KWAME NKRUMAH UNIVERSITY OF SCIENCE AND TECHNOLOGY, KUMASI

COLLEGE OF HEALTH SCIENCES

SCHOOL OF MEDICAL SCIENCES

DEPARMENT OF COMMUNITY HEALTH

COMPLEMENTARY FEEDING PRACTICES AND NUTRITION STATUS OF YOUNG CHILDREN 06-23 MONTHS OF AGE IN THE KASSENA-NANKANA DISTRICT, UPPER EAST REGION, GHANA

BY

Martin Nyaaba Adokiya

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Thesis Submitted to the School of Graduate Studies, Kwame Nkrumah University of Science and Technology, Kumasi, Ghana in Partial Fulfillment of the Requirements for the Award of Master of Public Health (MPH) Degree in Population and Reproductive Health

By

Martin Nyaaba Adokiya

April, 2010

DECLARATION

I, Martin Nyaaba Adokiya herein declare that this study was done by me. No part of this work referred to has been submitted in support of an application for another degree or qualification in this and/ any other Institution of learning.

Signature……

Martin Nyaaba Adokiya

(MPH-Resident)

Signature……

Dr. Anthony K. Edusei

(Supervisor)

Signature……

Dr. Anthony K. Edusei

(Head of Community Health Department)

DEDICATION

I dedicate this work to my mother, Benedictta and my three sisters Ramatu Baba Issaka, Justina and Agnes Adokiya for their love, encouragement, support throughout these years, who inspired me to keep looking for the best in life.

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DEFINITION OF TERMS

Malnutrition: The term is used to refer to a number of conditions, each with a specific cause related to one or more nutrients (for example, protein, iodine or calcium) and each characterized by cellular imbalance between the supply of nutrients and energy on the one hand, and the body's demand for them to ensure growth, maintenance, and specific functions, on the other.

Stunting: Height-for-age Z-scores (HAZ) reflect linear growth retardation and are used to describe long-term nutritional status; stunting is defined as HAZ < -2 Z-scores.

Underweight: Weight-for-age Z-scores (WAZ) represent a global measure of malnutrition; and underweight is defined as WAZ < -2 Z-scores

Wasting: Weight-for-height Z-scores (WHZ) reflect more current nutritional status and measure the degree of thinness in a child; wasting is defined as WHZ < -2 Z-scores.

Complementary feeding: Complementary feeding is defined as the feeding process which starts when breastmilk alone is no longer sufficient to meet the nutritional requirements of infants, and therefore other foods and liquids are needed, along with breastmilk for healthy growth and development.

Exclusive breastfeeding: Exclusive breastfeeding refers to the practice whereby the child receives only breastmilk, not even water - for the first six months of life for healthy growth and development.

Z-scores: A Z-score (or standard deviation score) is defined as the deviation of the value of an individual child from the median value of the reference population, expressed in standard values.

ABBREVIATIONS/ACRONYMS

AED	Academy for Educational Development
ACC	Administrative Committee on Coordination
BMI	Body Mass Index
CFs	Complementary Foods
CHO's	Community Health Officer's
CHPS	Community-based Health Planning and Service
CI	Confidence Interval
Cm	Centimetres
DHMT	District Health Management Team
ENA	Emergency Nutrition Assessment
FANTA	Food and Nutrition Technical Assistance Project
GDHS	Ghana Demographic and Health Survey
GDP	Gross Domestic Product
GHS	Ghana Health Service
HAZ	Height-for-Age Z-score
ICOUR	Irrigation Company of Upper Region
IFPRI	International Food Policy Research Institute
IUGR	Intra-Uterine Growth Retardation
JSS	Junior Secondary School
Kg/ m^2	Kilogram per metre square
KND	Kassena-Nankana District
LBW	Low Birth Weight
MDHS	Malawi Demographic and Health Survey
NCHS	National Centre for Health Statistics
NHIS	National Health Insurance Scheme
NHRC	Navrongo Health Research Centre
O-Level	Ordinary Level
OR	Odds Ratio
PAHO	Pan American Health Organization
P-Value	Probability Value
SAM	Severe Acute Malnutrition
SCN	Standing Committee on Nutrition (of the United Nations System)
SD	Standard Deviation
SMART	Standardized Monitoring and Assessment of Relief and Transitions
SSS	Senior Secondary School
TZ	Tuo Zaafi
UN	United Nations
UNICEF	United Nations Children's Fund
USA	United States of America
USAID	United States Agency for International Development
WAZ	Weight-for-Age Z-score
WHO	World Health Organization
WHZ	Weight-for-Height Z-score

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ABSTRACT

Malnutrition is responsible globally for 60.0% of deaths among children under 5 years and is often attributed to suboptimal feeding practices. The objective was to assess complementary feeding practices among young children 06-23 months of age and their nutritional status. Hypothesis of the study was to identify if there is an association between early introduction of complementary foods (before 6 months of age) and the nutritional status of children 06-23 months of age in the Kassena-Nankana District, Ghana. A cross sectional household study was conducted in the Kassena-Nankana District, 379 children and mothers/caregivers were selected using a multistage sampling method. Complementary feeding practices of young children and nutritional status of both mother/caregiver and child was assessed. The study also assessed mothers' knowledge on complementary feeding. From the study, 61.2% of the children were timely introduced to complementary foods (6 months of age) and 96.3% of the children were still breastfeeding. The prevalence of child undernutrition among the children was as follows: stunting (HAZ <-2 z scores) was 15.6%, underweight (WAZ <-2 z scores) 15.3% and wasting (WHZ <-2 z scores) 8.7%. Prevalence of maternal malnutrition was 10.3% (BMI<18.5kg/m^2), overweight was 12.4% (BMI>18.5-≤30.0-kg/m^2) and obese was 2.4% (BMI>30.0kg/m^2). This is a measure of the double burden of malnutrition in the district. There was no association between early introduction of complementary foods before six months and child undernutrition based on univariate analysis (unadjusted). There was no statistically significance when the children were compared using complementary foods introduction time and child undernutrition: stunting was (<6 months of age: OR=0.70, 95%CI=0.31-1.59, P=0.400), underweight (<6 months of age:

OR=1.04, 95%CI=0.48-2.23, P=0.920), and wasting (<6 months of age: OR=0.65, 95%CI=0.21-1.96, P=0.442) of infants and young children. A significant association (adjusted odds ratio) was found between stunting and age (6-8 months, 9-11 months and 18-23 months), primary level of maternal education, female sex, whilst underweight was associated with age (6-8 months, 9-11 months and 18-23 months), divorced/separated marital status, Nankam/Frafra tribe, primary level of maternal education, and female sex. Wasting was associated with only female sex. There was high frequency (38.8%) of inappropriate complementary feeding practices in the district. Though there was no association of child malnutrition and early introduction of complementary foods this relation does exist and could be found in a similar survey.

CHAPTER ONE

INTRODUCTION

1.1 Background Information

Globally, malnutrition has been responsible, directly or indirectly, for 60.0% of the 10.9 million deaths annually among children under five. Well over two-thirds of these deaths, which are often associated with inappropriate feeding practices, occur during the first year of life. No more than 35.0% 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. Malnourished children who survive are more frequently sick and suffer the life-long consequences of impaired development (WHO, 2003).

Malnutrition in its many forms persists in virtually all countries of the world inspite of a general improvement in food supplies and health conditions, and the increased availability of educational and social services. An estimated 174 million under-five children in the developing world are malnourished as indicated by low weight for age (WAZ), and 230 million are stunted (HAZ). Malnutrition results in poor physical and cognitive development as well as lower resistance to illness. In addition to the human suffering, the loss in human potential translates into social and economic costs that no country or most countries can afford (WHO, 1996).

Infants and young children are at increased risk of malnutrition from six months of age onwards, when breastmilk alone is no longer sufficient to meet all nutritional requirements and complementary feeding needs to be introduced to them. Breastmilk alone is the ideal food to start an infant's life for healthy growth and development. Breastmilk provides all the energy and nutrients an infant needs in the first 6 months of life. Exclusive breastfeeding means human breastmilk only.

No solids or other fluids (including water) should be given, with the exception of prescribed drops or syrups consisting of vitamins, mineral supplements or medicines.

Timely introduction of appropriate complementary foods promote good health and positive nutritional status of infants and young children during a period of rapid growth, physiological maturation and development. Less than optimum feeding practices during this critical period (less than 2 years of age) can increase the risk of growth faltering (wasting and stunting) and nutritional deficiencies and may have longer-term adverse effects on health, mental development and level of productivity in later years of life.

Complementary foods are often of lesser nutritional quality than breastmilk and some of the nutrients may have low bioavailability and utilization. In addition, they are often given in insufficient amounts and, if given too early or too frequently, they displace breastmilk. Adequate nutrition during infancy and early childhood is fundamental to the development of each child's full human potential. It is well recognized that the period from birth to two years of age is a "critical window" opportunity for the promotion of optimal growth, health and behavioural development. After a child reaches 2 years of age, it is very difficult to reverse stunting that has occurred earlier (Martorell et al., 1994).

Poor breastfeeding and complementary feeding practices, coupled with high rates of infectious diseases, are the principal causes of malnutrition during the first two years of life (PAHO/WHO, 2003). Complementary feeding is defined as the feeding process of starting other foods when breast milk alone is no longer sufficient to meet the nutritional requirements of infants and therefore other foods and liquids are needed, along with breast milk for healthy growth and development until the age of 2 years and beyond. It is recommended by WHO that those children between the ages of 06

to 24 months be given complementary foods to ensure appropriate growth and healthy life. Thus, understanding the causes and context of malnutrition will lead to improved child survival and better child health outcomes.

1.2 Problem Statement

Undernutrition is a human disaster on a vast scale especially among children under two years of life living in rural communities globally. Chronic undernutrition affects one in three children in developing countries. Malnutrition accounts for the death of more than 3 million children and more than 100,000 mothers every year. Undernutrition cripples the immune system, making children much more susceptible to disease. It increases the risk of anaemia and women dying during pregnancy and childbirth. It prevents proper brain development, which means children are less able to start school when they should, and less able to learn and perform. Adults who were undernourished in childhood earn significantly less and contribute less to economic growth. Undernutrition also reduces Gross Domestic Product in every country across the globe. The situation is even more pronounced in rural communities where individuals and groups are also the most vulnerable to changes in food prices and have limited coping opportunities for survival and development.

It is believed that undernutrition arises from a complex, multiple and interactive events or causes. The immediate causes include inadequate dietary intake and disease. Underlying these are causes operating at household and community levels: household food insecurity, inadequate care for women and children, and unhealthy household environments and lack of health services, with income poverty underpinning all three. Ultimately, these factors are determined by the larger political, economic, social and cultural environment. Gender inequalities act at all levels. Gendered

power relations are a key factor in decision making within the household and often in ensuring the entitlement of female household members to adequate nutrition. The complex causality calls for a multi-sectoral approach and action at different levels to effectively address undernutrition in the long term.

1.3 Rationale for the Study

Adequate nutrition through exclusive breastfeeding and appropriate complementary feeding during infancy and early childhood is fundamental to the development of each child's full human potential. The period of birth to 2 years of age is the critical time for the promotion of optimal growth, health and physical (motor) and intellectual development. Good nutrition in early ages is translated into high productivity and economic development at the national level too. There is increasing recognition that optimal complementary feeding depends not only on what is fed, but also on how, when, where, and by whom the child is fed (Pelto et al., 2002).

The study shall document the current prevalence of malnutrition in the district among children 06-23 months of age and their mothers. It is noted that there is no such information for planning and implementation of nutrition interventions in the district for children and their mothers. The results will also serve as baseline data for the Kassena Nankana District. It shall also provide information on the feeding practices associated with children in the area.

1.4 Research Questions

- When do mothers introduce complementary foods to young children in the Kassena-Nankana District?

- What foods did mothers give to young children while they were still breastfeeding?
- What are the hygienic practices associated with complementary feeding in the district?
- What is the prevalence of malnutrition among young children 06-23 months of age in the district?
- What is the prevalence of maternal malnutrition in the district?

1.5 Objectives

1.5.1 General Objective:

- To assess complementary feeding practices and nutritional status of young children 06-23 months of age in the Kassena-Nankana District.

