(27)
Protein	28.21±28.29	11	74.5(35)
Carbohydrate	119.60±81.67	95	57.4(27)
Iron	8.33±6.18	11	31.9(159
Vitamin A	185.94±350.37	500	8.5(4)

12 - 23 months

	Mean ± SD	EAR		Percent % (n) of children meeting EAR
		12mo	>12 - 23	
Energy	1436.22±917.74	750	1250	54.7(82)
Protein	43.85±40.05	11	13	88.7(133)
Carbohydrate	177.83±114.53	95	130	70(105)
Iron	12.37±8.52	11	7	70(105)
Vitamin A	360.34±388.51	500	150	59.3(89)

(Dietary Reference Intakes-The Essential Guide to Nutrition requirement. Institute of Medicine of the National Academies, 2006)

Figure 4.3: Bar chart showing percentage of children who did not met their EAR for the nutrients



Pearson chi-square for categorical variables. Statistically significant at p-value <0.05.

4.7 Child nutritional status (Anthropometry)

Anthropometric data from the survey was compared among the three age groups. The mean length-for-age (LAZ) Z-score for all the children was -0.76±1.34 while the mean weight-for-age and weight-for-length Z-scores were -0.35±1.15 and -0.66±1.22, respectively. LAZ and weight-for-length Z-score (WAZ) decreased with increasing child age. However WLZ did not decrease with child age. Children aged 6-8 months had significantly higher LAZ and WAZ (p- value = 0.001 and p-value = 0.02 respectively) values than children aged 12-23 months but not 9-11 months old children. The three child age groups did not differ in their weight-for-length Z-scores (p-value = 0.34).

With regard to sex of children, significant differences was observed among sexes in relation to their weight-for-length Z-score (p-value=0.01) and weight-for-age Z-score (p-value=0.01) but not length-for age Z-score (p-value=0.17).

The findings on Table 4.6, shows that about 16.2% of the children are stunted, 10.8% wasted and 6.9% underweight. A small percentage of children aged 6-8 months (6.5%) were wasted as compared to 15% of wasting observed among children 9-11 months. Significant differences in stunting was observed among the three child age groups, and more children aged 12-23 months were stunted as compared to children aged 6-8 months and 9-11 months (p-value = 0.03). No significant difference in percentage of wasting and underweight were observed.

The pie-chart below shows the number of malnourished and well-nourished children. Children were categorized into malnourished and well-nourished based on whether a child was stunted, wasted or underweight. A child who had any one or more of these nutritional deficits was classified as malnourished and a child who did not have any of these was

classified as well-nourished. The result shows that 22% of the children had at least one of them.

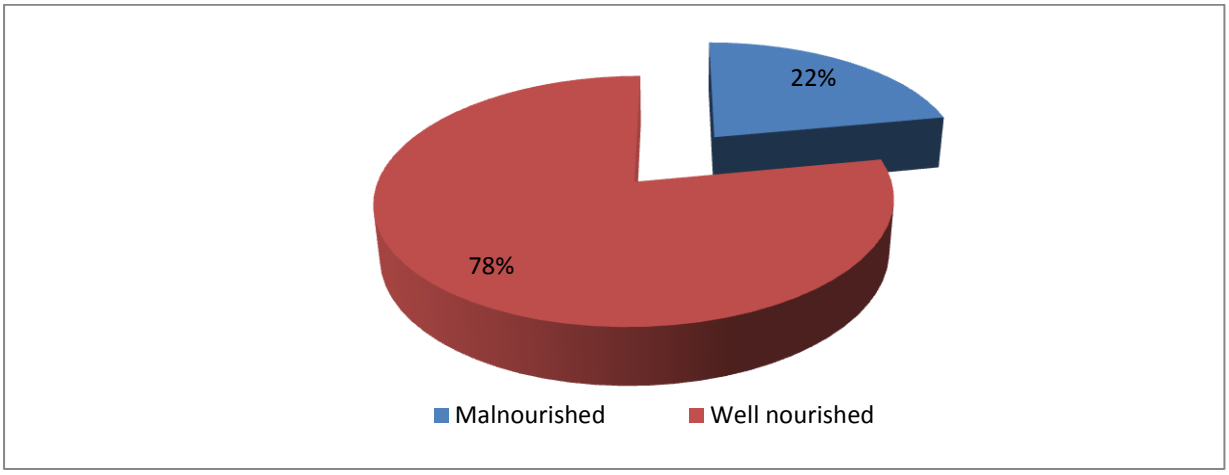
Table 4.6: Table showing Children nutritional status by Age groups

Anthropometric Indicator		**Age Category (months)**			**P-value[1]**
		6-8 n=63	**9-11 n=47**	**12-23 n=150**	
		Mean±SD	**Mean±SD**	**Mean±SD**	
LAZ		-0.19±1.24[1]	-0.57±1.3	-0.9±1.2[2]	<0.01*
WLZ		-0.17±1.31	-0.45±1.2	-0.5±1.0	0.34
WAZ		-0.31±1.27[1]	-0.60±1.3	-0.8±1.11[2]	0.02*
MUAC		13.78±1.39	13.82±1.20	14.0±1.22	0.39
	Total Sample N (%)	**6-8 mo n(%)**	**9-11 mo n(%)**	**12-23 mo n(%)**	**P- value[2]**
Stunting	42(16.2)	5(7.9)	5(10.6)	32(21.5)	0.03*
Wasting	18(6.9)	4(6.3)	7(14.9)	7(4.7)	0.05
Underweight	28(10.8)	5(7.9)	7(14.9)	16(10.7)	0.51

[1]ANOVA for continuous variable; Post hoc: Turkey's test, Means on the same row with different superscript are significantly different.

[2]Pearson's chi-square for categorical variables; statistical significance is at p<0.05

Figure 4.4: Pie-chart showing percentage of malnourished and well-nourished children



4.8 Food group frequency questionnaire (FFQ)

Table 4.7 below shows the number of days that children consumed food items from the seven food groups. Grains roots and tubers was the most frequently consumed food group and was consumed in all most all the days of the week with an average consumption days of 5.7 ± 2.0 days, while eggs was the least consumed food group (1.3 ± 1.6 days). The average number of days that dairy products and vitamin A rich fruits were consumed the previous seven days to the interview was 1.1 ± 1.9 days and 1.7 ± 1.8 days, respectively.

Children aged 12-23 months from the post hoc analysis, significantly consumed all the food groups except for dairy products on a more number of days than children aged 6-8 months but not 9-11 months old children.

Well-nourished children differed significantly from malnourished children in the frequency of consumption of dairy products (p-value = 0.01). [That is, well-nourished children consumed dairy products on more number of days as compared to malnourished children]. There was also a statistical difference between the two groups (well-nourished and malnourished children) in the number of days that they received Vitamin A rich fruits (p-value = 0.03).

No significant differences were observed between the malnourished and well-nourished children in relation to frequency of consumption of legumes and nuts, flesh fruits and other fruits and vegetables (p-value=0.25, p-value=0.1 and p-value=0.29 respectively).

Table 4.7: Consumption of foods from the various food groups by Age group and nutritional status

Food Groups	All Children (N =259)	Child Age Group			P-value[1]
		6-8 mo n=63	9-11 mo n=47	12-23 mo n=150	
	Mean±SD	Mean±SD	Mean±SD	Mean ±SD	
Grains, roots and tubers	5.7±2.0	5.0±2.6[1]	5.9±1.8[1′2]	5.9±1.8[2]	0.02*
Legumes and Nuts	1.8±1.8	0.1±1.6[1]	2.1±1.9[1′2]	2.0±1.8[2]	<0.01*
Dairy Products	1.1±1.9	1.5±2.4	1.3±2.2	0.9±1.5	0.06
Flesh foods	4.5±2.9	1.8±2.7[1]	5.2±2.6[1′2]	5.5±2.3[2]	<0.01*
Eggs	1.3±1.6	0.8±1.4[1]	1.2±1.9[1′2]	1.5±1.6[2]	0.03*
Vitamin A rich fruits	1.7±1.8	0.9±1.5[1]	1.6±1.8[1′2]	2.1±1.8[2]	<0.01*
Others fruits and Vegetables	2.1±2.0	1.4±1.8[1]	1.8±2.1[1′2]	2.5±2.1[2]	0.02*

Food Groups	All Children (N =259)	Nutritional Status		P-value[2]
		Well-Nourish n=203	Malnourish n=57	
	Mean±SD	Mean±SD	Mean±SD	
Grains, roots and tubers	5.7±2.0	5.67±2.10	5.66±1.93	0.97
Legumes and Nuts	1.8±1.8	1.86±1.85	1.54±1.78	0.25
Dairy Products	1.1±1.9	1.25±2.02	0.54±1.04	0.01*
Flesh foods	4.5±2.9	4.37±2.95	5.10±2.60	0.10
Eggs	1.3±1.6	1.35±1.74	1.0 ±1.21	0.16
Vitamin A rich fruits	1.7±1.8	1.84±1.82	1.25±1.53	0.03*
Others fruits and Vegetables	2.1±2.0	2.1±2.11	1.84±1.71	0.29

[1] ANOVA for continuous variable; Post hoc: Turkey's test, Means on the same row with different superscript are significantly different

[2]Independent sample T-test for continuous variables

Malnourished; child having at least one nutritional deficit (stunting, wasting, underweight)

Well-nourished; child not having any nutritional deficit (stunting, wasting, underweight)

4.9 Child composite feeding index

The modal ICFI score was 6 (22% of subjects) and 62% of children had scores between 5 and 7. The lowest ICFI score was 3 for children aged 6-8 months and 9-11 months and 1 for children aged 12-23 months. The mean ICFI scores was 5.83 ± 1.47, 6.34 ± 1.48 and 5.63 ± 1.91 for children aged 6-8 months, 9-11 months and 12-23 months, respectively.

ICFI internal validity was evaluated by testing the association between ICFI and each of its components by chi-square test. As assessed by the chi-square test for each of the age groups, the results shows that ICFI was strongly associated with the breastfeeding, dietary diversity, the seven-day food group frequency and meal frequency for all the three child age groups ($p<0.05$ in all cases), but not with bottle feeding (result of ICFI internal validity are not shown).

The distribution of the ICFI components by children's age groups is presented in Table 4.8, below. Breastfeeding was almost ubiquitous (98.4%, 97.9% and 92.3%) for all the child age groups. Surprisingly, 38.1%, 46.1% and 34% of children, respectively for the three child age groups of 6-8 months, 9-11 months and 12-23 months were fed from bottles.

Table 4.8: ICFI Component distribution by Age Groups

Component	6-8 months (n=63)	9-11 months (n=47)	12-23 months (n=150)
Breastfeeding, %	98.4	97.9	92.3
Bottle-feeding, %	38.1	46.8	34.0
DDS, %			
Poor	0-3 food-groups= 87.3	0-3 food-groups= 59.6	0-3 one food-group= 52
Average	4 food-groups= 7.9	4 food-groups= 23.4	4 food groups= 26.7
Good	> 4 food-groups= 4.8	>4 food groups= 17.0	> 4 food-groups= 21.3
FGF (Past 7 days), %			
Poor	0 (no foods in Previous week) = 7.9	0 or 1 = 2.	10 through 3= 4.7
Average	1 or 2 = 19.0	2 through 4=14.9	4 through 6= 24.0
Good	3 or higher = 73.0	5 or higher = 83	7 or higher = 71.3
Meal Frequency, %			
Poor	0-1 time = 8.0	0-2 times = 8.0	0-2 times = 14.0
Average	2 times = 11.3	3 times = 6.0	3 times = 14.7
Good	3 or more times = 80.7	4 or more times = 86.0	4 or more = 71.3
ICFI			
Minimum	3.0	3.0	1.0
Maximum	9.0	9.0	9.0
Median	6.0	7.0	6.0
Mean ± SD	5.83±1.47	6.34±1.48	5.63±1.91

4.9.1 Child composite feeding index (ICFI) and socio-demographic characteristic.

Table 4.9 below shows the relationship between socio-demographic characteristics of study participants and ICFI score category for all the three child age groups.

For children aged 6-8 months, no significant relationship was observed between socio-demographic characteristics of the study participants and child ICFI score. That is neither child nor caregivers socio-demographic variables were found to be related to child ICFI.

For children 9-11 months, child sex and whether or not the child was sick did not predict the child composite feeding score (p-value = 0.79 and p-value = 0.62). However, caregivers age category was related to child ICFI score (p-value = 0.04) while other caregivers variables such as education, marital status and occupation were not related to child ICFI score.

No significant relations were observed between demographic variables and child ICFI score for children aged 12-23 months, that is neither child nor caregiver's socio-demographic variables were found to be related to child ICFI score for this child age group.

Table 4.9: Association between ICFI and socio-demographic characteristics of study participants by age groups

Child Characteristics	ICFI Classes 6-8 mo n(63)	% of Poor	% of Average	% of Good	p[1]	ICFI Classes 9-11 mo n(47)	% of Poor	% of Average	% of Good	p[1]	ICFI Classes 12-23 mo n(150)	% of Poor	% of Average	% of Good	p[1]
Sex															
Male	31	38.7	16.1	45.2	0.14	26	26.9	46.2	26.9	0.79	78	32.1	35.9	32.1	0.06
Female	32	34.4	37.5	28.1		21	33.3	47.6	19		72	18.1	52.8	29.2	
Child was Sick															
Yes	48	33.5	29.2	33.3	0.62	31	25.8	51.6	22.6	0.62	93	29	38.7	32.3	0.21
No	15	33.3	20	46.7		16	37.7	37.5	25.0		57	19.3	52.6	28.1	
Caregivers Characteristics															
Age															
15 – 20	18	44.4	33.3	22.2	0.57	13	15.4	69.2	15.4	0.04	37	24.3	51.4	24.3	0.48
21 - 29	26	38.5	23.1	38.5		26	38.5	26.9	34.6		60	28.3	45	26.7	
≥30	19	26.3	26.3	47.4		8	25	75	0		53	22.6	37.7	39.6	
Education															
None	7	42.9	14.3	42.9	0.65	4	50	50	0	0.30	25	32	40	28	0.58
Primary	50	36	26	38		40	30	47.5	22.5		120	24.2	45.8	30	
SHS/Tertiary	6	36.5	27	36.5		3	0	33.3	66.7		5	20	20	60	
Marital Status															
Single	5	20	40	40	0.68	4	25	50	25	0.98	13	23.1	38.5	38.5	0.78
Married	58	37.9	25.9	36.2		43	30.2	46.6	23.3		133	24.8	45.1	30.1	
Widow/divorced											4	50	25	25	
Occupation															
Trader	30	36.7	23.3	40	0.99	20	30	45	25	0.50	63	20.6	46	33.3	0.19
Famer	25	36	28	36		21	28.6	57.1	14.3		76	26.3	46.1	27.6	
Others[a]	8	37.5	37.5	25		6	33.3	16.7	50		11	45.5	18	36.4	

[1]Pearson chi-square test for categorical variables. Statistical significant is at p-value < 0.05. Others[a]; refers to hairdressers, students and teachers.

4.9.2 Association between composite index (ICFI) and child length-for-age Z-score

Findings of the study shows that, the composite feeding index (ICFI) was not associated with child length-for-age Z-score for all the three child age groups (p-value=0.35, p-value = 0.53 and p-value=0.19) after adjusting for potential confounders (child age, sex, marital status, caregivers level of education and household size) either in the generalized linear model or in the bivariate analysis (results of the bivariate analysis are not shown). However, certain components of the index were found to be associated with child length-for-age Z-score.

Currently breastfeeding was negatively associated with children length-for-age Z-score for children aged 12-23 months (p-value=0.02). Breastfeeding comparison's was not made for children aged 6-8 months and 9-11 months because breastfeeding was almost universal among these age groups of children. Child dietary diversity score was negatively related to child length-for-age Z-score for children aged 6-8 months (p-value=0.03) but not 9-11 months and 12-23 months old children. Food group frequency (past seven days) was positively associated with child length-for-age Z-score for children aged 6-8 months (p-value=0.04) and 12-23 months (p-value=0.05)

Bottle feeding and meal frequency was not associated with child length-for age Z-score for all the three child age groups. All analysis was done separately for each child age group. Table 4.10 below shows the details of the relation between ICFI and its components with child length-for-age Z-score.

Table 4.10: Adjusted relations of ICFI and its components with child length-for-age Z-score by age groups.

		Length-for-Age Z-score		
ICFI/Component	Category	6 – 8 months	9 – 11 months	12 – 23 months
ICFI	Poor	-0.42±0.22	-0.51±-0.41	-1.23±0.17
	Average	-0.17±0.24	-0.44±0.22	-1.13±0.12
	Good	-0.04±0.21	-0.89±0.32	-0.85±0.15
	P	0.35	0.53	0.19
Breastfeeding	Yes	-	-	-1.17±0.10
	No	-	-	-0.67±0.19
	P	-	-	0.02*
Bottle Feeding	Yes	-0.05±0.22	-0.46±0.29	-1.06±0.14
	No	-0.27±0.17	-0.67±0.27	-1.07±0.10
	P	0.44	0.63	0.94
Dietary Diversity Score	Poor	-0.25±0.14	-0.56±0.24	-1.14±0.12
	Average	0.90±0.46	-0.73± 0.38	-1.16±0.16
	Good	-0.85±0.60	-0.36±0.49	-0.80±0.18
	P	0.03*	0.85	0.23
FGF (Past 7 days)	Poor	-0.58±0.46	1.70±1.24	-1.87±0.40
	Average	-0.87±0.32	-0.76±0.49	-1.22±0.17
	Good	0.03±0.15	-0.59±0.20	-0.97±0.10
	P	0.04*	0.17	0.05*
Meal Frequency	Poor	-0.36±0.30	-0.85±0.39	-1.32±0.22
	Average	-0.40±0.26	-0.90±0.43	-1.13±0.21
	Good	-0.03±0.19	-0.32±0.25	-1.01±0.10
	P	0.48	0.38	0.42

Values are means ± SE. FGF; refers to food group frequency.