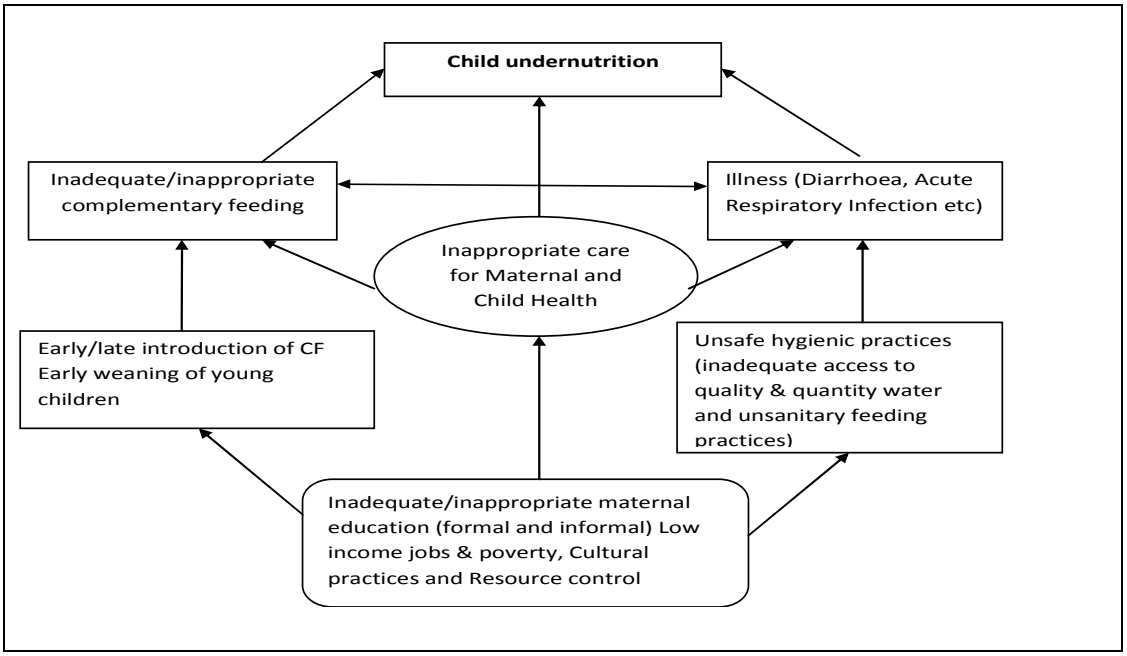
1.5.2 Specific Objectives:

- To determine the proportion of continued breastfeeding among young children 06-23 months of age in the Kassena-Nankana District.
- To determine the timely introduction of complementary foods to young children 06-23 months of age.
- To determine the frequency of food intake among young children 06-23 months of age in the district.
- To determine the hygienic practices associated with complementary feeding of young children 06-23 months of age in the district.
- To determine the prevalence of malnutrition among young children 06-23 months of age and their mothers.

1.6 Hypothesis

The hypothesis of the study was to determine the statistical difference between time of complementary food introduction and undernutrition of children 06-23 months of age in the Kassena-Nankana District, Ghana.

1.7 Conceptual Framework



Source: Author's, 2007 CF (Complementary Feeding),

1.8 Profile of the Study Area

The Kassena-Nankana District of the Upper East Region lies within the Guinea Savannah woodland area of Ghana. It is one of the most impoverished districts in the country with two main climatic seasons. These are a short duration of rainy season (June-September), with an average rainfall between 850-1000 mm per year. During this period, many communities on the peripheries are cut off due to flooding and the situation this year (2007) was worse as compared to previous years due

to the persistent rains and floods in the months of July, August and September particularly in the three Northern Regions of the country. Another problem is the dry season which lasts usually from October to May, with the harmattan winds peaking in January and February in most years. The temperature ranges from 20°C to 44°C (Annual District Report, 2006).

1.9 Study population

The estimated population of the district from the 2000 population and housing census is 159,637 living in 294 communities. It has a land area of 1,658 square kilometres and a population density of 96 people per square kilometre. About 90.0% of the district is rural; only 10.0% of the population live in urban area (Navrongo town). The settlement in the area is dispersed with extended families living in large compounds. Farmlands belonging to households and compounds are found surrounding the houses. There are two main ethnic groups – the Kassenas who comprise 49.0% and speak Kassim and the Nankanis, which make up 46.0% and speak Nankam. Other minor ethnic groups living in the district are primarily Builsas and Mamprusis forming about 5.0% of the population.

1.10 Economic Activity:

The majority of inhabitants of the Kassena-Nankana district were engaged in subsistence agriculture. The ICOUR irrigation project, which is situated in the district, irrigates an area of 36 square miles and several small dugout dams provide water to the people and their livestock, especially during the dry season when most of the rivers and other water sources dry up. Most of the residents are subsistence farmers, with millet, sorghum, beans and groundnuts being the main cultivated crops.

1.11 Health:

The district has 6 sub districts and 5 zones demarcated as its operational areas. These are grouped into Central, North, South, East, West and North-East (sub-districts) and the zones are Central, North, South, East, and West. Health facilities in the district include 3 health centres and 3 community clinics and one district hospital which is the only referral point not only for the Kassena-Nankana district, but also for the Builsa district and neighbouring towns in Burkina Faso. There is one private clinic and 25 functional Community-based Health Planning and Services (CHPS) compounds with resident Community Health Officers (CHOs) offering doorstep services.

1.12 Scope of the Study

The survey gathered data primarily on date of birth of the studied children. Weight and height of the children and their mothers were taken. Information on maternal education, occupation, hygiene practices, and infant feeding practices, focusing on knowledge about the ideal duration of breastfeeding, the appropriate introduction of complementary foods, and appropriate feeding frequency for children in different age groups was also collected. The study asked respondents about their knowledge related to the introduction of liquids and foods from different food groups (water/liquids, semi-solid, staple foods, vegetables, eggs, and meats) to infants. In this study, complementary feeding practices were measured on the following components: continued breastfeeding of index child, use of baby bottles, feeding frequency, and dietary diversity in foods fed to the child during the previous 24 hours, care during feeding and feeding during/after illness.

Four of the district zones were randomly selected and then five communities/villages per zone chosen for study. Within each community, an average number of 19 eligible children participated in

the study. The duration of interview per mother was about 20 minutes. The study was conducted between the months of June and August, 2007.

CHAPTER TWO

LITERATURE REVIEW

2.0 Introduction

Despite maternal and child undernutrition having enormous negative consequences across the course of life, this area of health usually receives very little development funding (James et al., 2000; Gillespie et al., 2003). For instance, the first Millennium Development Goal (MDG1) aims to eradicate extreme poverty and hunger, and while progress on poverty reduction is on target, that of hunger is not (James et al., 2000). This implies that the challenge ahead in reducing hunger and therefore maternal and child malnutrition in all forms may not be achieved soon.

2.1 Malnutrition

Malnutrition includes both undernutrition and overnutrition. Undernutrition is described as when the weight and/or height growth of a child is insufficient compared to the reference values. However, the description of overnutrition is taken as when the weight and or height growth of a child exceeds the reference cut-off values leading to obesity (James et al., 2000). Undernutrition also occurs when the levels of micronutrients such as iron, vitamin A, iodine and zinc are inadequate in the body, leading to compromised body functions such as anaemia, impaired vision, reduced intelligence and reduced immunity as examples. Maternal and child undernutrition is especially important when it occurs during the period from conception through to two years of age, as it can cause impaired functions that are manifested across the rest of the life course among those that survive (James et al., 2000). Child undernutrition includes underweight, stunting and wasting.

2.2 The causes of maternal and child undernutrition

The process of length/height and weight growth faltering which are used to calculate or generates child undernutrition, are largely over by age of two years (James et al., 2000). Growth faltering begins during pregnancy and progresses after birth until the age of two years. The window of opportunity for capture-growth through manipulation or intervention is loss when the child is over two years of age without success. However failure to grow in length leading to stunting and failure to grow in weight leading to underweight are different processes. While weight growth faltering is largely confined to the period between 4 and 12 months of age, height growth faltering is a continuous process probably starting in the uterus, and continuing from birth to about two years. Weight growth faltering is associated with a spiral of malnutrition and infection (James et al., 2000) which can lead to wasting and death unless appropriate interventions are put in place to redress the problem. Wasting and underweight can be improved by reducing exposure to infection as well as by improving food intake. Height growth faltering, or stunting, goes on during the first two years of life even if infections are controlled and food intake improved.

The causes of stunting seem to be rooted in inadequate foetal growth, and for this reason includes poor maternal nutrition (THE LANCET 1001UN Press Release issued by Tony Kirby, 17/01/2008). Most of the major factors associated with foetal growth retardation are nutrition related, and include among others maternal height, pre-pregnancy weight, maternal birth weight, gestational weight gain and caloric intake (James et al., 2000). In developing countries the major factors associated with intra uterine growth retardation (IUGR) and/or low birth weight (LBW) besides race, are poor gestational nutrition, low pre-pregnancy weight, short maternal stature, and malaria.

2.3 Consequences of Maternal and Child Undernutrition

Maternal and child malnutrition have major consequences for all sorts of outcomes, and are commonly manifested across the course of life, with implications that are especially serious for achieving all of the MDGs (SCN, 2004). A major consequence of maternal and child undernutrition is early child death, with about a half of these considered to have undernutrition as an underlying cause (Black RE et al., 2005). Among those that survived, the productivity losses due to maternal and child undernutrition are conservatively estimated to be at least 2.0%-3.0% of GDP annually in Asian countries (Horton, 1999).

Stunting is increasingly associated with overweight in children in developing countries. Constrained growth during the foetal and infant period which leads to stunting, followed closely by subsequent rapid weight growth later in childhood, is associated with the development of degenerative diseases of adulthood in both developed and developing countries (Barker et al., 1989). Shifts in dietary patterns and life style that result from urbanization and economic development are accelerating the adult consequences of early undernutrition.

In recent times, several rural communities in Ghana are progressively becoming urbanized. This trend is a sign of the challenge that may confront the Ghanaian population in the near future if nothing concrete is done to contain the threat or reverse it. The prevalence of type 2 diabetes is rising rapidly in all non-industrialized populations. In China the health costs of treating the consequences of undernutrition were overtaken by the cost of treating adult degenerative diseases in 1995, and in India this is likely to happen by 2025 (THE LANCET 1001UN Press Release issued by Tony Kirby, 17/01/2008). When will this high prevalence of degenerative diseases also be observed in Ghana, is the question yet to be answered?

Malnutrition in all forms has varied consequences for individuals, families and communities. The immediate consequences of poor nutrition during these formative years include significant morbidity and mortality and delayed mental and motor development. In the long-term, early nutritional deficits are linked to impairments in intellectual performance; work capacity, reproductive outcomes and overall health during adolescence and adulthood. For instance, the cycle of malnutrition continues, as the malnourished girl child faces greater odds of giving birth to a malnourished, low birth weight infant when she grows up. Poor breastfeeding and complementary feeding practices, coupled with high rates of infectious diseases, are the principal causes of malnutrition during the first two years of life (WHO, 2003).

2.4 Child and Maternal Undernutrition

More than 3.5 million mothers and children less than five years of age die each year due to the underlying cause of undernutrition, and millions more are permanently disabled by the physical and mental effects of a poor dietary intake in the earliest months of life. By the time children reach their second birthday, if undernourished, they could suffer irreversible physical and cognitive damage, impacting their future health, economic well-being, and welfare. The consequences of insufficient nourishment continue into adulthood and are passed on to the next generation as undernourished girls and women have children of their own. Child undernutrition includes a wide array of effects including intrauterine growth restriction (IUGR), underweight, stunting, wasting, and less visible micronutrient deficiencies. Micronutrient deficiencies in children are not clearly presented in most instances and this hinders the opportunity for early intervention.

Although in recent years the global public health and nutrition community has focused primarily on obesity and specific micronutrient interventions, maternal and child undernutrition continues to place a heavy burden on low and middle income countries. Because undernutrition is an intergenerational problem, countries with high rates of maternal and child undernutrition face an uncertain future in which the health of their workforce and their opportunity for economic development are at risk. Undernutrition and poverty are often intertwined.

2.5 Childhood Underweight, Stunting and Wasting

In 2005, 20.0% of children younger than 5 years of age in low and middle income countries were underweight. The prevalence was highest in south-central Asia and eastern Africa where 33.0% and 28.0%, respectively, were underweight. An estimated 32.0% of children younger than 5 years of age in low and middle income countries were stunted. Eastern and middle Africa has the highest prevalence estimates where 50.0% and 42.0%, respectively, were stunted. Globally, 55 million (10.0%) children under 5 years are wasted (low weight-for-height).

The highest prevalence is found in south-central Asia where 29 million children are wasted. An additional 19 million children in the world are severely wasted, a description often used to determine the need for urgent lifesaving actions, including therapeutic feeding (THE LANCET 1001UN Press Release issued by Tony Kirby, 17/01/2008). Together, stunting, severe wasting and IUGR are responsible for 7.0% of the total disease burden for any age group, making these conditions the highest of any risk factor for overall global disease burden. Among micronutrient deficiencies, vitamin A and zinc are the greatest contributors to disease burden because of their direct effects on child health.

Malnutrition plays an important role in the health and welfare of children and women in Ghana. Poor nutrition results in morbidity, mortality, poor education, and fewer opportunities for economic development. Poor education, low socio-economic status, and high fertility are factors that may influence the nutritional status of an individual. In Ghana, children under five years and women of reproductive age are the most vulnerable individuals to undernutrition and diseases. Adequate food and sound nutrition are essential to good health. They are crucial not only for human survival, but also for prevention and recovery from illness.

In Ghana, stunting increases with the age of the child. This is evidenced by the marked increase in stunting levels from 14.0% at 6-9 months to 35.0% at the age 12-23 months. The GDHS 2003 study did not report of any significant difference between males (33.0%) and females (27.0%) in the levels of stunting among children less than 5 years of age. It therefore, shows that wasting is more common in the age group 6-23 months and decreases as the child ages beyond. Underweight is very minimal for children less than 6 months of age but becomes more pronounced at age 6 months and above (during the normal complementary feeding period). It was also observed in the same study that, the percentage of malnourished children decreases with increasing level of mothers' education. About a third of children whose mothers have no education are stunted or underweight (GDHS, 2003).