Comparisons are adjusted for the following factors; Child Age (For children 6-8 mo; (0 = 6mo, 1= 7-8mo), For children 9-11 mo; (0 = 9-10mo, 1 = 11mo), For children 12-23mo; 0 = 12-17mo, 1 = >17mo)), Sex (0 = Female, 1=Male), Marital Status (0 = Not Married, 1 = Married), Maternal level of education (0 = Never Schooled, 1 = Schooled) and Household size (0 = 1-6 persons, 1= >6).

4.9.3 Association between composite index (ICFI) and child weight-for-length Z-score

The composite feeding index (ICFI) after adjusting for potential confounders (child age, sex, marital status, caregivers level of education and household size) was not significantly related to child weight-for-age Z-scores for all the three child age categories (p-value=0.12, p-value=0.36 and p-value=0.36) neither in the generalized linear model nor in the bivariate analysis (results of the bivariate analysis are not shown).

Breastfeeding, bottle feeding, seven-day food group frequency and meal frequency was not associated with child weight-for-length Z-score. However child dietary diversity score was negatively related with child weight-for-length Z-score for children aged 6-8 months (p-value<0.001) but not for children 9-11 months and 12-23 months. All analysis was done separately for each child age group (Table 4.11).

Table 4.11: Adjusted relations of ICFI and its components with Child weight-for-length Z-scores by Age groups

		Weight for Length Z- score		
ICFI/Component	Category	6 – 8 months	9 – 11 months	12 – 23 months
ICFI	Poor	-0.19±0.22	-0.33±0.28	-0.35±0.17
	Average	0.19±0.25	-0.78±0.22	-0.42±0.12
	Good	-0.31±0.21	-0.84±0.32	-0.40±0.15
	P	0.12	0.36	0.95
Breastfeeding	Yes	-	-	-0.06±0.19
	No	-	-	-0.48±0.09
	P	-	-	0.06
Bottle Feeding	Yes	-0.18±0.17	-0.74±0.23	-0.32±0.14
	No	-0.16±0.22	-0.59±0.22	-0.43±0.10
	P	0.94	0.65	0.53
Dietary Diversity Score	Poor	0.06±0.14	-0.55±0.19	-0.42±0.12
	Average	-0.64±0.46	-0.1±0.31	-0.05±0.16
	Good	-1.90±0.60	-0.55±0.39	-0.21±0.18
	P	<0.01*	0.40	0.46
FGF (Past 7 days)	Poor	0.37±0.46	1.17±1.03	-0.64±0.40
	Average	-0.53±0.32	-0.70±0.41	-0.47±0.17
	Good	-0.13±0.15	-0.70±0.16	-0.36±0.10
	P	0.26	0.20	0.70
Meal Frequency	Poor	0.13±0.30	-0.53±0.32	-0.33±0.22
	Average	-0.14±0.26	-0.49±0.35	-0.32±0.22
	Good	-0.29±0.18	-0.78±0.21	-0.42±0.10
	P	0.50	0.71	0.87

Values are means ± SE. FGF; refers to food group frequency.

Comparisons are adjusted for the following factors; Child Age (For children 6-8 mo; (0 = 6mo, 1= 7-8mo), For children 9-11 mo; (0 = 9-10mo, 1 = 11mo), For children 12-23mo; 0 = 12-17mo, 1 = >17mo)), Sex (0 = Female, 1=Male), Marital Status (0 = Not Married, 1 = Married), Maternal level of education (0 = Never Schooled, 1 = Schooled) and Household size (0 = 1-6 persons, 1= >6).

4.9.4 Association between composite index (ICFI) and child weight-for-Age Z-score

Similarly as the outcomes of the length-for-age and weight-for-length Z-scores, in both the generalized linear model and bivariate analysis, the ICFI index was not significantly associated with child weight-for-age Z-score after adjusting for potential confounders. Results of the latter analysis are not shown.

None of the components of the composite feeding index was associated with child weight-for-age Z-score for children aged 9-11 months. Nevertheless, currently breastfeeding was negatively related to the weight-for-age Z-score of children 12-23 months (p-value=0.01) but not to children aged 6-8 months. Child dietary diversity score was found to be negatively associated with child weight-for-age Z-score for children 6-8 months old (p-value=0.01**)** and not for children aged 12-23 months. All analysis was done separately for each child age group (Table 4.12).

Table 4.12: Adjusted relations of ICFI and its components with child weight-for-Age Z-score by Age groups

		Weight for Age Z-score		
ICFI/Component	**Category**	**6 – 8 months**	**9 – 11 months**	**12 – 23 months**
ICFI	Poor	-0.47±0.22	-0.33±0.27	-0.86±0.17
	Average	-0.06±0.251	-0.78±0.22	-0.85±0.12
	Good	-0.34±0.21	-0.84±0.32	-0.71±0.15
	P	0.48	0.36	0.72
Breastfeeding	Yes	-	-	-0.92±0.09
	No	-	-	-0.38±0.19
	P	-	-	0.01*
Bottle Feeding	Yes	-0.24±0.22	-0.74±0.23	-0.75±0.14
	No	-0.35±0.167	-0.59±0.22	-0.85±0.10
	P	0.69	0.66	0.57
Dietary Diversity Score	Poor	-0.17±0.14	-0.55±0.19	-0.86±0.12
	Average	-0.84±0.46	-0.10±0.31	-0.93±0.16
	Good	-0.19±0.60	-0.55±0.39	-0.55±0.18
	P	0.01*	0.40	0.23
FGF (Past 7 days)	Poor	-0.16±0.46	1.17±1.02	-1.40±0.40
	Average	-0.96±0.32	-0.69±0.41	-0.94±0.17
	Good	-0.16±0.15	-0.70±0.16	-0.73±0.10
	P	0.08	0.20	0.20
Meal Frequency	Poor	-0.19±0.30	-0.53±0.32	-0.90±0.22
	Average	-0.40±0.26	-0.49±0.35	-0.77±0.22
	Good	-0.31±0.17	-0.78±0.21	-0.81±0.1
	P	0.87	0.71	0.91

Values are means ± SE. FGF; refers to food group frequency.

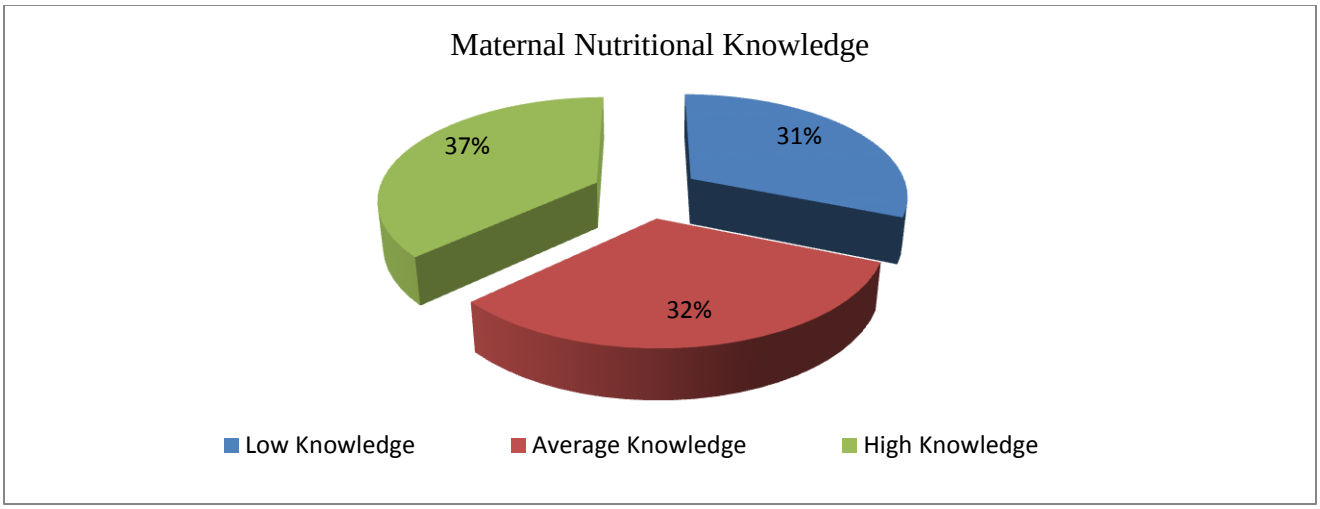
Comparisons are adjusted for the following factors; Child Age (For children 6-8 mo; (0 = 6mo, 1= 7-8mo), For children 9-11 mo; (0 = 9-10mo, 1 = 11mo), For children 12-23mo; 0 = 12-17mo, 1 = >17mo)), Sex (0 = Female, 1=Male), Marital Status (0 = Not Married, 1 = Married), Maternal level of education (0 = Never Schooled, 1 = Schooled) and Household size (0 = 1-6 persons, 1= >6).