2.6 Long term effects of malnutrition on development and health

The implication of child undernutrition that has not been corrected early is extended to the entire family and subsequent generation. The effects of undernutrition span into future generations, with a mother's nutritional status affecting the health of her future grandchildren. Children who are stunted or born with IUGR are also shown to complete fewer years of schooling and earn less income as

adults, hindering their cognitive growth and economic potential. Lower income, poor health, and reduced access to proper nutrition then continue to impact the health of children born into the next generation, establishing a repetitive cycle. Undernourished children are more likely to become short adults, to have lower educational achievement, and to give birth to smaller infants. Maternal and child undernutrition is also associated with lower economic status in adulthood, with effects that spill over to future generations. These findings reinforce existing arguments about the positive economic outcomes of good nutrition and its importance as a prerequisite for economic development (Lawrence Haddad, 2002).

Healthy birth weight and weight-for-age are associated with higher economic productivity but, the best determinant of future capital is a child's height-for-age at 2 years old. It is important to manage the situation appropriately by improving the dietary intake including optimal breastfeeding in the earliest months of life to ensure growth and development. Children born with a low birth weight face an increased risk of chronic disease as adults.

2.7 Breastfeeding

Breastfeeding is the natural way to feed infants and young children. Exclusive breastfeeding for the first six months of life ensures optimal growth, development and health (Davis et al., 2003). Breastmilk alone is ideal start to an infant's life. Exclusively breastfed infants who are fed on demand will remain healthy. Inappropriate breastfeeding, especially lack of exclusive breastfeeding during the first half-year of life are important risk factors for infant and childhood morbidity and mortality (WHO, 2003). Virtually all children benefit from breastfeeding, regardless of where they live. Breastmilk has all the nutrients babies need to stay healthy and grow. It protects them from diarrhea and acute respiratory infections which are the two leading causes of infant death. The

process by which breast milk does this is by stimulating the immune system which then respond to vaccinations intended to prevent the occurrence of the health problems mentioned above. It contains hundreds of health-enhancing antibodies and enzymes. It requires no mixing, sterilization or equipment. And it is always in the right temperature for the child (UNICEF, 1999).

Breastfeeding also affects the mother in various ways. The physiological suppression of fertility as a result of intensive breastfeeding influences the length of the interval between pregnancies. In Ghana, the median duration of any breastfeeding is 23 months and regional differences in breastfeeding prevalence are minimal, with the longest duration being 28 months in the Northern Region and the lowest 19 months in Greater Accra (GDHS, 2003). Urbanization affects the duration of breastfeeding in all forms. Breastfeeding is nearly universal throughout the first year of life for both urban and rural children in Ghana. In the second and third years of life, breastfeeding rates decline, and decline more rapidly in urban areas. However, rates remain quite high overall through the second year in most communities (Arimond et al., 2002). Exclusive breastfeeding during the first 6 months of life also helps to avoid or reduce exposure to contaminants and displacement of breastfeeding by water or other foods (Gupta et al., 2007).

The use of baby feeding bottle is considered an unhealthy and inappropriate practice as far as child feeding is concerned. However, it is documented that the use of baby feeding bottle is still practiced in many countries. In Ghana, about 12.0% of young children are still being fed, using baby feeding bottles (GDHS, 2003). This practice has health and nutrition implications for young children and the community at large (Menon et al., 2003).

2.8 Young Child Feeding Recommendations

Current infant and child feeding recommendations (PAHO/WHO, 2003; Dewey and Brown, 2003) are that infants should be exclusively breastfed starting from soon after birth and up to 6 months of age. Starting at 6 months of age, complementary foods should be gradually introduced in the diet, while frequent, on-demand breastfeeding should be continued until 2 years of age or beyond. The quantity, frequency, and variety of complementary foods should be increased as the child gets older. For the average healthy breastfed infant, complementary foods should be provided 2-3 times at 6-8 months of age and 3-4 times per day at 9-23 months of age. If energy density or amount of food per meal is low, more frequent feedings may be required. Diversity in the diet is also recommended to ensure that nutrient needs are met, and it is recommended that meat, poultry, fish, or eggs be eaten daily, or as often as possible. In Ghana, the meal frequency is reported low, with 40.0% of children 18-23 months of age being fed less than the recommended three meals per day. Although low meal frequency may be related to food insecurity and poverty, it is also driven by cultural beliefs that evening meals cause indigestion in young children and therefore should be avoided (GDHS, 2003).

The consistency of foods should also be adapted to the infant's requirements and abilities, and responsive feeding should be practiced, applying the principles of psychosocial care in order that children will be able to consume adequate food to meet their nutritional requirements for healthy growth and development. Safe preparation and storage of complementary foods and appropriate feeding during and after illnesses are other key elements of optimal complementary feeding of the young child (PAHO/WHO, 2003).

2.9 Timeliness of Complementary Feeding

Complementary feeding is defined as the process starting when breast milk alone is no longer sufficient to meet the nutritional requirements of infants, and therefore other foods and liquids are needed, along with breast milk for healthy growth and development. The target age range for complementary feeding is generally taken to be 6-24 months of age, even though breastfeeding may continue beyond two years (WHO/UNICEF, 1998), (WHO, 2003).

Even though exclusive breastfeeding and appropriate complementary feeding are recommended, there are concerns about low rates and early cessation of breastfeeding. In Ghana, the practice of giving plain water to infants in addition to breastmilk is pervasive and often begins on the day of birth (Davis et al., 2003). This has subsequent adverse implications on health, social and economic well-being of women, children, the community and the environment. It also results in greater expenditure on national health care provision, and may increase inequalities in health. There are usually issues on pre-lacteal foods/drinks, early weaning, early introduction of complementary foods, low nutrient quality and quantity of foods, and unhygienic practices all associated with child feeding. It was also reported in the GDHS study that some mothers believed they were unable to produced adequate breast milk for their babies. For such mothers, the immediate solution was early introduction of complementary foods and drinks before the 6 months recommended duration for exclusive breastfeeding. In addition, mothers/caregivers who are engaged in economic activities do practice early weaning in order to increase their productivity level and to secure their positions at job.

Cultural barriers are also common in most societies. For instance, water/herbs are given to the newborn as a sign of welcome into the human world. This practice is strongly in conflict with the

International recommendations on exclusive breastfeeding and complementary feeding guidelines. Notwithstanding this challenge, there is significant improvement over the years with respect to breastfeeding and complementary feeding even though, the achievements in this line varies across different countries, regions and communities. There is increasing recognition that optimal complementary feeding depends not only on what is fed, but also on how, when, where, and by whom the child is fed (Pelto et al., 2002). In a previous study, 62.0% of the children were given complementary foods before the age of 6 months (Gupta et al., 2007), 16% were classified as having wasting and 20% were stunted.

The results of GDHS, 2003, shows that at the age of 6-9 months, more than 70.0% of the breastfeeding infants received solid foods in the 24 hours before the survey. The majority (53.0%) consumed food made from grains, 29.0% received fruits and vegetables, and 21.0% received animal products. Foods rich in vitamin A were consumed by only 24.0% of breastfeeding infants 6-9 months, and fats by only 8.0%. In the same study, children aged 20-23 months old consumed grains 84.0%, fruits and vegetables 62.0%, and foods rich in vitamin A53.0% by the majority of breastfeeding children (GDHS, 2003). Majority (79.0%) of the infant's age 6-9 months were fed solid foods in addition to breast milk, and 1.0% of infants were completely weaned. These children were therefore not receiving the additional nutritional and emotional support of breastfeeding (MDHS, 2004). In Ghana mothers may delegate childcare responsibilities, but for the most part they prepare the foods that their children eat. Mothers are expected to earn income or farm to support their children.

Delayed complementary feeding in the second half of infancy is also a problem and it is also reported in a study in Ethiopia. Majority of the infants aged 6-9 months received no solids or semi-

solids on the previous day before the interviews were conducted supporting the above statement. A substantial proportion of older infants (9-12 months) also received no solids or semi-solids in the previous 24 hours (Arimond et al., 2002). The results in GDHS, 2003, shows that on the average foods made from grains are given to breastfeeding children only once a day from age 6-9 months.

2.10 Hygienic Practices

The safety of complementary foods given to young children aged 6-24 months is very essential for healthy life. Contaminated food or drink may lead to diarrhea. Childhood diarrhea is one of the leading causes of child mortality. To prevent the transmission of potential pathogens through food or infant feeding, a number of specific behaviours are recommended. First, the individuals preparing and serving food should wash hands thoroughly before food preparation and handling. Secondly, food should be served immediately after preparation and stored safely for later use. Third, clean utensils should be used to prepare and serve food. Fourth clean cups and bowls should be used when feeding children. And finally, feeding bottles should be avoided because they are difficult to keep clean and may be a source of dangerous pathogenic organisms (PAHO/WHO, 2003; Marie et al., 2003). Up to 70.0% of diarrhea diseases episodes may be food borne and transmitted through food contaminated during operation/preparation (WHO, 1996).

In environments where environmental sanitation is very poor, late introduction of complementary foods, after the ages of 6 months of life may reduce the exposure to food-borne pathogens. However, because infants are beginning to actively explore their environment at this age, they may be exposed to microbial contaminants through contact with the soil and other objects even if they are not given complementary foods. In an urban population in Ghana, Ruel et al., (1999), found that "care practices" scale (which included breastfeeding patterns, timing of complementary feeding,

food quality, and two “active feeding” behaviours) was positively associated with child anthropometric status among mothers with little or no schooling (WHO, 2003). The peak incidence of diarrhea disease is reported to occur during the second half year of infancy, as the intake of complementary foods increases (Martinez et al., 1992).

Increased fluid intake during illness (increased frequent of breastfeeding, soft food intake, variety of foods and motivation of appetite and intake of child’s favorite foods) is vital in maintaining good child health and nutrition for development. After illness, it is recommended that children should be encouraged to eat often. This will help the child to regain the weight loss during the illness. During illness, the need for fluids is often higher than normal. Sick children appear to prefer breast milk to other foods (Brown et al., 1990), so continued, frequent breastfeeding during illness is advisable. Even though appetite may be reduced, continued consumption of complementary foods is recommended to maintain nutrient intake and enhance recovery (Brown, 2001). After illness, the child needs greater nutrient intake to make up for nutrient losses during the illness and allow for catch-up growth.

2.11 Care for Maternal and Child Health

Across the developing world women play key roles in maintaining household food security and in caring for children on a day-to-day basis, both of which are extremely important factors influencing a child's nutritional status. Women in Ghana, depending on the region, are often highly involved in food production and acquisition, thus boosting food security in the household and nation as a whole. Right from childbirth, breastfeeding can only be carried out by women; they are naturally the primary caregivers at the beginning of a child's life. Women are those who most often feed, bathe children, seek health care when they are sick, protect them from exposure to danger, and support

their cognitive and social development. Given these key roles, women's knowledge and abilities and their own physical well-being and decision-making power are crucial to children's nutrition. In many communities, majority of women are not part of the decision making process including things which affect their own lives such as seeking of medical care, food intake and control of property. These and other discriminations against women predispose them to inadequate access and control of the available household and community resources. The quality of the health environment, such as water cleanliness, sanitation, and access to health services, is also known to be a prime determinant of children's nutrition (IFPRI, 2000).

2.12 Maternal Education

Maternal education is related to knowledge of good child care practices. This is also translated to household wealth. The majority of women globally have limited access to formal education which accounts for high prevalence of illiteracy. It then means that they are unable to compete for certain jobs and their productivity is low generally. The GDHS 2003 study reported that 35% of women have never been to school. However, as in most developing countries, in Malawi, 26.0% of the mothers of children less than five years of age have never attended school, while 64.0% have some primary education and 10.0% have a secondary or higher education. Nonetheless, there is no difference in the level of wasting between children of mothers with no education compared with children of mothers with primary education and secondary or higher education (MDHS, 2004).

However, the percentage of malnourished children decreases with increasing level of mothers' education. About a third of children whose mothers have no education are stunted or underweight (GDHS, 2003). The findings of a study in Malawi, 2004, found no relationship between mother's educational status and maternal undernutrition. Malnutrition among mothers is likely to have a

major impact on their ability to care for themselves and their children. The MDHS 2004 survey documented that 8% of the women with children less than five years of age were undernourished with BMI<18.50kg/m^2. The results of another study (Arimond et al., 2002) showed the following prevalence of mother's education: never attended school (76.0%), had some primary education (15.0%) and had some secondary education (9.0%). Differences in maternal education are particularly relevant to childcare and feeding: 38.0% of urban women reported no education as compared to 84.0% of rural women. Use of baby bottles - a practice known to dramatically increase the risk of infectious diseases among infants and young children in developing countries - is high among both urban 38.0%, and rural 15.0% infants 6 months or younger (Arimond et al., 2002).

2.13 Low Income and Poverty

Reducing malnutrition is a cornerstone of poverty reduction. General malnutrition and specific micronutrient deficiencies contribute to infant, child and maternal morbidity; decreased learning capacity; lower productivity and higher mortality. Studies from Ghana, for example, show that stunted children lose years of education because they enter school at later ages. These children who failed to enter school at the right time of age, later in life may contribute less to Gross Domestic Product which directly affects national development. The vicious cycle of poverty and nutrition is then passed on to the next generation if appropriate interventions are not found. While income growth is a key factor in reducing malnutrition, recent studies confirm that malnutrition persists even where rapid income growth occurs, unless additional direct measures are taken (WHO/UNICEF, 1998).

Food is important for health because undernourishment makes people vulnerable to illness. It is a major drain on developing countries' prospects for development because malnourished children

require more intense care from their parents and are less physically and intellectually productive as adults. It is also a violation of a child's human rights (IFPRI, 2000).

2.14 Maternal and Child Undernutrition

An estimated 174 million under-five children in the developing world are malnourished as indicated by low weight for age, and 230 million are stunted (WHO, 1996). Child malnutrition is common in Ghana: 26.0% of children under age five are stunted, while another 10.0% are wasted, indicating acute malnutrition. Malnutrition is rare in the first months of life, but the percentage of underweight in children rises to nearly 20.0% in the 6-12 months. Rates of malnutrition increase sharply during the second year of life, with 27.0% of children stunted and 38.0% underweight.

In 1998 a study in Ghana estimated that among children aged 0-59 months, stunting, underweight and wasting were 26.0%, 25.0%, and 10.0% respectively (GDHS, 1998). Again, there was still no significant improvement when a similar study was conducted in 2003 GDHS; where stunting had increased from 26.0% to about 30.0%. Underweight however reduced to 22.0% and wasting also improved to 7.0%. It indicates that wasting is more common in the age group 6-23 months and decreases as the child ages. Underweight is very minimal for children less than 6 months of age but becomes more pronounced at age 6 months and above (during the normal complementary feeding period) (GDHS, 2003).

As observed in most developing countries (Ruel, 2001), children's nutritional status deteriorates rapidly during the first year of life, and up to 17 months of age. The results of another study (Menon et al., 2003) indicated that 23.0% of children were stunted, 21.0% were underweight, and 5.0% were wasted. Stunting increases sharply from 15.0% among 6-11-month-old children to

approximately one-third of children 18-23 months. The peak prevalence of wasting-13.0% was found among 12-17-month-old children (Menon et al., 2003). Results in Malawi indicated that children under five years were stunted 48.0%, wasted 5.0% and underweight 22.0%, (MDHS, 2004).

Malnourished children who survive are more frequently sick and suffer the life long consequences of impaired development. Rising incidences of overweight and obesity in children are also a matter of serious concern. Because poor feeding practices are a major threat to social and economic development, they are among the most serious obstacles to attaining and maintaining health that face this age group. Improved infant and young child feeding begins with ensuring the health and nutritional status of women, in their own right, throughout all stages of life and continues with women as providers for their children and families. Mothers and infants form a biological and social unit; they also share problems of malnutrition and ill-health. Whatever is done to solve these problems concerns both mothers and children together (WHO, 2003).

A significant number (9.0%) of the women were found (Arimond et al., 2002) to be chronically malnourished (BMI less than 18.5), whilst 25.0% are overweight. Women undernutrition is more pronounced in rural areas than urban. Some of these variations between urban and rural women are observed as; BMI<18.50kg/m^2 in rural areas (12.0%) than in urban areas (6.0%). The percentage of overweight or obese BMI>25.050kg/$m^2$50kg/m^2 women is, however, higher in urban areas (35.0%) than in rural areas (16.0%). The findings of the study still estimates that mother's BMI <17.050kg/m^2 (5.0%), BMI 17.0<18.550kg/m^2 (18.0%), normal and High BMI >25.050kg/m^2 (3.0%), (Arimond et al., 2002).

A woman's height may be used to predict the risk of difficulty in delivery (given the relationship between height and the size of the pelvis). The risk of giving birth to a low-birth-weight baby is influenced by the mother's nutritional status. The mean height of women is 159 centimetres, which is above the critical height of 145 centimetres, and 9.0% of the women were found to be chronically malnourished (BMI less than 18.5), while 25.0% are overweight (GDHS, 2003).

CHAPTER THREE

METHODOLOGY

3.1 Study Methods and Design

This was a cross-sectional study which employed both qualitative and quantitative data collection techniques in gathering the information of interest. Data collection was through an administered semi-structured questionnaire and anthropometric measurements (both mother and child) were taken based on standard procedures. The sampled population comprised children 06-23 months of age in the district. The survey used a sample size of 384 households with eligible children 06-23 months of age, selected from 20 enumeration communities in the District. However, data was collected from 379 of these children, due to attrition.

3.2 Data Collection Techniques and Tools

Self reported face-to-face interviews were used to collect the data from the respondents, in addition to the anthropometric measurements. The tools for data collection included: semi-structured questionnaire, UNICEF Electronic Scale (SECA), Infant/Child/Adult Height/Length Measuring Board, Equipment bag, List of communities, Field books, and Waterproof envelopes for blank and, weighing scales bags, stapler and box of staples, pens, spare paper, pencils and pencils sharpeners and erasers. Lying down (recumbent) was the position for all children as their lengths were measured. This measuring board has a 200cm capacity and it measured to the nearest 0.1cm, whilst ages of the children were accurately determined using documented evidence of the birth date from the child's health book/card and birth certificates. Each child had a copy of this book which contained all essential information on the health status and household demographic characteristics. To ensure the accuracy of the date of birth recordings of the children by the field enumerators, the anthropometric team had to confirm this by also filling-in the child's date of birth the second time;

during the anthropometry measurements. All the mothers and children who were selected and interviewed had to come to the central point with the child and his/her essential documents for cross-checking and filling-in. The age was later calculated in months using a computer software program (ENA by SMART) which require the date of birth and date of measurement/interview and then converts it into months for each child. Information on pre-lacteal feeds was not collected from the mothers in this survey. The quality of the results largely depends on the answers provided by the respondents.

Informed consent was obtained verbally from all respondents prior to the interview in the communities and indicated by the enumerators in the questionnaire. Data were collected among randomly selected households rather than at health clinics, which allowed a more representative sample and equal inclusion of families without access to health care facilities.

3.3 Sampling Techniques and Sample Size

Multi-stage sampling was adopted in this study. Four of the five district zones were randomly selected. Within each of the selected zones, 5 communities/villages (cluster) were again chosen randomly. Households with eligible children (06-23 months of age) were selected to take part in the study forming the second stage sampling unit. In each of the selected communities (clusters), a central point was identified and from there, a pen was used to give the direction of the first household by spinning. All houses/compounds along that direction were entered looking for potential respondents for the study. In cases, where we had more than one eligible child per household or compound, one of them was randomly selected again to participate in the study by choosing yes/no in order to give each child equal chance of selection. At the end of the first randomly selected direction, the sampling team returned to the central point and moved in the

opposite direction looking for more respondents. The process was repeated until the end of the community was reached.

3.4 Sample Size Determination or Selection

There is no information on the prevalence of child malnutrition in the district for children 06-23 months of age; therefore, it was assumed that the current prevalence of undernutrition in the district was p (50%). Sample size is shown below:

p=50% n = (1.96^2*50 (100-50))/25 =384. The sample size for the study was 384 children 06-23 months of age. Approximately, 19 households with children 06-23 months of age were visited per community/village.

3.5 Training of Enumerators and Supervisors

Training of enumerators and supervisors took three days. They were also retrained in the use of the equipment and the recording of anthropometric data. This was done over a period of two-and-half days and included lectures, translation of questions (Kasem and Nankani), and equipment demonstrations. This was followed by a day of practical exercise in the measurement of height and weight of infants and children and their mothers. The field enumerators were only standardized in the measurement of height, since weight was being measured using an electronic scale. Twenty (20) University students were recruited and trained as field enumerators and supervisors for the study. Four of the university students were disqualified for various reasons such as inaccuracy, poor recording and inappropriate attitudes towards members of the team.

3.6 Pre-testing

The data collection tools were pre-tested in Korania (community/village). This is a mixed community of Kassenas and Nankanis. Korania is one of communities of the West zone in the district, which was not selected for the study. The necessary corrections were effected to the questionnaire before the actual study was conducted.

3.7 Data Handling Plan

The daily administered questionnaires were checked by the coordinator to ensure accuracy on each day. The field enumerator reviewed each questionnaire before leaving the household/community where it was administered. At the end of each day of fieldwork, the supervisors reviewed each questionnaire for accuracy, logical patterns, and legible writing. Field enumerators were asked to return to survey households in cases where missing data or other problems were observed. The data was entered by the coordinator using Epidata software (version 3.1) within 7 working days. Data entry started immediately after the field work.

3.8 Statistical Methods

Epi-Info version 3.4 was used to analyze the data in the form of Percentages and Frequencies. Stata 9.1 was used to determine the Odds Ratio, Confidence Intervals, and P-Values. Some of the responses were used as the baseline data compared to the other answers for each of the independent variables which were considered to be relevant in determining child undernutrition in the study. These were then classified as statistically significant using the P-values which are less than 0.05 or at 95%CI, where the value one is not inclusive within the range. Mothers' BMI was calculated and graphics were drawn for nutritional status of the children using Excel version 2007. Emergency

Nutrition Assessment by SMART (August, 2007 Version) was also used to analyze part of the data in the form: Weight-for-age (WAZ z-score), weight-for-height (WHZ z-score), height-for-age (HAZ z-score), and graphics were also produced for nutritional status of children.

3.9 Ethical Consideration

Field enumerators explained the purpose of the study to the mothers/caregivers and sought their informed consent before proceeding with the interviews. We made sure the scale and weighing board were cool, clean and safe. The mothers were also given the opportunity to ask questions for clarity and decision making with regard to the survey. The informed consent was read out to the respondents since majority of them are illiterate. A suitable atmosphere for interaction between the field enumerators and mothers/caregivers was created such as following the mother to where she was engaged in an activity.

3.10 Fieldwork constraints/limitations

Although the present study contributes to the understanding of the complex pattern of factors associated with maternal and child undernutrition in the Kassena-Nankana District, it has noteworthy limitations. A methodological problem in studies of this nature is bias due to lack of recall. Children in the study were not assessed for oedema to identify the presence of kwashiorkor. This bears implications of lowering the reported prevalence of underweight. Second, birth weight, a known determinant of linear growth, was not considered in the study too. As it is often the case in this type of survey, the fieldwork took a longer time than initially planned. This was due to a number of fieldwork-related difficulties, such as the remoteness of some of the selected

communities and households, the extremely poor road conditions due to the heavy rains, the absence of the mothers on market days.

Finally, unmeasured household characteristics, such as occupation of husband, maternal knowledge regarding breastfeeding recommendations, income levels of the household and distance of maternal employment, could have introduced confounders. However, these factors are unlikely to have altered the major associations. Therefore, we cannot exclude that significant interactions existed, but were undetected in the present study. The survey did not gather complete dietary information because of limited resources. Instead, data were collected on food/food group intake by asking mothers to recall whether the child had consumed the list of liquids and foods presented in the previous 24 hours. Although the approach does not allow for assessing the quantity of food consumed, it provides a proxy for the quality of the diet (Ruel, 2003). Both the number of food groups consumed can be assessed and whether or not the child consumed specific types of foods of interest such as meat, fish or eggs, dairy products, or vitamin-A rich fruits or vegetables. The weakness strongly observed in this study was that the survey's reported rates, particularly of exclusive breastfeeding, appeared to have a systematic upward bias.

CHAPTER FOUR

RESULTS

This chapter deals with the key findings of the survey. It represents the opinion and views of the study population and nutritional status of both children and mothers.

4.1 Background characteristics of Respondents

Table 4.1: Background characteristics of mothers/caregivers in Kassena-Nankana District

Background characteristics of respondents:	Frequency	Percentage (%)
Age (years):		
15-19	25	6.6
20-24	107	28.2
25-29	106	28.0
30-34	65	17.2
35-39	57	15.0
40+	19	5.0
Total	**379**	**100.0**
Marital status:		
Never married/single	16	4.2
Married	350	92.3
Divorced, Separated, or Widowed	13	3.4
Total	**379**	**100.0**
Educational (level):		
None	137	36.1
Primary	129	34.0
JSS/Middle	72	19.0
SSS/O Level/Post Secondary	35	9.2
Tertiary	6	1.6
Total	**379**	**100.0**
Religion:		
Christianity	262	69.1
Islam	27	7.1
Traditionalist	77	20.3
None	13	3.4
Total	**379**	**100.0**
Ethnicity:		
Kasem	190	50.1
Nankam/Frafra	179	47.2
Builsa/Zanbrama	8	2.2
Mamprusi	2	0.5
Total	**379**	**100.0**
Occupation:		
Salary worker	13	3.4
Business/income jobs	138	36.4
Farming/by-day	180	47.5
Unemployed/student	48	12.7
Total	**379**	**100.0**

Table 4.1 depicts the major background characteristics of the mothers in the district. A few (6.6 %) of the mothers were less than 19 years of age whilst 20.0% were above 35 years. The majority

(34.8%) of the children were born to women below the age of 25 years. A significant proportion of the respondents (92.3% of the mothers) were married and 36.1% never attended school, but 34.0% had primary schooling, whilst 19.0% and 9.2% had JSS/Middle and SSS/O Level/Post Secondary, respectively. Only few (1.6%) of the mothers had some tertiary education.

The major religious denomination in the district was Christianity (69.1% of the respondents), 20.3% were Traditionalist, 7.1% were Muslims and 3.4% were not practicing any faith. The results also show that, 50.1% of the respondents were Kassena, 47.2% were Nankane, whilst the remaining 2.7% were either Builsa/Zanbrama or Mamprusi. A significant number (47.5% of the mothers) were engaged in farming/by-day jobs, 36.4% were into business or income jobs, 12.7% were either students or unemployed, and salary workers formed 3.4%.