4.10 Caregiver's nutritional knowledge.

The results as presented on Figure 4.5 below shows that about 31% of the women had little knowledge of nutrition, 32% of the women had a fair knowledge of nutrition and 37% had a good knowledge about nutritional practices and deficiencies.

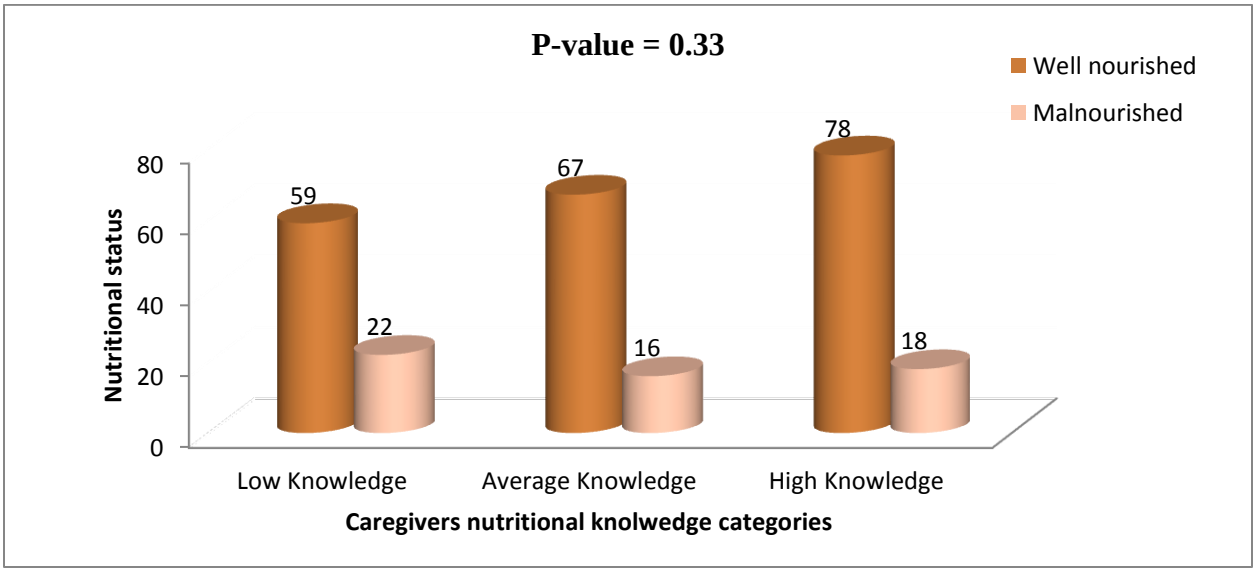
The mean nutritional knowledge score of the caregivers was 9.6±2.2 from a range of 0-17. About 27% of the caregivers, who had good nutritional knowledge, had a score ≥ 13 of the total seventeen questions asked. No caregiver had all the answer's right.

Figure 4.5: Pie chart showing caregivers nutritional knowledge categories



4.10.1 Association between caregivers nutritional knowledge and child nutrition status

Figure 4.6: Bar chart showing the relation between maternal nutritional knowledge and child nutritional status



Pearson's chi-square test for categorical variable. Statistical significant is at p-value < 0.05

Figure 4.6 above shows that caregivers nutritional knowledge was not significantly related to child nutritional status (p-value = 0.33).

Chi-square analysis and fisher's exact test was conducted with the individual variables which make up the nutritional knowledge index to examine the relationship between these variables and child nutritional status. The result shows that none of the variables which make up the nutritional knowledge index was significantly associated with child nutritional status and as such a caregivers knowledge of any of these nutritional behaviours and practices was not related to whether or not their children were well-nourished or malnourished.

The results further showed that, 82.3% of the women knew that breastfeeding should be initiated immediately after birth. About 79.6% of the women had knowledge that colostrum should be given to infants, and when ask why colostrum should be given to baby's, well over 58% of them

said it gives strength and protection to the baby and it helps the baby to grow well while the others said it is part of breast milk (15.4%) and it helps the child to pass mucous stool (5.8%). The other women (20.4%) who said colostrum should not be given to infants reported that it was full of germs and their mother-in-laws have asked them not to give. Almost all the women (95.4%) had certain foods that they taboo and as many as about 78.8% of the women did not know the signs and symptoms of kwashiorkor. Almost all women knew (99%) that children should be fed with fruits and vegetables frequently.

A further binary logistic regression analysis as can be seen from Table 4.13 below shows that the nutritional knowledge of the caregivers was not a determinant of the nutritional status of the study children.

The results further showed that, children belonging to caregivers who were married were less likely to be malnourished as compared to children of divorced caregivers (odds ratio 0.09 [95% CI 0.009, 0.90]) and children of single caregivers were also less likely to be malnourished as compared to children of divorce caregivers (odds ratio 0.05 [95% CI 0.004, 0.69]). However, children whose caregivers have not been to school and children whose caregivers had attained a secondary or a tertiary education were similar in nutritional status (odds ratio 4.3 [95% CI 0.48, 38.90]).

No significant differences were observed between malnourished and well-nourished children in relation to their caregiver's age and educational status, but significant differences were observed for caregiver's marital status and caregiver's height (odds ratio 0.09 [95% CI 0.86, 0.96]).

Table 4.13: Determinants of child nutritional status

Variable	N	Odds Ratio	95 % Confidence Interval	P-value
Maternal Age				
15-20	68	1.24	0.56, 2.74	0.60
21-29	112	0.86	0.41, 1.81	0.70
≥30	80	1.00		
Maternal level of Education				
None	36	4.31	0.48, 38.90	0.19
Primary	210	3.60	0.46, 28.40	0.22
Secondary/Tertiary	14	1.00		
Marital Status				
Married	234	0.09	0.009, 0.90	0.04
Single	22	0.05	0.004, 0.69	0.03
Separated/Divorced	4	1.0	Ref	
Maternal Height	259	0.09	0.86, 0.96	0.001
Maternal nutritional Knowledge				
Low Knowledge	81	1.59	0.78, 3.24	0.20
Average Knowledge	83	1.03	0.49, 2.18	0.95
High knowledge	96	1.00	Ref	

4.10.2 Association between maternal nutritional knowledge and ICFI

A chi-square test to determine the association between the nutritional knowledge of caregivers and the ICFI scores of the children showed that caregivers nutritional knowledge was not associated with the ICFI score of children ($p = 0.72$). The ICFI scores of all the children were similar for the three nutritional knowledge categories of the caregivers (Table 4.14).

Table 4.14: Association between caregiver's nutritional knowledge and ICFI index

ICFI Categories	Independent Variable	B	Odds Ratio	95 % Confidence Interval
Poor	**Caregivers Nutritional Knowledge**			
	Low	0.36	1.43	0.72, 2.85
	Average	0.12	1.12	0.57, 2.22
	High			Ref
	Sex			
	Female	0.05	1.1	0.59, 1.87
	Male			Ref
	Child Age			
	< 1 year	0.71	2.0	0.81, 5.1
	≥ 1 year			Ref
	Household Size			
	<7 persons	-0.49	0.61	0.33, 1.14
	≥7 persons			Ref
	Caregivers Level of Education			
	Educated	-0.33	0.72	0.31, 1.66
	None			Ref
	Marital Status			
	Married	0.44	1.60	0.58, 4.2
	Not Married			Ref
Average	**Caregivers Nutritional Knowledge**			
	Low	0.041	1.04	0.44, 2.4
	Average	0.37	1.44	0.65, 3.18
	High			Ref
	Sex			
	Female	0.84	2.31	1.16, 4.6*
	Male			Ref
	Child Age			
	< 1 year	0.25	1.29	0.41, 4.0
	≥ 1 year			Ref
	Household Size			
	<7 persons	-0.92	0.91	0.43, 1.95
	≥7 persons			Ref
	Caregivers Level of Education			
	Educated	-0.38	0.68	0.25, 1.90
	None			Ref
	Marital Status			
	Married	-0.40	0.67	0.24, 1.87
	Not Married			Ref

The reference category is Good/well feeding

CHAPTER FIVE

5.0 DISCUSSION

5.1 Caregivers characteristics

Our findings from Upper Manya Krobo district showed that, caregivers of the three child age groups were different in relation to their age. Caregivers of children aged 9-11 months were significantly younger as compared to caregivers of children aged 12-23 months. Most of the women/caregiver's are farmers, traders and hairdressers. The observed high numbers of women in non-formal occupations in the area may be due to high illiteracy rate, poverty and high school drop-out rate. Parents of these caregivers especially those in rural areas are not engage in any high income yielding ventures and have not attained high educational levels and as a result are not likely to send their female children to school and this goes a long way to affect the type of jobs they engage in later in life. These caregivers who did not have any formal education may have to engage in non-formal ventures and farming which are easily accessible so as to raise income to support themselves and their families.