Table 4.2: Background characteristics of the children 06-23 months of age in the Kassena-Nankana District

Background characteristics of the children	Frequency	Percentage (%)
Sex of index child:		
Male	191	50.4
Female	188	49.6
Total	379	100.0
Age in months:		
6-8	68	17.9
9-11	106	28.0
12-17	133	35.1
18-23	72	19.0
Total	379	100.0
Number of children per mother in the study:		
1	95	25.1
2	98	25.9
3-5	168	44.3
>5	18	4.7
Total	379	100.0

In table 4.2 the findings of the study estimate that 50.4% of the children were males. The majority of the children (35.1%) were in the age group (12-17 months), 28.0% (9-11 months), 19.0% (18-23

months) and 17.9% (6-8 months) of age. A notable number of the respondents (44.3%) had 3-5 children, 25.9% had 2 children, 25.0% had 1 child and few, 4.7% had more than 5 children.

4.2 Continued Breastfeeding and Introduction of CF in Kassena-Nankana District

Table 4.3: Child Feeding Practices in the Kassena-Nankana District

Child Feeding Practices	Frequency	Percentage (%)
Exclusive breastfeeding for the first 6 months of life:		
Yes	314	82.8
No	65	17.2
Total	**379**	**100.0**
If no to exclusive breastfeeding, when did the child receive first food/drink:		
Before a week after birth	8	12.3
Before a month after birth	4	6.2
Two months after birth	5	7.7
Within 2-5 months after birth	47	72.3
Don't know	1	1.5
Total	**65**	**100.0**
Index Children Still breastfeeding:		
Yes	365	96.3
No	14	3.7
Total	**379**	**100.0**
Breastfeeding at night (24 hour recall):		
On-demand	66	18.1
<5 times	17	4.7
5 to 9 times	282	77.3
Total	**379**	**100.0**
Breastfeeding during the day time (24 hour recall):		
On-demand	39	10.7
<5 times	23	6.3
5 to 9 times	303	83.0
Total	**379**	**100.0**
Time of complementary foods introduction to index child:		
< 6 months	66	17.5
On/soon after 6 months	232	61.2
7 months and above	77	20.3
Don't know	4	1.1
Total	379	**100.0**

On Demand means feeding of the child up to 10 or more times during the day or at night or mentioning of the term "on-demand" by the respondents

Table 4.3 shows breastfeeding and complementary feeding practices in the district. The practice of exclusive breastfeeding for the first 6 months of child's life was 82.8%. Among the children who were not exclusively breastfed, 72.3% of them received food/drink within 2-5 months after birth, 12.3% before a week after birth, and 7.7% before two month after birth, 6.2% before a month after

birth and 1.5% of the respondents did not know exactly when their children were introduced to food/drink. Children who were still being breastfed in the district were 96.3%. Determining the frequency of breastfeeding, 77.3% of the children were breastfed between 5-9 times, 18.1% were breastfed On-demand and 4.7% of the children were breastfed less than 5 times at night, whilst 83.0% of the children were breastfed 5-9 times, 10.7% were breastfed On-demand and only 6.3% were breastfed less than 5 times during the day time. The majority (61.2%) of the children) were introduced to complementary foods at the age of 6 months, 20.3% were introduced to complementary foods in the 7th month or above, and 17.5% were given complementary foods before 6 months of age.

Figure 4.1: Distribution of mothers' opinion on time of commencement of complementary feeding in the Kassena-Nankana District

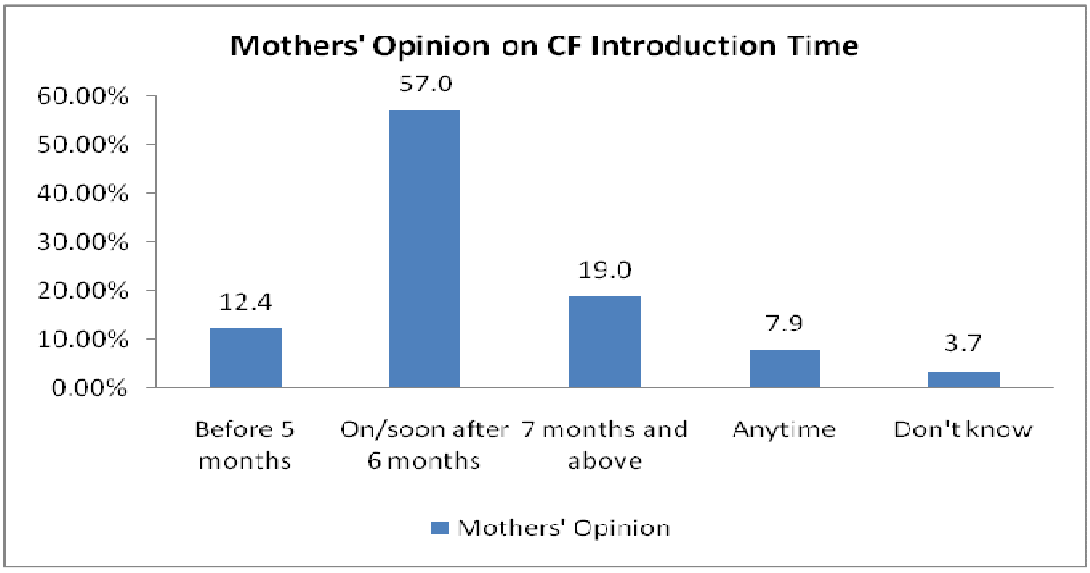


Figure 4.1 shows the mothers' own opinion/knowledge on when complementary foods should commerce for the children. The results indicate that, 57.0% of the mothers think that foods/drinks should be given to children on/soon after 6 months of age, 19.0% think on/after 7 months and 12.4% before 6 months.

4.3 Food Intake among Young Children 06-23 months of age in Kassena-Nankana District

Table 4.4: Frequency of consumption of solid and semi-solid foods (24 hour recall) by age of child in Kassena-Nankana District

Age of child in months	Frequency (< 2times)	(%)	Frequency (2-3 times)	%	Frequency (3-4 times)	%
Intake of solid foods						
6<9 months (68)	60	88.2	8	11.8	0	0.0
9<24 months(311)	122	39.2	173	55.6	16	5.1
Total (379)	**182**	**48.0**	**181**	**47.8**	**16**	**4.2**
Intake of semi-solid foods						
6-<9 months (68)	63	92.6	5	7.4	0	0.0
9-<24 months (311)	236	75.9	70	22.5	5	1.5
Total (379)	**299**	**78.9**	**75**	**19.8**	5	**1.3**

Source: Field Survey, 2007

Table 4.4 illustrates the frequency of food/drink intake among different age groups. The majority (88.2%) of the children in the age group 6<9 months received solid food less than twice daily, 11.8% received 2-3 times and none received 3-4 times of solid food. In addition, the frequency among children in the age group 9>24 months were, 39.2% received solid food less than twice daily, 55.6% received 2-3 times and 5.1% did receive 3-4 times of solid food. The results also indicate that 92.6% of the children in the age group 6<9 months received semi-solid food less than twice daily, 7.4% received 2-3 times and none received 3-4 times of semi-solid food. Whilst, the children 9>24 months of age, 75.9% reported that they received semi-solid food less than twice, 22.5% received 2-3 times and 1.5% were given 3-4 times of semi-solid foods daily.

Figure 4.2: Frequency of solid and semi-solid foods intake in Kassena-Nankana District

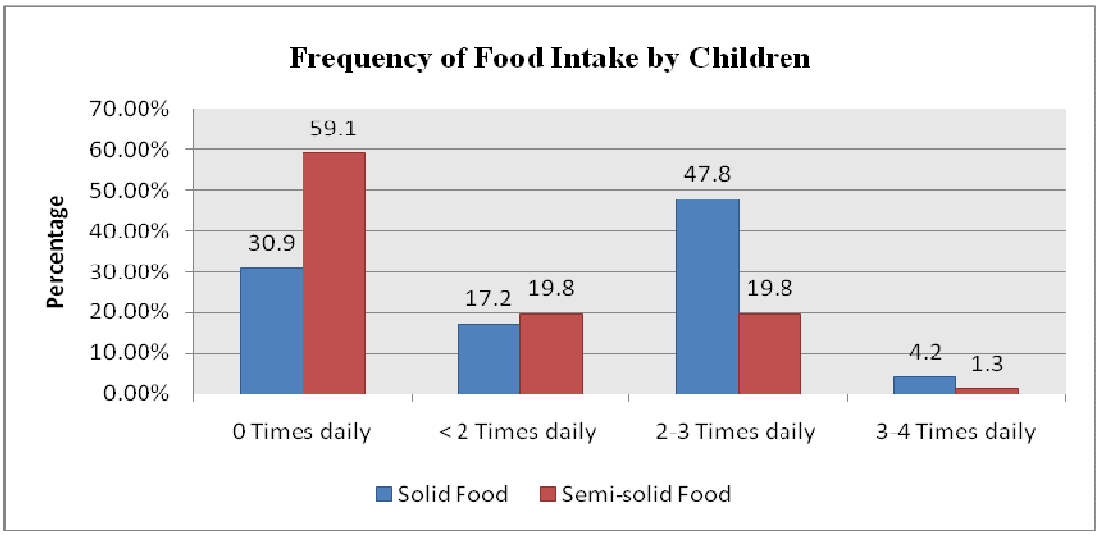


Figure 4.2, above shows the consumption pattern of complementary foods in the district. It is estimated that, the children received zero times of solid food (30.9%) or semi-solid food (59.1%). Others received solid food (17.2%) and semi-solid food (19.8%) less than twice daily; whilst 47.8% and 19.8% received 2-3 times of solid or semi-solid foods respectively in the study.

Table 4.5: Frequency of porridge intake (24 hour recall) in Kassena-Nankana District

Children	Frequency	Percentage (%)
Porridge intake:		
Yes	163	43.0
No	216	57.0
Total	**379**	100.0
Consistency of the porridge:		
Thick with paste/sheabutter	18	11.0
Very thin without paste/sheabutter	79	48.5
Thick without paste/sheabutter	53	32.5
TZ porridge	13	8.0
Total	**163**	**100.0**
Frequency of porridge intake		
< 3 times	148	90.8
4-6 times	14	8.6
7 or more times	1	0.6
Total	**163**	**100.0**

Table 4.5, the results indicated that 43.0% of the children received porridge. A high proportion (48.5%) of the mothers reported that the porridge consumed was very thin without paste/sheabutter

to improve its nutritive value, 32.5% of the children received thick porridge without paste/sheabutter, and 11.0% of the children received thick porridge with paste/sheabutter and 8.0% of the children received porridge purposely for Tuo Zaafi (TZ). Most of the children, 90.8% consumed less than 3 times, 8.6% of the children consumed between 4-6 times and 0.6% of the children received 7 or more times of the porridge in the previous 24 hours before the interview.

Table 4.6: Frequency of some liquids intake among children in Kassena-Nankana District (24 hour recall)

Liquid intake (N=379):	Frequency	Percentage (%)
Breastmilk:		
Yes	364	96.3
No	14	3.7
Total	378	100.0
Plain water:		
Yes	368	97.1
No	11	2.9
Total	379	100
Commercial infant formula:		
Yes	8	2.1
No	371	97.9
Total	379	100.0
Other fortified child foods:		
Yes	16	4.2
No	363	95.8
Total	379	
Other porridge/flour:		
Yes	79	20.8
No	300	79.2
Total	379	100.0
Tinned, powdered or fresh animal milk:		
Yes	25	6.6
No	354	93.4
Total	379	100.0
Fruit juice:		
Yes	36	9.5
No	343	90.5
Total	379	100.0
Coffee or tea :		
Yes	31	8.2
No	348	91.8
Total	379	100.0
Any minerals:		
Yes	18	4.7
No	361	95.3
Total	379	100.0
Traditional medicine (herbs):		
Yes	27	7.1
No	352	92.9
Total	379	100.0
Drink anything from a bottle with a nipple:		
Yes	42	11.1
No	337	88.9
Total	379	100.0

Table 4.6 presents data on the intake of some liquids. In this study, 96.3% of children still received breastmilk, 97.1% of the children were given plain water, 2.1% took commercial infant formula, and 4.2% ate other fortified foods. In addition, 20.8% of the children were given flour/other

porridge, 6.6% received animal milk and 9.5%, 8.2% and 4.7% received fruit juice, coffee/tea and minerals respectively. Expectedly, 7.1% of the children received traditional medicine or herbs. A significant proportion (11.1% of the children) was fed with baby feeding bottle in the district.

Table 4.7: Frequency of foods consumed among children in Kassena-Nankana District (24 hour recall)

Food intake:	Frequency	Percentage (%)
Foods from grains:		
Yes	298	78.6
No	81	21.4
Total	379	100.0
Carrots or yellow sweet potatoes:		
Yes	8	2.1
No	371	97.9
Total	379	100.0
Roots and tubers:		
Yes	21	5.5
No	358	94.5
Total	100	100.0
Dark green vegetables:		
Yes	187	49.3
No	192	50.7
Total	379	100.0
Vitamin A rich fruits (mango or pawpaw):		
Yes	65	17.2
No	314	82.8
Total	379	100.0
Other fruits and vegetables:		
Yes	104	27.4
No	275	72.6
Total	379	100.0

Table 4.7 illustrates the consumption pattern of some common foods. The majority (78.6%) of the children consumed foods prepared with grains, 2.1% carrots/yellow sweet potatoes, and 5.5% did consume roots and tuber foods. However, 49.3% of the children consumed dark green vegetables, 17.2% consumed vitamin A rich fruits, and 27.4% received other fruits/vegetables.

Table 4.8: Consumption of protein source foods (24 hour recall) among children in Kassena-Nankana District

Source of Protein intake:	Frequency	Percentage (%)
Animal meat:		
Yes	57	15.0
No	322	85.0
Total	379	100.0
Chicken or other birds:		
Yes	26	6.9
No	353	93.1
Total	379	100.0
Fresh or dried fish:		
Yes	176	46.4
No	203	53.6
Total	379	100.0
Eggs:		
Yes	99	26.1
No	280	73.9
Total	379	100.0
Foods made from beans:		
Yes	71	18.7
No	308	81.3
Total	379	100.0
Groundnut:		
Yes	171	45.1
No	208	54.9
Total	379	100.0
Cheese or yogurt:		
Yes	8	2.1
No	371	97.9
Total	379	100.0
Foods made with oil, fat or butter:		
Yes	131	34.6
No	248	65.4
Total	379	100.0
Organ meats (offal):		
Yes	9	2.4
No	370	97.6
Total	379	100.0
Insects:		
Yes	6	1.6
No	373	98.4
Total	379	100.0
Foods made of red palm oil, or palm nut:		
Yes	57	15.0
No	322	85.0
Total	379	100.0

Table 4.8 presents data on the consumption of some major sources of protein. The mothers reported that, 15.0% of their children consumed foods served with animal meat, 6.9% of the children also

consumed foods served with chicken/other birds, 46.4% of the children consumed foods served with fish, whilst 26.1% consumed foods served with eggs. Another 18.7% of the children consumed foods prepared from beans, and 45.1% consumed foods prepared with groundnut and the consumption of foods served with oil/fat was 34.6%.

Table 4.9: Percentage (%) of children who consumed specific foods (24 hour recall) by age in Kassena-Nankana District

Foods consumed by children (N=379):	**6-8 months**	**9-11 months**	**12-17 months**	**18-23 months**
Breast milk	98.5	100.0	100.0	81.9
Plain water	89.7	99.1	98.5	98.6
Infant formula	4.4	0.9	2.3	1.4
Fortified food	0.0	3.8	5.3	6.9
Other porridge	14.7	18.9	21.8	27.8
Other milk	2.9	4.7	7.5	11.1
Fruit juice	2.9	3.8	14.3	15.3
Tea/Coffee	5.9	6.6	9.0	11.1
Other liquids	2.9	0.9	9.0	4.2
Traditional medicine	7.4	7.5	6.8	6.9
Grains	57.4	72.6	85.7	94.4
Carrots/Orange	1.5	1.9	3.0	1.4
Roots/Tubers	0.0	5.7	4.5	12.5
Green vegetables	17.6	38.7	63.9	68.1
Mango/Pawpaw	5.9	13.2	20.3	27.8
Other fruits	10.3	19.8	33.8	43.1
Animal meat	1.5	11.3	17.3	29.2
Bird meat	0.0	6.6	7.5	12.5
Fish	14.7	40.6	53.4	72.2
Eggs	4.4	24.5	33.1	36.1
Beans	4.4	14.2	21.8	33.3
Groundnuts	13.2	35.8	55.6	69.4
Cheese/Yogurt	0.0	0.9	3.0	4.2
Oily Foods	8.8	30.2	41.4	52.8
Organ meat	0.0	2.8	1.5	5.6
Insects	0.0	0.9	3.8	0.0
Palm oil	1.5	14.2	16.5	26.4

Table 4.9 shows the feeding pattern of the children in the different age groups. The majority (98.5%) and (81.9%) of the children in the age groups (6-8 months) and (18-23 months) were still breastfeeding, respectively. Intake of plain water among all the children in the different age groups

was consistently high 89.7% (6-8 months), 98.5% (12-11 months), 98.6% (18-23 months) and 99.1% (12-17 months).

Other porridge was also consumed, 14.7% (6-8 months), 18.9% (9-11 months), 21.8% (12-17 months) and 27.8% (18-23 months). Fruit juice, other milk and coffee/tea intake increases with increase in age group as shown on table 4.9. Other liquids/carbonated drinks were also marginally consumed by the children whilst traditional medicine/herbs were significantly consumed with prevalence of 7.5% in the age group 9-11 months and 6.8% in the age group 12-17 months. A significant proportion (57.4%) of the children in the age group (6-8 months) consumed foods prepared with grains, 72.6% (9-11 months) of the children similarly consumed food prepared with grains, 85.7% (12-17 months) of the children did receive foods prepared with grains and 94.4% (18-23 months) consumed foods made with grains. Children who consumed beans were: 4.4% (6-8 months), 14.2% (9-11 months), 21.8% (12-17 months) and 33.3% (18-23 months) whilst the consumption of nuts was 13.2% (6-8 months), 35.8% (9-11 months), 55.6% (12-17 months) and 69.4% (18-23 months).

4.4 Hygienic Practices Associated with CF by mothers/caregivers in Kassena-Nankana District

Table 4.10: Frequency of main source of drinking water for households in the Kassena-Nankana District

Source of water:	Rainy season		Dry season	
	Frequency	%	Frequency	%
Piped:	43	11.3	42	11.1
Borehole:	295	77.8	297	78.4
Deep well with pump:	5	1.3	5	1.3
Shallow well with pump:	3	0.8	4	1.1
Open well without cover:	28	7.4	28	7.4
Spring/river/stream:	2	0.5	1	0.3
Pond/lake/dam:	1	0.3	0	0.0
Others	2	0.5	2	0.5
Total:	379	100.0	379	100.0

Table 4.10 shows the major sources of drinking water in the study area. During the rainy season, 77.8% of the mothers had their drinking water from boreholes, 11.3% accessed water from standing pipes, 7.4% from open wells without cover, whilst a few (1.3%) fetched water from deep wells with fitted pumps for their households. There was no significant difference with regard to accessing water in rainy or dry season. In the dry season, 78.4% of the households had their drinking water from boreholes, 11.1% fetched from standing pipes, 7.4% collected the water from open wells without cover, 1.3% of the women collected water from deep wells with fitted pumps and only 1.1% accessed water from shallow wells with fitted pumps for their households.

Table 4.11: Frequency of water treatment for drinking, type of treatment and child food storage in Kassena-Nankana District by households

Water treatment and type:	Frequency	Percentage (%)
Treatment:		
Yes	49	12.9
No	330	87.1
Total	379	100.0
Type of treatment:		
Settle/sedimentation	1	2.0
Strain it through cloth	11	22.4
Boil	4	8.2
Add bleach/chlorine	24	49.0
Water filter	9	18.4
Total	49	100.0
Storage of food for child:		
Baby bowl	182	48.0
Food flask	126	33.2
Pot	34	9.0
Fridge	1	0.3
Don't store	36	9.5
Total	379	100.0

From the above table 4.11, 12.9% (n=49) reported that they did treat their water before drinking. Among those who treated their water before drinking, 49.0% added bleach/chlorine, 22.4% strained through cloth, 18.4% used water filter, 8.2% boiled and only 2.0% applied sedimentation to improve the quality and safety of their water. On type of storage facilities used for children's food, 48.0% of the mothers stored it in the child's bowl, 33.2% in a food flask, 9.5% of the mothers did not store food at all for their children. The reason which was given for the 9.5% is that these particular children were not receiving complementary foods. Whilst 9.0% left the food in a pot and only 0.3% of the mothers stored their children's food in a fridge.

Table 4.12: Distribution of hygienic practices (hand washing) associated with child feeding in Kassena-Nankana District on the previous day before the interview

Hygienic practices (hand washing):	Frequency	Percentage (%)
Before food preparation:		
Yes	296	78.1
No	83	21.9
Total	379	100.0
Before eating:		
Yes	298	78.6
No	81	21.4
Total	379	100.0
Before feeding child:		
Yes	205	54.1
No	174	45.9
Total	379	100.0
After defecation:		
Yes	317	83.6
No	62	16.4
Total	379	100.0
After cleaning babies:		
Yes	127	33.5
No	252	66.5
Total	379	100.0
After returning from outside:		
Yes	54	14.2
No	325	85.8
Total	379	100.0
After handling garbage:		
Yes	196	51.7
No	183	48.3
Total	379	100.0
Use of soap on the previous day:		
Yes	361	95.3
No	18	4.7
Total	379	100.0

From table 4.12, the majority (95.5%) of the respondents used soap on the previous day and 78.1% did wash their hands before food preparation, 78.6% before eating, 54.1% before feeding the child, 83.6% after defecation, 33.5% after cleaning the child, 14.2% after returning from outside the house, and 51.7% after handling/carrying of garbage.

Table 4.13: Distribution of care provision during child feeding in Kassena-Nankana District

Care provision of child:	Frequency	Percentage (%)
Primary feeder in the absence of mother:		
Grandmother	132	34.8
House help	2	0.5
Older children	93	24.5
Other relatives	52	13.7
Father	23	6.1
Don't eat yet	77	20.3
Total	379	100.0
Person that eats with child:		
Mother	243	64.3
Other children	30	7.9
Alone	59	15.6
Other relatives	26	6.9
Father	20	5.3
Total	378	100.0
Fed from separate bowl:		
Yes	144	38.3
No	232	61.7
Total	379	100.0
Quantity of food given during and after illness:		
Less than usual	321	84.7
Same as usual	43	11.3
More than usual	1	0.3
Nothing to drink	7	1.8
Don't know	7	1.8
Total	379	100.0

From table 4.13, (34.8%) of the children were fed by their grandmothers in the absence of the mother, 24.5% by older children, 13.7% by other family relatives, and 6.1% by fathers. About (20.3%) of the children were not yet receiving complementary foods. The majority (64.3%) of the children ate with their mothers, 15.6% ate alone, 7.9% ate with older children, 6.6% ate with other family relatives and 5.3% ate with the child's father. A significant proportion (38.3%) of the children received their food in a separate bowl. Most children, (84.7%) received less food than usual during or after illness, 11.3% consumed the same quantity as usual, and 1.8% was not given food/drink and another 1.8% of the mothers could not remember what quantity was eaten during/after illness, only 0.3% took more than usual.

4.5 Prevalence of Malnutrition in Kassena-Nankana District

Figure 4.3: Prevalence of child undernutrition by education of mothers in Kassena-Nankana District

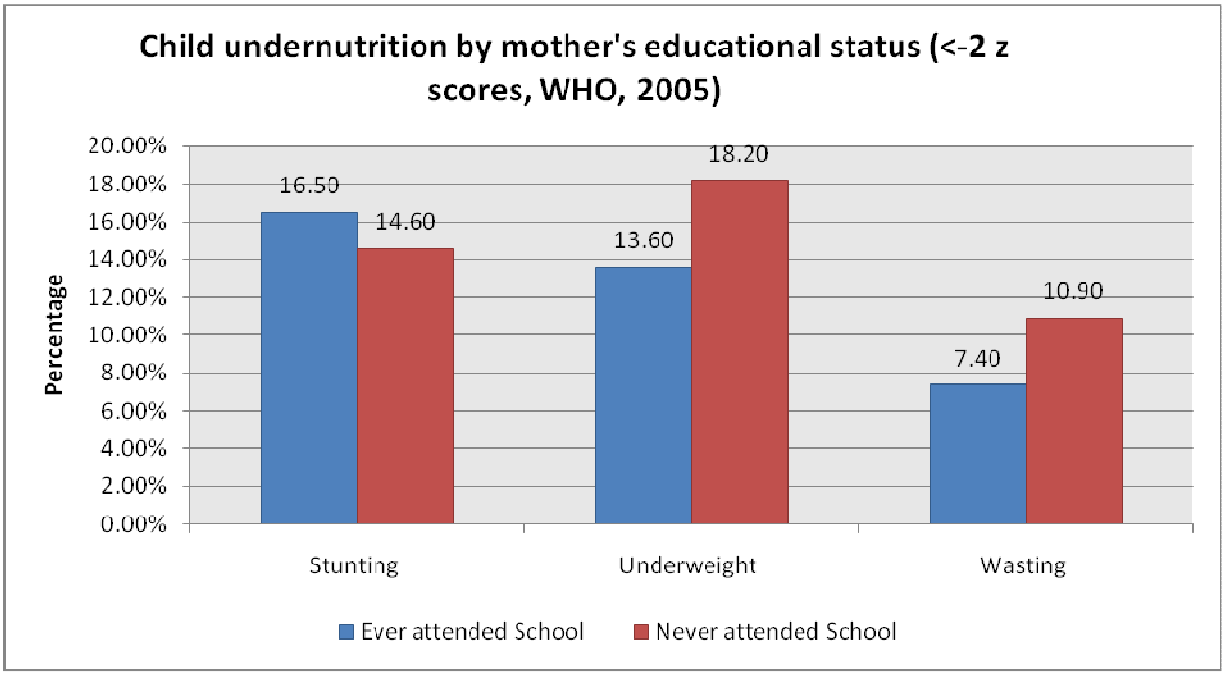


Figure 4.3 shows the prevalence of child undernutrition by mothers' educational status. The findings of the study shows that the prevalence of child undernutrition with mothers who had no education were, 14.6% stunted, 18.2% underweight, and 10.9% wasted whilst mothers who had some level of education showed 16.5% stunted, 13.6% underweight and 7.4% wasted in the district.