Education provides people with knowledge that can lead to a better quality of life. The study also shows that most of the caregivers have not attained at least a secondary school (SHS) education. This finding may be due to poverty and the inadequate amenities and infrastructure like schools in Upper Manya Krobo district which is still developing. A study by Grantham-McGregor *et al*., in 2007 reported that, poverty was related to school performance. In Zambia, Aldaz-Carroll and Moran in 2001, found that poor children were more than four times likely to start school late than rich children and in 16 Latin American countries, the same authors reported that family income predicted completion of secondary school education.

In addition, the cultural practices of the Krobo people such as the *dipo* rites which imply that a young girl can be become pregnant after the rites (Atobrah, 2005) could be a possible explaining for the observed high level of illiteracy among the caregivers. The *dipo* rite by its cultural acceptance contributes to teenage pregnancy leading to early marriages and making it impossible or less likely for females to attain higher educational pursuits.

5.2 Child morbidity (Surveillance)

Pneumonia was found to be the leading cause of childhood morbidity in the area. This findings is consistent with the report of the Paediatric Association of Ghana (PAG, 2010), which reports that pneumonia is one of the leading cause of morbidity and mortality among young children (under-five) in Ghana. Again, pneumonia according to the WHO is the leading infectious cause of death worldwide and is estimated to be responsible for the loss of about 935, 000 lives among children under-five in 2013 alone.

Malaria prevalence was the least (7%) among the common illnesses investigated in the area. A cross sectional study by Atuobi in 2010 reported 16.4% malaria prevalence in the same study area. This observed low prevalence of malaria as compared to Atuobi findings could be attributed to the recent free ITN nets distribution by the Ghana Health service in the area. Treated mosquito nets distribution exercise was going on during the time of the survey and could have possibly accounted for the low malaria rate observed.

The prevalence of fever and diarrhoea observed in this study is lower than the rates reported at baseline of an integrated education intervention to improve infant and young child nutrition and growth in Ghana study by Cofie in 2012. The difference may be due to seasonal variation in the

prevalence of these diseases. The later study was conducted between July to December while the former was conducted between November to February. Malaria transmission peaks between May to October in Ghana (Koran *et al*., 2000) and could explain the observed low prevalence's in this current study.

5.3 Breastfeeding and complementary feeding practices

Breastfeeding is the normal way of providing children with the nutrients needed for growth and healthy living. The WHO and GHS recommends that breastfeeding should be initiated immediately after birth to ensure that colostrum is fed to the infant, and that children should be exclusively breastfed for the first six months, with continued breastfeeding and appropriate complementary feeding to two years and beyond. Our findings from the survey show that breastfeeding was almost ubiquitous for all the three child age groups and a large percentage of the women reported breastfeeding initiation within an hour of birth. Breastfeeding was done on demand and caregivers were willing to breastfeed up to two years.

This finding is consistent with the findings of the GDHS report in 2014. Evidence from the health survey report shows that breastfeeding is nearly universal in Ghana with about 92.3% of children under-two ever breastfed (GDHS, 2014) and the average duration of breastfeeding is 20 months (GDHS, 2008). Nevertheless the percentage of caregivers reported initiating breastfeeding within an hour of birth was higher in this study than the percentage reported in 2008 by GDHS. The difference could be due to the continuous nutrition education on breastfeeding the nurses give to pregnant and lactating women during ANC and CWC clinics.

Similarly, Sawadogo *et al*., in 2006 who conducted a study in rural Burkina Faso also reported a nearly universal breastfeeding rate among children (6-35 months). The authors observed that

breastfeeding was prolonged for all children and a fairly good proportion of even children aged 24-35 months were still breastfeeding.

Complementary feeding practices from the findings in the area in our estimation are less than ideal. Complementary feeding was either started earlier (13%) or later (9%) than the recommended six months for the children in the area and this have implications for their well being and health. Although, the reasons for the early or late start of complementary feeding was not investigated in this study but some of the reasons reported by Abang in 2013 for the early start of complementary feeding among mothers in Ghana include; children are thirsty and needs water, mothers also complain that breast milk alone does not satisfy children just to mention a few. Our findings supports the findings of Nti and Lartey in 2006 who observed that about 14% of children in the same study area was introduced to complementary foods before the age of 3 months. Atuobi, (2010) in a cross sectional study in the same study area concluded that complementary feeding practices in the area was not optimal and was seen in the low dietary diversity scores and certain specific nutrient deficiencies in the diet of the children. On the other hand, our findings were inconsistent with the results obtained by Cofie in 2012 that conducted a qualitative study in the same area and estimated that timely initiation of complementary feeding may not be a problem in the study area. The differences in findings may be due to the different communities selected for the study.

The main food used by caregivers at the start of complementary feeding was observed to be *koko* (a low nutrient dense fermented cereal porridge) and quite a good number of the caregivers fed their children through bottles, a practice which the WHO discourages. The bottles which the mothers used may not be well cleaned and could serve as a medium of transfer of disease causing microorganisms to children. These poor feeding practices especially during the early

stages of life in the area could be responsible for the observed pneumonia and diarrhoea cases. Studies by Popkin *et al.*, in 1990 showed that poor infant feeding practices is the underlying cause of diarrhoea among young children. Again victora (1996) also found an association between inadequate infant feeding practices and diarrhoea onset among young children.

The proportion of children meeting their WHO recommended minimum acceptable diet and minimum dietary diversity score was less than half. However majority of the children received food items the required number of times in a 24 hour period. This is similar to the baseline findings of Cofie (2012) who conducted a study in the same study area and found that, the overall percentage of children (all three groups combined) who met their minimum acceptable diet and minimum dietary diversity was less than 50%. Also, reports from the demographic and health survey, 2014 shows that far less than half of Ghanaian children 6-23 months were able to meet their WHO recommended minimum acceptable diet. The inability of children in this study to meet their WHO minimum acceptable diet recommendation may be partly due to the low socio-economic status of caregivers making it difficult for them to provide the right type of food for their children. It was observed that about 60% of caregivers earned less than GHc50 (<US$12) as income in a month.

5.4 Child nutritional status

The prevalence of stunting, wasting and under-weight observed in this study (16.2%, 6.9%, and 11% respectively) were similar to the rates observed by the Ghana demographic and health survey in 2014 (19%, 5%, and 11% respectively). The prevalence of stunting increased with increasing child age. This is similar to the trend reported by Atuobi, (2010) and GSS, (1998) where older age children were more stunted than younger age children. However the mean prevalence of wasting was observed in this study to be high among children aged 6-11 months as compared to the older age group, a finding that contradicts the results of Atuobi in 2010 who observed an increasing trend of the mean prevalence of wasting among children (6-23) in the same study area. This finding is however similar to the GDHS, 2014 reports where younger age children (6-11 months) were found to be more wasted than the older age group.

Poor complementary feeding practices (Maleta *et al*., 2003), enteric and other infections (Lindsay *et al*., 2008) and inadequate dietary intake (Hillbruner and Egan, 2008) have be found as the main attributing factors for poor childhood growth in low-income countries. These factors elucidated by these researchers could have possibly accounted for the prevalence of stunting, wasting and underweight observed in this study. Wasting is an indication of current malnutrition and shows that a child is currently not receiving the right amount of nutrients needed for good health and was found to be more prevalent in the younger age group. The high wasting is explained by the significantly high diarrhoea episodes among the younger age group. Diarrhoea episodes could lead to loss of appetite causing a reduction in food intake and resulting in the high percentage of wasting observed among the younger age group children (6-11 months).