Table 4.14: Unadjusted Odds Ratio for association between the children's characteristics and child undernutrition in Kassena-Nankana District

Background Characteristics (N=379)	HAZ OR	95% CI	P-Value	WAZ OR	95% CI	P-Value	WHZ OR	95% CI	P-Value
Age of child:									
06-08 months	0.07	0.00-0.52	**0.009**	0.19	0.57-0.67	**0.009**	**	**	**
09-11 months	0.47	0.23-1.03	0.061	0.54	0.26-1.09	0.086	0.79	0.36-1.75	0.559
12-17 months	1.0			1.0			1.0		
18-23 months	1.47	0.76-2.84	0.255	0.77	0.38-1.59	0.491	0.37	0.12-1.14	0.083
Marital status:									
Married	1.0			1.0			1.0		
Single	0.77	0.17-3.47	0.730	0.84	0.18-3.79	0.818	0.71	0.09-5.57	0.745
Divorced/separated	0.98	0.21-4.52	0.974	3.66	1.15-11.64	**0.028**	1.94	0.41-9.16	0.403
Religion:									
Christianity	1.0			1.0			1.0		
Islam	0.84	0.28-2.54	0.756	1.19	0.43-3.32	0.739	1.19	0.33-4.21	0.793
Traditionalist	0.41	0.17-0.99	**0.049**	0.69	0.32-1.49	0.351	0.52	017-1.54	0.238
None	2.14	0.63-7.26	0.221	0.95	0.20-4.45	0.951	0.79	0.09-6.33	0.824
Ethnicity:									
Kasem	1.0			1.0			1.0		
Nankam/Frafra	1.02	0.58-1.81	0.947	0.55	0.30-0.99	**0.050**	0.45	0.20-1.01	0.052
Builsa/Zanbrama	1.78	0.18-17.67	0.623	4.13	0.25-67.66	0.320	7.64	0.46-126.5	0.156
Mamprusi	0.71	0.15-3.27	0.661	0.26	0.03-2.01	0.196	0.47	0.06-3.78	0.483
Educational Level:									
None	1.0			1.0			1.0		
Primary	1.21	0.62-2.37	0.583	0.46	0.22-0.96	**0.038**	0.47	0.18-1.18	0.109
JSS/Middle	1.37	0.63-2.96	0.426	1.08	0.52-2.24	0.833	0.87	0.34-2.26	0.784
SSS/O Level	1.04	0.36-2.99	0.949	1.12	0.44-2.85	0.812	1.05	0.33-3.39	0.936
Tertiary	1.24	0.14-11.22	0.847	**	**	**	**	**	**
Occupation:									
Farming/By-day job	1.0			1.0			1.0		
Salary worker	1.95	0.50-7.59	0.336	1.24	0.26-5.96	0.787	2.16	0.43-10.70	0.347
Business/Income jobs	1.65	0.91-3.01	0.098	1.58	0.86-2.92	0.140	1.34	0.62-2.91	0.462
Unemployed/student	0.59	0.19-1.79	0.353	1.17	0.47-2.90	0.742	0.79	0.22-2.87	0.721
CF Introduction Time:									
On/after 6 months	1.0			1.0			1.0		
< 6 months	0.70	0.31-1.59	0.400	1.04	0.48-2.23	0.920	0.65	0.21-1.96	0.442
7 months/above	1.04	0.52-2.07	0.918	1.18	0.59-2.38	0.637	1.00	0.41-2.46	0.992
Sex of child:									
Male	1.0			1.0			1.0		
Female	0.71	0.40-1.24	0.228	0.68	0.38-1.19	0.175	0.35	0.16-0.77	**0.010**
Still breastfeeding:									
Yes	1.0			1.0			1.0		
No	3.19	1.03-9.91	**0.044**	1.54	0.42-5.69	0.520	0.80	0.10-6.32	0.833
Fruit Juice Intake:									
Yes	1.0			1.0			1.0		
No	0.86	0.32-2.32	0.770	0.88	0.33-2.37	0.804	1.35	0.45-4.09	0.592
Medicine (herbs):									
Yes	1.0			1.0			1.0		
No	1.51	0.44-5.19	0.510	0.61	0.23-1.57	0.304	0.75	0.21-2.62	0.647
Solid food intake:									
Yes	1.0			1.0			1.0		
No	1.39	1.02-1.89	**0.037**	1.10	0.82-1.49	0.515	1.10	0.75-1.62	0.611
Animal meat intake:									
Yes	1.0			1.0			1.0		
No	1.38	0.59-3.20	0.459	3.71	1.12-12.29	**0.032**	2.93	0.68-12.59	0.149
Mother's BMI:									
18.5-25.0kg/m^2	1.0			1.0			1.0		
BMI< 18.5kg/m^2	0.11	0.01-0.85	**0.035**	1.08	0.45-2.58	0.870	1.09	0.36-3.29	0.882
25.0-30.0kg/m^2	0.40	0.14-1.18	0.097	0.33	0.09-1.12	0.077	0.42	0.09-1.84	0.252
>30.0kg/m^2	0.54	0.07-4.45	0.571	**	**	**	**	**	**

[1]** The independent variable was not used against the outcome variable.

* Stata 9.1 dropped categorization under the particular independent variable.

[1]Odds Ratio (OR) for Stunting (HAZ), Underweight (WAZ) and Wasting (WHZ) of the children. The association is considered statistically significant if P<0.05 and 95%CI range which exclude's the value (1) in the interval.

Table 4.14 shows the level of association of child undernutrition (stunting, underweight and wasting) and their demographic information. The findings of the study depict some significant associations for stunting, underweight and wasting. Comparing children in the age group 6-8 months with children in the age group 12-17 months of age; children in 6-8 months of age had strong statistical significance (protective) for stunting (unadjusted OR=0.07, 95%CI=0.00-0.52, P=0.009) and underweight (unadjusted OR=0.19, 95%CI=0.57-0.67, P=0.009). Children in the age group 6-8 months were 0.07 times and 0.19 times more likely to be stunted and underweight compared to children in the age group 12-17 months of age respectively.

The analysis also detected borderline statistical significance when children whose parents reported to practice Christianity were compared with traditional religious respondents for stunting (unadjusted OR=0.41, 95%CI=0.17-0.99, P=0.049). This implies that children whose parent's practiced traditional beliefs were 0.41 times more likely to be stunted compared to the children from Christian families. However, the P-value was very close to 0.05 (0.049) making it fall within a borderline classification. Also children who had divorced/separated mothers were strongly statistically significant (risk) for underweight (unadjusted OR=3.66, 95%CI=1.15-11.64, P=0.028). This suggests that children who had divorced/separated parents were 3.66 times more likely to be underweight compared to the children who had married mothers.

The Nankana/Frafra tribe had borderline statistical significance (protective) with underweight (unadjusted OR=0.55, 95%CI=0.30-0.99, P=0.050) compared to the Kassena tribe. This indicates that children of Nankana/Frafra ethnic background were 0.55 times more likely to be underweight in the district compared to children from Kassena ethnic family. In comparing the educational levels of the mothers, the study detected statistically significant values which can be interpreted as

protective for underweight (unadjusted OR=0.46, 95%CI=0.22-0.96, P=0.038). The results suggest that children whose mothers had some level primary education were 0.46 times more likely to be underweight compared to the children of respondents who never had any form of formal education. It also means that when a child was born to a mother who had no form of formal education had a high chance of becoming underweight compared to some level of primary education for the respondents.

The females were less likely to become wasted compared to male children (unadjusted OR=0.35, 95%CI=0.16-0.77, P=0.01). The female children were 0.35 times more likely to be wasted compared to males. The children of malnourished mothers (BMI less than 18.5kg/m^2) were statistically significant (protective) with stunting (unadjusted OR=0.11, 95%CI=0.01-0.85, P=0.035) compared to mothers who were well nourished (BMI 18.5-25.0kg/ m^2). This implies that the children whose mothers had BMIs less than 18.5kg/m^2 (malnourished) were 0.11 times more likely to be stunted compared to the children with well nourished mothers (BMI 18.5-25.0kg/ m^2).

Children who had stopped breastfeeding were weakly statistically significant (risk) for stunting (unadjusted OR=3.19, 95%CI=1.03-9.91, P=0.044) compared to the children who were still breastfeeding. Weaned children were 3.19 times more likely to be stunted compared to children who were still breastfeeding. Children who had been introduced to solid foods were statistically significant (risk) for stunting (unadjusted OR=1.39, 95%CI=1.02-1.89, P=0.037) compared to the children who were yet to receive solid foods. The children who were not eating solid foods were 1.39 times more likely to be stunted compared. Also underweight was found to be associated (risk) with failure to eat animal meat (unadjusted OR=3.71, 95%CI=1.12-12.29, P=0.032) compared to the children who had consumed animal meat. Children who did not consume animal meat were 3.71

times more likely to be underweight compared to those children who ate meat. Finally, there was no association with stunting (unadjusted OR=0.70, 95% CI=0.31-1.59, P=0.400), underweight (unadjusted OR=1.04, 95%CI=0.48-2.23, P=0.920) and wasting (unadjusted OR=0.65, 95%CI=0.21-1.96, P=0.442) for children who were introduced to complementary foods before the age of 6 months compared to the children who received complementary foods at the right time.

Table 4.15: Adjusted Odds Ratio for association between the children's characteristics and child undernutrition in Kassena-Nankana District

Background Characteristics (N=379)	HAZ OR	95% CI	P-Value	WAZ OR	95% CI	P-Value	WHZ OR	95% CI	P-Value
Age of child:									
06-08 months	0.01	0.00-0.07	**0.001**	0.00	0.00-0.01	**0.001**	*	*	*
09-11 months	0.16	0.06-0.40	**0.001**	0.04	0.01-0.12	**0.001**	0.51	0.20-1.29	0.155
12-17 months	1.0			1.0					
18-23 months	22.20	6.79-72.54	**0.001**	20.69	5.13-83.44	**0.001**	0.62	0.17-2.33	0.479
Marital status:									
Married	**	**	**	1.0			**	**	**
Single	**	**	**	0.69	0.10-4.65	0.702	**	**	**
Divorced/separated	**	**	**	11.73	2.04-67.42	**0.006**	**	**	**
Ethnicity:									
Kasem	**	**	**	1.0			**	**	**
Nankam/Frafra	**	**	**	0.25	0.10-0.59	**0.002**	**	**	**
Builsa/Zanbrama	**	**	**	13.22	0.68-256	0.088	**	**	**
Mamprusi	**	**	**	0.13	0.01-1.34	0.087	**	**	**
Educational level:									
None	1.0			1.0			1.0		
Primary	2.72	1.17-6.34	**0.020**	0.26	0.09-0.69	**0.007**	0.42	0.16-1.09	0.077
JSS/Middle	2.39	0.88-6.51	0.086	0.98	0.36-2.64	0.972	0.87	0.32-2.34	0.779
SSS/O Level	0.92	0.26-3.21	0.897	0.94	0.24-3.74	0.931	1.08	0.31-3.69	0.907
Tertiary	3.45	0.24-50.22	0.365	*	*	*	*	*	*
Sex of child:									
Male	1.0			1.0			1.0		
Female	0.25	0.12-0.53	**0.001**	0.12	0.05-0.29	**0.001**	0.28	0.12-0.68	**0.005**

[2]** The independent variable was not used against the outcome variable.

* Stata 9.1 dropped categorization under the particular independent variable.

Table 4.15 depicts adjusted odds ratio for association between child undernutrition and demographic characteristics. Majority (133) of the children who were studied are between the 12-17 months of age. As a result of the high proportion of children within this age group, it was taken as the baseline where the remaining age groups were compared with it to determine the existence of any statistical significance. In comparing the children in the age group 12-17 months with children in other age groups; 6-8 months, 9-11 months and 18-23 months, were statistically significant for

[2] [2]Odds Ratio (OR) for Stunting (HAZ), Underweight (WAZ) and Wasting (WHZ) of the children. The association is considered statistically significant if P<0.05 and 95%CI exclude's the value 1 in the range.

stunting (adjusted OR=0.01, 95%CI=0.00-0.07, P=0.001), (adjusted OR=0.16, 95%CI=0.06-0.40, P=0.001), and risk (adjusted OR=22.2, 95%CI=6.79-72.54, P=0.001) respectively. Children in the age group 6-8 months were 0.01 times more likely to be stunted after accounting for the effect of other variables, whilst the children in the age group 9-11 months were 0.16 times more likely to be stunted, and children in the age group 18-23 months of age were 22.2 times more likely to be stunted (risk) compared to the children in the age group 12-17 months of age after adjusting for the effect of other variables.

In addition, underweight was strongly statistically significant (protective) for children in the age group 6-8 months of age (adjusted OR=0.00, 95%CI=0.00-0.01, P=0.001), 9-11 months of age (adjusted OR=0.04, 95%CI=0.01-0.12, P=0.001), and risk for 18-23 months of age (adjusted OR=20.69, 95%CI=5.13-83.44, P=0.001) compared to children 12-17 months of age. Children in the age group 6-8 months were 0.001 times more likely to be underweight after adjusting for the effect of other variables. Children in the age group 9-11 months were 0.04 times more likely to be underweight and children in the age group 18-23 months were 20.69 times more likely to be underweight compared to the children in the age group 12-17 months of age respectively taking into account the effects other variables.