Moreover, the culture of the Krobo people where women taboo snails and bush rats for traditional reasons and pork for religious reasons hinder pregnant women from eating animal

source foods (Lartey *et al*., 2005). Animal source foods are good sources of micronutrients (Iron, zinc, calcium and B-vitamins) and these micronutrients are essential especially during pregnancy (Allen, 2003). These cultural practices together with poverty may prevent women as well as their children from meeting their dietary requirement, increasing the tendency for the children to become under nourished, because eggs for instance is belief to cause cataract in children and crabs are associated with witcraft (Nti *et al*., 2002). Children are therefore unlikely to be offered such foods.

If appropriate interventions are not taken, children can be born short and this stunting is likely to persist until childhood as observed in children aged 12-23 months (21.5%). This high stunting rate could be due to poverty and low educational status of the caregivers coupled with the poor breastfeeding practices. Also the early or late introduction of complementary foods in the study area can lead to onset of nutritional deteriorations (stunting, wasting and underweight) and if nutrition education measures are not put in place to teach caregivers the need to start complementary feeding at 6 months, the current prevailing rate of stunting, wasting and underweight will continue to rise with time and more children will be malnourished. There is the need for the GHS to emphasize on appropriate complementary feeding practices in the area.

5.5 Child composite feeding index and child nutritional status

Globally, researchers have assessed the relation between an infant and a young child feeding index (ICFI) and child nutritional status. This current study provides data on infant and young child feeding practices in the Upper Manya Krobo district of Ghana. This study found no association between children's ICFI score and their Length-for-age Z-score, weight-for-age Z-score and their weight-for-length Z-score for all the three child age groups after adjusting for potential confounders. However certain components of ICFI after adjusting for confounders were associated with child length-for-age Z-score, weight-for-length Z-score and weight-for-age Z-score. Food group frequency (past seven days) was positively associated with LAZ of children aged 12-23 months whiles currently breastfeeding and dietary diversity (past 24 hours) were negatively associated with the length-for-age Z-score and weight-for-age Z-score of some of the child age groups.

Food group frequency (past seven days) which is an indication of the number of times and days the child had eaten from a particular food group within a week positively predicted the LAZ among children aged 12-23 months. The positive association between food group frequency and the LAZ of the older age group children is comparable to other studies that have documented the benefits of eating from a variety of foods for the growth of children. In Madagascar, Moursi *et al.,* 2008 observed that children consuming a high number of food groups had a higher LAZ ($r = 0.41$; $p<0.05$). Similar finding was reported by Steyn *et al*., 2005 in South Africa. Steyn and colleagues observed that children (1-8years) who received different food items (food variety score of 5.5) presented better height for age Z-scores than their counterparts ($r = 0.21$; $p<0.0001$).

On the other hand, currently breast feeding was found to be negatively associated with the LAZ of study children aged 12-23 months. The reverse causality between breastfeeding and LAZ of children observed in this study has also been reported by other researchers. In Senegal, Ntab *et al.,* 2005 observed lower height-for-age Z-scores among breastfed children and Simondon *et al.,* 1998 observed that mothers in the same country prolonged breastfeeding for malnourished children in order to improve the health status of the children and reduce mortality risk associated with the weaning of malnourished children. We also observed dietary diversity score to be negatively associated with the length for age Z-score of children aged 6-8 months. This finding could partly be due to the observation that a higher percentage of the children with good feeding practices were sick and that the mothers probably increased the number of food groups fed to their sick children in other to improve recovering, just as mothers in the reverse causality hypothesis between breastfeeding duration and stunting (Moursi *et al.,* 2008; Ntab *et al.,* 2005; Simondon *et al.,* 1998) tend to increase breastfeeding for malnourished children. However dietary diversity score has been related to better height-for-age Z-score in children in Latin America (Ruel & Menon, 2002) and among children aged 12-23months in Burkina Faso (Sawadogo *et al.,* 2006).

Our findings on ICFI and child anthropometric indices were consistent with the findings of Ntab *et al*., (2005) who investigated the relation between ICFI and height-for-age Z-score and linear growth among rural Senegalese children and found no association between ICFI and child height-for-age Z-score ((adjusted means: -1.01, -1.06, and -1.20 Z-scores for the 1st, 2nd, and 3rd tercile, respectively), or linear growth (6.2, 6.0, and 6.3 cm/7 mo for the 3 terciles, respectively) among children aged 12-42 months. In addition our findings is also in line with the findings of Moursi *et al.,* in 2008 who conducted an assessment of child feeding practices using a

summary index, studied its stability over time and association with child growth in urban Madagascar. The study found that the cross sectional ICFI was neither associated with child weight-for-length Z-score (p-value = 0.14) at visit 3 nor with length-for-age Z-score (p-value = 0.22, 0.08 and 0.1 respectively for visit 1, 2 and 3).

Nevertheless, evaluation by Ruel and Menon, 2002 using demographic and health survey from seven Latin American countries showed significant relationship between feeding practices and height-for-age Z-score for children aged 12-36 months (p-value <0.005). The researchers showed that feeding terciles relations with height-for-age Z-score were weaker and less consistent for the younger age group children (9-11 months) but increased with age. Ruel and Menon, 2002 also tested the components of the ICFI with height-for-age Z-score and observed that dietary diversity was strongly associated with child height-for age Z-score. Sawadogo *et al.*, 2006 in Burkina Faso also found a significant positive relationship between a modified ICFI and height-for-age Z-score of children aged 6-8months (p-value = 0.003) and 12-23 months (p-value = 0.002). ICFI was also associated with the weight-for-age Z-score of children 6-11 months (p-value =0.02). Dietary diversity and meal frequency was also associated with child height-for-age for children aged 6-8 and 12-23 months.

The discrepancies in the results obtain by this current study and the findings of Ruel and Menon, 2002 may be due firstly to the difference in the settings where the study was conducted. The feeding practices of children may be different across continents and countries and as such Latin American children feeding practices may differ from those of Upper Manya Krobo district. Eggs for instance are rarely eating in Upper Manya Krobo but are not the same for Latin American countries. Results from this study have shown that eggs were the least consumed food group but were reported fed to more than half of all the children in Ruel and Menon, 2002 study.

The second possible explanation could be that our sample size was not large enough to detect significant differences among the children. Ruel and Menon, 2002 used 1599 - 6347 children aged 12-36 months per data set and observed differences; Sawadogo *et al.,* 2006 used a sample size of 2,465 and detected differences while this study used 260 children aged 6-23 months and did not detect any differences; Ntab *et al.,* 2005 used a sample size of 500 and did not detect differences; Moursi used a sample size of 440 and did not detect differences at the final visit 3. This wide variation in sample size could have been responsible for difference in results.

Lastly, new feeding recommendations for breastfed children aged 6-23 months have been published in particular with lower energy intake from complementary food and lower recommended numbers of daily meals than previously (i.e., 2–3 at 6–8 mo of age and 3–4 thereafter) since the creation of the Ruel and Menon index (Dewey, 2003). There were also no specific recommendations unlike now on the number of food groups a child should consume in a day as such arbitrary scoring was used for all the age groups in the Ruel and Menon index. The current study however awarded marks based on the current complementary feeding practices for all the age groups. The difference in the criteria used in awarding marks in this current study and the Ruel and Menon study could be a possible explanation for the difference in the findings.

5.6 Child composite feeding index and caregivers nutritional knowledge

The relation between maternal nutritional knowledge and child feeding index was also investigated in this study. The results showed that a caregiver's knowledge of nutrition was not associated with the composite feeding index score of the child. This means that the feeding practices of the children of caregivers with high knowledge was similar to the feeding practices of the children of caregivers with low or average nutritional knowledge. This could explain why there were no observed differences in the nutritional status of the children of these groups of caregivers.

The lack of association between caregivers nutritional knowledge and child feeding behaviours observed in this study contradicts the findings of Ongosi, 2010 who in Kenya among women (0-6 months) post partum observed that women knowledge of nutrition influenced the quality of care mothers gave to themselves and their children and empowered them to make optimal choices for nutritious and safe food. Mothers are the principal provider of primary care for infants during their first six months of life. The quality of care mothers provided was reported to be largely depended on their knowledge of nutrition and their understanding of certain aspects of nutrition (Christian *et al.,* 1988) and mothers in Mozambique with high nutritional knowledge choose more diversified diets for their children and were able to use food more effectively (Francesco, 2010).

The lack of association in this study is expected because the findings of this study show that a large percentage of caregivers had knowledge that complementary feeding practices should start at 6 months but did not practice what they knew. If caregivers do not practice what they know then the feeding practices or ICFI score of their children is not expected to be better than caregivers who do not have adequate nutritional knowledge. Also the low socio-economic status

of caregivers in the area is expected to hinder the practice of what the women know about nutrition. In low socio-economic settings the impact of nutritional knowledge on child feeding practices is mitigated (Ruel *et al.*, 1992).

5.7 Caregivers nutritional knowledge and child nutritional status

Insel *et al.,* in 2003 defined nutritional knowledge as the understanding of the different food types and choices that affects health and nutrition. A mother's knowledge of nutrition has been found to be positively associated with the nutritional status of children in several studies in Ghana and other countries.

In the present study, caregiver/maternal nutritional knowledge was not found to be associated with child nutritional status. A slightly high percentage of the women had high knowledge of nutrition but their knowledge of nutrition did not make their children significantly more well nourished as compared to caregivers/mothers with low and average nutritional knowledge in a chi square test. A further regression analysis of the individual questions that make up the nutritional knowledge index revealed that a caregiver's knowledge of any of the questions asked was not related to the nutritional status of her child. However certain socio-demographic variables; caregivers/maternal height and marital status were found to predict child nutritional status.

Our study confirms the findings of Waihenya *et al.* (1996) who explored the relationship between maternal nutritional knowledge and child nutritional status among preschool children in Nairobi slum. The authors reported that a large number of the mothers had access to nutrition education but no association was found between maternal nutritional knowledge and the overall nutritional status of their children. Nutrition education alone according to the authors was not enough to guarantee the nutritional security of children. Similarly, Ruel *et al.* (1992) found that maternal nutritional knowledge in Lesotho was not associated with child weight-for-age Z-score among mothers in the lower socio-economic group. This findings means that the socio-economic status of caregivers and household wealth is necessary for good nutritional well-being of

children, so that caregivers with appropriate nutritional knowledge can appropriately provide all the right type of food for better nutritional outcomes.

Nevertheless in 2005, Appoh and Krekling observed a positive association between maternal nutritional knowledge and child nutritional status in the Volta region of Ghana. Mothers who had well-nourished children had higher nutritional knowledge scores than mothers of malnourished children indicating that a mother's knowledge of nutrition was related to the nutritional status of their children. The authors further showed that mothers knowledge of; the time of initiation of breastfeeding, colostrum, the importance of colostrum, the age at which complementary foods should be introduced and the causes of kwashiorkor was associated with the nutritional status of their children. In addition, an exploration by Webb and Lapping, 2002 of the association between maternal nutritional knowledge, education and child nutritional outcomes in six developing countries, showed that maternal nutritional knowledge and education was independently associated with child nutritional outcomes. In Bangladesh, better nutritional habits of children were associated with a higher nutritional knowledge of their mothers (Faraque, *et al.*, 2008).

In conclusion the lack of association between caregivers/maternal nutritional knowledge and child nutritional status in this study suggests that caregiver's knowledge of nutrition may not guarantee a better nutritional security. It is one thing to know about something and another thing to practice it or have the resources to practice it. Some caregivers for instance in this study knew that complementary feeding should begin at six months but started feeding their children before or after six months. Also it was observed in this study that majority of the caregivers earn less than GH¢50 a month and the average household size was 6 ± 3 people. Adequate nutritional knowledge may therefore not be enough to guarantee child nutritional security and as such other factors such as poverty or low economic status may have hindered mothers with adequate

knowledge of nutrition from providing the right type of food in their right combinations for their children and could have accounted for the lack of difference in nutritional status of the children of mothers with high knowledge and children of mothers with low knowledge.

5.8 Limitation of the study

The cross sectional design of the study might not reflect the usual feeding practices of the study children and hence the relation could be different if data is taken at other times. We assumed that the feeding practices measured represent the usual feeding practices of the study children.

CHAPTER SIX

6.0 CONCLUSION AND RECOMMENDATION

6.1 Conclusion

Our study showed that, children in the Upper Manya Krobo District are less well nourished and under-nutrition was prevalent in the district.

The complementary feeding practices of the children were less than ideal even though, the duration of breastfeeding was long and the frequency of feeding was also good. The practices that were of concern were early or late introduction of complementary feeding. ICFI was not associated with the nutritional status of the children in the study area. A higher percentage of caregivers had good knowledge of nutrition but caregiver's nutritional knowledge was not association with child nutritional outcomes (LAZ, WHZ and WAZ). Caregiver height, consumption of dairy products, consumption of vitamin A rich foods and marital status however predicted the nutritional status of the children. Child ICFI score was also not associated with the nutritional knowledge of caregivers. However, a seven day food group frequency positively predicted the LAZ of the study children. Thus, increasing the consumption of foods from different food groups will likely lead to a reduction in stunting among rural children in Ghana.

6.2 Recommendations

In other to improve breastfeeding and complementary feeding practices in the Upper Manya Krobo district, the following recommendations are suggested.

- Interventions on optimal breastfeeding in the district with focus on promoting exclusive breastfeeding and timely introduction of complementary feeding.
- Nutrition education of caregivers on appropriate complementary feeding practices and its implications for health and nutrition.

- Emphasis should be made by the community health nurses through their monthly CWC sessions on the need to diversify diets giving to children.
- A similar study should be carried out to investigate the relationship between child composite feeding index and child nutritional status using a larger sample size.

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Appendix I: Parental consent form

PARENTAL CONSENT FORM.

Title: The Association Between An Infant And Young Child Feeding Index, The Nutritional Knowledge Of The Care-Giver And The Nutritional Status Of Children 6-23 Months In The Upper-Manya Krobo District.

Principal investigator: Prosper Chapu Pagui

Address: University of Ghana

P.O. Box LG, 25

Accra- Ghana.

General Information about Research

This is a research study. Please take your time and read through carefully and decide whether or not you will like you and your child to be part of the study. Feel free to ask any question at any time. The purpose of this study is to find out how child feeding practice affects how children grow. You are being invited to participate in this study because you have a child between 6 – 24 months in your household.

If you agree to participate in this study, we will ask you questions about yourself, your household and the way you feed your child. Also we will provide a list of food items and you will tell us whether you have fed your child any of these in the past week. The Length, weight and Mid-upper arm circumference of your child will be measured. You can skip any question you do not wish to answer or that makes you feel uncomfortable during the interview. About 300 women will participate in this study.

Possible Risk and Discomfort

There is no risk involved in participating in this study. A little discomfort may be felt by the child during the measurements.

Possible Benefits

There is no direct benefit to you or your child for participating in this study. It is also hoped that the information gained in this study will benefit the community by providing the best way of feeding children in this age group.

Confidentiality

Information about you and your child will be kept confidential. You or your child will not be named in any of our reports and only investigators involved in this study will have access to records of subjects. The record of the study will be kept at the University of Ghana. However the Institutional Review Board (a committee that reviews and approves human subject research studies may inspect and /or copy your record for quality assurance and data analysis.

Compensation

At the end of the study, you and your child will receive a token of two bars of Geisha soap as compensation for your time and effort for participating.

Voluntary Participation and Right to leave the Study

You and your child's participation in this study are completely voluntary. You have the right to refuse to take part in the study or withdraw at any point in time. This will not result in any penalty or loss of benefits.

Contacts for Additional Information

You are encouraged to ask any question at any time of the study. Further questions about this study may be directed to Prosper Chapu Pagui (0200522218; Prosperchapu@yahoo.com), Dr. Ohemeng Agartha (0244862606; anohemeng@ug.edu.gh).

You and your child's Rights as Participants

This research has been reviewed and approved by the Institutional Review Board of Noguchi Memorial Institute for Medical Research (NMIMR-IRB). If you have any questions about your rights as a research participant you can contact the IRB Office between the hours of 8am-5pm through the landline 0302916438 or email addresses: nirb@noguchi.mimcom.org or HBaidoo@noguchi.mimcom.org.

VOLUNTEER AGREEMENT

The above document describing the benefits, risks and procedures for the research title ***(***The Association Between An Infant And Young Child Feeding Index, The Nutritional Knowledge Of The Care-Giver And The Nutritional Status Of Children 6-23 Months In The Upper-Manya Krobo District***.)*** has been read and explained to me. I have been given an opportunity to ask any questions about the research answered to my satisfaction. I agree to participate with my child as volunteers.

_____ _____

Date Name and signature or mark of volunteer

If volunteers cannot read the form themselves, a witness must sign here:

I was present while the benefits, risks and procedures were read to the volunteer. All questions were answered and the volunteer has agreed to take part in the research.

_____ _____

Date Name and signature of witness

I certify that the nature and purpose, the potential benefits, and possible risks associated with participating in this research have been explained to the above individual.

_____ _____

Date Name Signature of Person Who Obtained Consent

Address _____

Phone number _____

Appendix II: Research questionnaire

THE ASSOCIATION BETWEEN AN INFANT AND YOUNG CHILD FEEDING INDEX, THE NUTRITIONAL KNOWLEDGE OF THE CARE-GIVER AND THE NUTRITIONAL STATUS OF CHILDREN 6-23 MONTHS IN THE UPPER-MANYA KROBO DISTRICT

MAIN STUDY QUESTIONNAIRE

1-1 SOCIO-DEMOGRAPHIC CHARACTERISTICS OF CHILD AND CAREGIVER

Kindly tick/write the appropriate response where applicable

1. Name of Child? …….
2. Sex of Child? 1 = Male [ ] 2 = Female [ ]
3. Age of Child in months? …….. . Please verify from the weighing card if available
4. Mother's age? ……
5. Marital status
   1 = Married [ ] 2 = Single [ ] 3 = Widowed [ ] 4 = Separated/Divorced [ ]
6. Maternal parity? ……..
7. How many children under two years of age do you have? ……..
8. Mothers level of Education?
   1= None [ ] 2 = Primary [ ] 3 = Senior High [ ] 4 = Tertiary [ ] 5 = Others specify[ ]
9. What is your Occupation? ……
10. What is your Ethnicity?
    1 = Akan [ ] 2 = Ewe [ ] 3 = Krobo[ ] 4 = Others (Specify) ……
11. Area/village of residence ……..
12. Religion ……

1-2 CHILD MORBIDITY

Kindly tick/write the appropriate response where applicable

13. Has your child been sick for the past two weeks? 1. Yes [ ] 2. No [ ] **if No, jump to Q17**

14. Did you seek medical care when your child fell sick? 1. Yes [ ] 2. No [ ]

15. If yes where did you seek medical care? 1. Own medication [ ] 2.Traditional healer [ ] 3. Health centre[ ] 4. Others specify……

16. If child was sick what was the sickness?

Sickness	YES		NO
	No. of times	No. of days in each occasion	
Malaria			
Diarrhoea			
Shortness of breath, cough			
Fever			
Other (specify)… ……			

1-2 INCOME AND HOUSEHOLD CHARACTERISTICS

Kindly tick/write the appropriate response where applicable

17. How many people are in your household? ……..

18. How many rooms does your household occupy? …….

19. Do you and your household own the house you live in? 1 = Yes [ ] 2 = No [ ]

20. How much is your monthly household income?
1 = less than GH¢50 [ ] 2 = between GH¢50 - GH¢100 [ ] 3 = between GH¢101-GH¢250 [ ] 4 = between GH¢250 - GH¢400 [ ] 5 = more than GH¢400 [ ]

21. What type of building materials was used in the construction of your place of residence?
1 = Cement blocks [ ] 2 = Wood [ ] 3 = Mud [ ] 4 = Baked Bricks [ ]

22. What is the main source of drinking water in your household?
1 = pipe born [ ] 2 = rain water [ ] 3 = well/ borehole [ ] 4 = river/stream [ ]
5 = Other (specify)……

23. Where is the source of the water located?
1 = Inside subject's house [ ] 2 = In subjects yard [ ] 3 = Other (specify) …….

24. Have you had water from this source in the past two weeks? 1 = Yes [ ] 2 = No [ ]

25. What kind of toilet facilities this household has?
1 = WC [ ] 2 = KVIP [ ] 3 = Pit Latrine [ ] 4 = Bush [ ] 5 = Others (specify)…….

26. How does your household dispose of refuse?
1 = Buried/ burn [ ] 2 = Dumped around the house or compound [ ]
3 = Dumped in a specific place far from the house [ ] 4 = Collected by a garbage collector [ ]
5 = Others (specify)……

27. What is the main fuel used in cooking in your household?
1 = Gas [ ] 2 = Charcoal [ ] 3 = Firewood [ ] 4 = Kerosene [ ] 5 = Electricity [ ]
6 = Other (specify)……..

28. Kindly indicate if you have any of the under-listed domestic animals in your household.

Domestic animal	Yes	No
Poultry		
Goats		
Sheep		
Pigs		
Cattle		

29. Kindly tell me if you have any of these items (currently working) in your household.

Item	Yes	No
Electricity		
Telephone/ mobile phone		
Refrigerator		
Radio		
Television		
Video deck		
Bicycle		
Motor cycle		
Vehicle (car, lorry etc)		
Kiosk/store		

1-4 MATERNAL NUTRITIONAL KNOWLEDGE

Kindly tick/write the appropriate response where applicable

30. At what time should breastfeeding be initiated after child birth? .....

31. Should colostrum (first yellowish milk) be given to a new born baby?
    1 = Yes [ ] 2 = No [ ]

32. Whether yes/no from the above question, ask Why? …….

33. At what age should complementary feeding be introduced? ……

34. Which of the following is best for infants under 6 months?
    1. Infant formula [ ] 2.Breast milk [ ] 3. Koko [ ] 4. Tom brown [ ] 5.Don't know [ ]

35. When serving food at home who do you think should get the greatest portion
    1. Father [ ] 2.Mother [ ] 3.Older children [ ] 4. Young children [ ] 5. Don't know [ ]

36. Do you have any food beliefs/taboos? 1= Yes [ ] 2 = No [ ]

37. What are the main sources of protein? …….

38. Have you heard of kwashiorkor? 1 = Yes [ ] 2 = No [ ]

39. What are the symptoms of kwashiorkor? Do not read the answers for the mother but just allow her to mention the symptoms she knows?
    1 = don't know [ ] 2 = child has big stomach, big head, thin legs, looks sick and unhappy, body and face swells, [ ] 3 = Others (specify) ……

40. What are the causes of kwashiorkor?
    1 = don't know [ ] 2 = evil spirits [ ] 3 = lack of the right type of food [ ] 4 = others (specify) ……..

41. Which of these groups of food are good for the eye sight?
    1 = plantain, maize and rice [ ] 2 = green leafy vegetables and palm oil [ ] 3 = chicken and meat [ ]

42. Fruits and vegetables must be eaten frequently? 1. Yes [] 2. No [ ] 3. Don't know [ ]

43. Rickets /bow legs in children are caused by lack of
    1. Vitamin K [ ] 2.Vitamin D [ ] 3.Vitamin E [] 4. Vitamin A [ ] 5.Don't know [ ]

44. Which of the following is a rich source of iron/blood?
    1. Meat [ ] 2.Tomatoes [ ] 3.Carrot [ ] 4. Rice [ ] 5.Don't know [ ]

45. Goitre (protruded thyroid) is caused by lack of...
    1. Iodine [ ] 2. Iron [ ] 3.Calcium [ ] 4.Sodium [ ] 5. Don't know [ ]

46. Which of the following is a rich source of iodine?
    1. Sea foods [ ] 2. Meat [ ] 3.Orange [ ] 4.Carrot [ ] 5. Don't know [ ]

1-5 DIETARY ASSESSMENT

1-5.1 BREASTFEEDING AND COMPLEMENTARY FEEDING PRACTICES

Kindly tick/write the appropriate response where applicable

47. Are you currently breastfeeding the child? 1 = Yes [ ] 2 = No [ ]

48. How many times have you breastfeed the child in the last 24 hours?
    1 = none [ ] 2 = 1-5 times [ ] 3 = 6 – 9 times [ ] 4 = > 10 times [ ]

49. At what age do you intend to stop breastfeeding your child? …….months

50. Do you practice bottle feeding? 1 = Yes [ ] 2 = No [ ]

51. At what age did you begin giving your child complementary foods?.....months

52. What food did you give to the child at the start of complementary feeding?
    1 = Koko [ ] 2 = Cerelac [ ] 3 = Rice water [ ] 4 = Tom brown [ ]
5 = Others (specify) …….

1-5.2 24- HOUR DIETARY RECALL

53. Kindly tell me all the foods the child ate from the past 24- hours to now.

Meal	Time	Description/Type of Food	Quantity
Breakfast			
Snack			
Lunch			
Snack			
Super			
Snack			

1-5.3 FOOD GROUP FREQUENCY (WITHIN 24 HOURS AND 7 DAYS)

Ask was each item given at least once in the last 24hr or 7 days before proceeding to the next item

FOOD GROUP	54. Has the child eaten this in the last 24 hours		55. Has child eaten this in the last seven days?		56. How many days in the last 7 did your child ate it?
	Yes	No	Yes	No	Number of days
Grains, roots and tubers (rice, bread, maize, cassava, yam, plantain, etc).					
Legumes and Nuts (beans, groundnuts, peanut, soybeans etc)					
Dairy Products (milk, butter, yoghurt and cheese)					
Flesh foods (meat, fish, poultry etc)					
Eggs					
Vitamin A rich fruits (mangoes, carrot, sweet potatoes, dark green leafy vegetables etc)					
Other fruits and vegetables (oranges, banana, pineapples etc)					

1-6 ANTHROPOMETRY

Kindly measure the child's weight, height and MUAC twice and record

Variables	1ST	2ND
57. WEIGHT (kg)		
58. LENGTH(cm)		
59. MUAC(cm)		

60. Maternal Height (cm)…….
61. Maternal Weight (Kg) …….

Appendix III: Map of Upper Manya Krobo District