Children who had divorced/separated mothers were strongly statistically significant (risk) for underweight (adjusted OR=11.73, 95%CI=2.04-67.42, P=0.006) compared to their counterparts who had married mothers. This means that children who had divorced or separated mothers were 11.73 times more likely to be underweight compared to children who had married mothers in the district when the effect of other variable are accounted for. Children whose mothers had some level of primary education were strongly statistically significant (risk) for stunting (adjusted OR=2.72,

95%CI=1.17-6.34, P=0.020) and protective for underweight (adjusted OR=0.26, 95%CI=0.09-0.69, P=0.007) compared to those children whose mothers never attended school. This suggests that children whose mothers had primary education were 2.72 times more likely to be stunted and 0.26 times more likely to be underweight compared to the children whose mothers had no education after controlling for other variables.

Also females were statistically significant for stunting (adjusted OR=0.25, 95%CI=0.12-0.53, P=0.001), underweight (adjusted OR=0.12, 95%CI=0.05-0.29, P=0.001) and wasting (adjusted OR=0.28, 95%CI=0.12-0.68, P=0.005). This indicates that the females were 0.25 times more likely to be stunted, 0.12 times more likely to be underweight and 0.28 times more likely to be wasted compared to males after controlling for the effect of other variables.

Figure 4.4: Prevalence of child undernutrition by age in months in Kassena-Nankana District

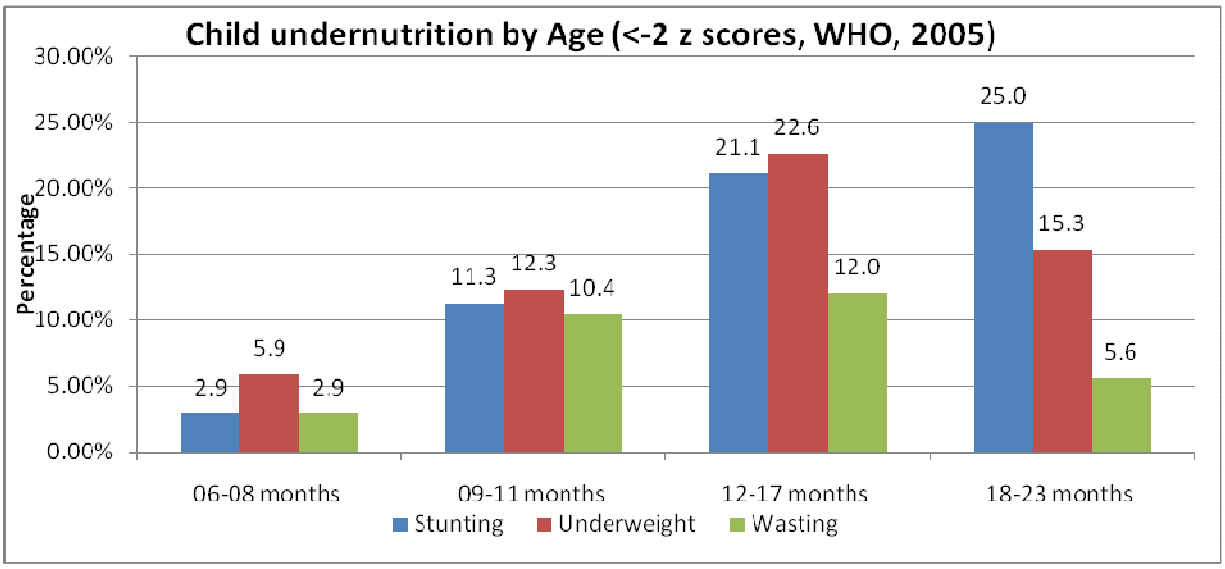


Figure 4.4 depicts the prevalence of child undernutrition by their age groups, stunting: 2.9% (6-8 months), 11.3% (9-11 months), 21.1% (12-17 months) and 25.0% (18-23 months) of age, whilst underweight: 5.9% (6-8 months), 12.3% (9-11 months), 22.6% (12-17 months) and 15.3% (18-23

months) of age and lastly, wasting: 2.9% (6-8 months), 10.4% (9-11 months), 12.0% (12-17 months) and 5.6% (18-23 months) of age.

Figure 4. 5: Prevalence of maternal malnutrition using BMI kg/m^2 in Kassena-Nankana District

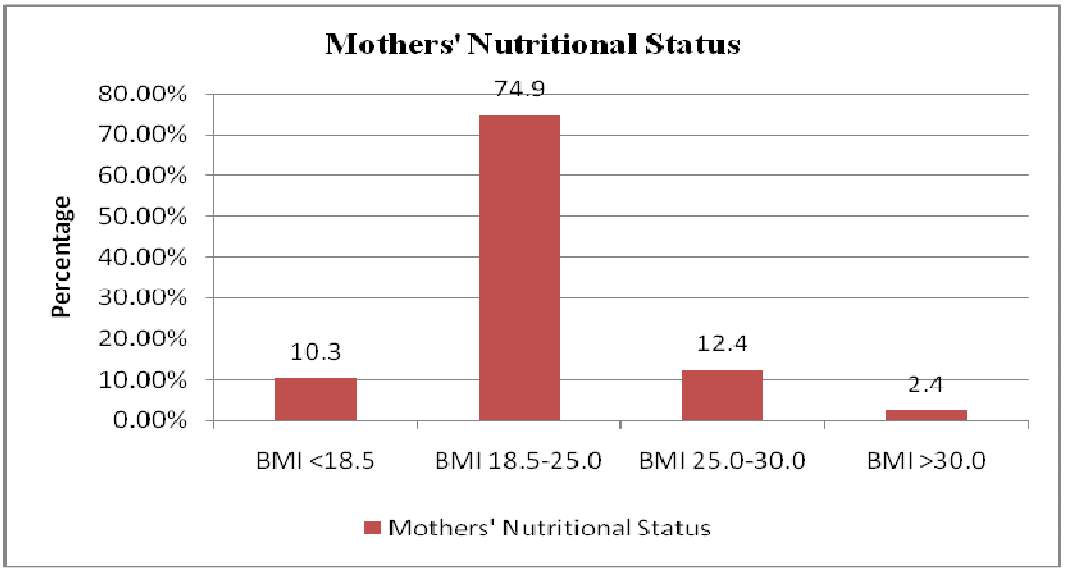


Figure 4.5 illustrate the prevalence of maternal undernutrition in the district. The majority (74.9%) of the respondents were normal (BMI 18.5-25.0kg/ m^2), 12.4% were overweight (BMI 25.0-30.0kg/ m^2), 10.3% were malnourished (BMI<18.50kg/ m^2) and 2.4% were obese (BMI>30.0kg/ m^2).

Figure 4.6 Prevalence of child undernutrition by sex in Kassena-Nankana District

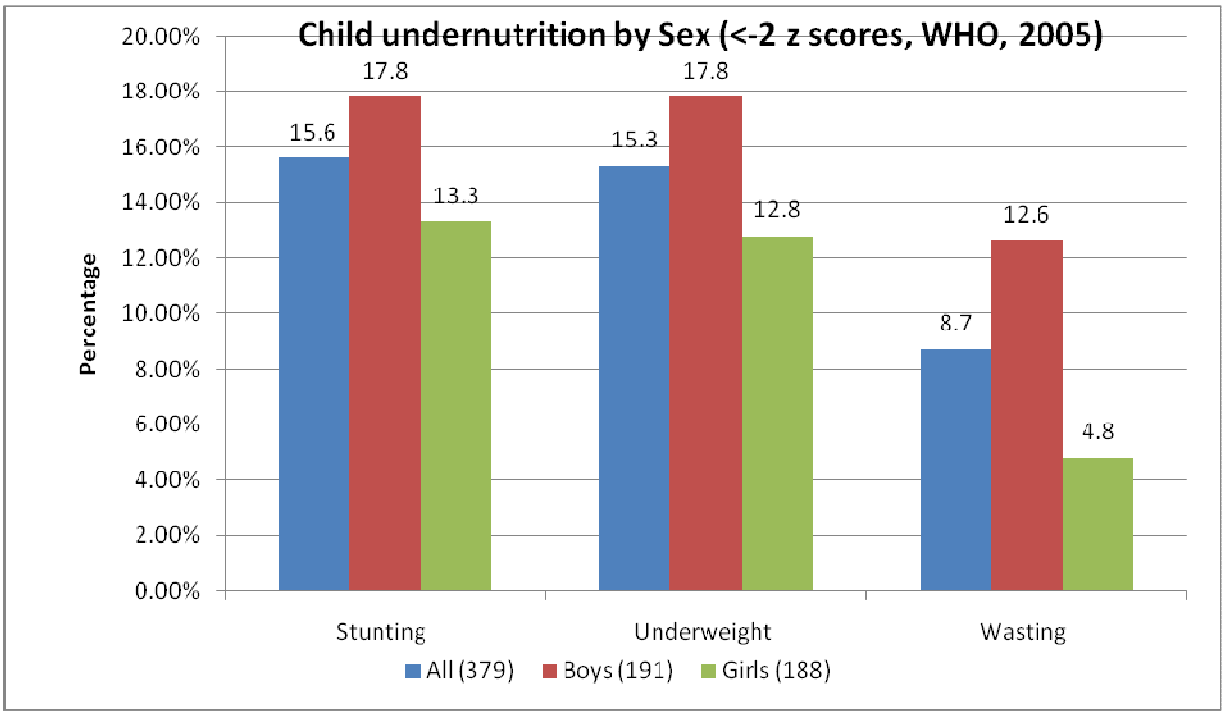


Figure 4.6 shows the prevalence of child undernutrition for both sexes: stunting was (15.6%), underweight was (15.3%) and wasting was (8.7%). For boys only: stunting was (17.8%), underweight was (17.8%) and wasting was (12.6%), whilst for girls only: stunting was (13.3%), underweight was (12.8%) and wasting was (4.8%).

CHAPTER FIVE

DISCUSSION

5.0 Introduction

The study investigated the possible determinants of child and maternal undernutrition in the Kassena-Nankana District. The findings of the study indicate that early introduction of complementary foods to children before the age of 6 months was not associated with child undernutrition using stunting, underweight and wasting as the indicators as shown on table 4.14 using P-values (HAZ=0.400, WAZ=0.920 and WHZ=0.442). Gupta et al., 2007 also reported similar findings were there was no statistically significant association between the intake of complementary food and water intake before 6 months of age and child undernutrition. However, the prevalence child undernutrition differed from what was reported in GDHS (2003) stunting (30%), underweight (22%) and wasting (7%) for children less than five years of age. The result on stunting was in agreement with other studies (Wamani et al., 2005) where it increased with the child's age. The prevalence of maternal malnutrition BMI< 18.5kg/m^2 (10.3%) and BMI>30.0kg/m^2 (2.4) in the study area equally varied from what was reported in GDHS (2003). The contrast is that, there were high prevalence of maternal undernutrition in the study area and less overnutrition compared to the results of the GDHS (2003) for women.

5.1 Background characteristics of respondents

Young mothers may be at risk of reproductive health complications during pregnancy and delivery. The reasons accounting for this include they are still growing physiologically and their nutritional stores for conception may not be adequate. This may be responsible for low birth weight of their newborns. In this circumstance, the fetus drive nutrients from the mother further depleting her own inadequate stores and making her more vulnerable to infection and malnutrition. It subsequently

affects the provision of care needed for the child too. The majority (34.8%) of the children were born to women below the ages of 25 years. These young mothers may still depend on their parents or family relatives for basic human needs. In addition, their productivity could be low resulting in less income. It has the tendency to affect their ability to provide quality care for their children.

Marriage is an important social requirement in most rural communities. As a result of the importance, majority of the respondents reported that they were married (92.3%). However, on very few instances individuals (man and women) may live together without going through the prescribed marriage process recognized in a particular culture. Underweight was statistically significant (risk) with children who had divorced or separated mothers (unadjusted: OR=3.66, 95%CI=1.15-11.64 and P=0.028) compared to children who had married mothers. This suggests that marriage may be a social support system for mothers and their children in poor communities. Additionally, in the adjusted odds ratio, underweight was more statistically significant with children whose mothers were either divorced or separated compared to the children whose mothers were married as showed in table 4.15. This significance suggests that maternal marriage does influence child undernutrition. The effect could be that married mothers get additional support from their husbands in terms of care and food availability. Another possible relation may be that the total household earning of married women is relatively higher than unmarried since their husbands could also contribute for the provision of household needs. It is also possible that married individuals may be economically better than unmarried persons based on their level of income from the different jobs. Under such circumstances, household food acquisition and consumption may also improve.

Most of the respondents were illiterates, implying that females probably continue to lag behind their male counterparts in the district. This high rate of never attended school among females was also

noted in GDHS (2003) particularly in the three northern regions. Female literacy rate increases as household economic status improves. The present study reports higher prevalence of malnourished children in case of illiterate mothers compared to that of literate mothers except for stunting as shown on figure 4.3. Better child care practices adopted by educated mothers than those by uneducated mothers may be accounting for this trend. Maternal education had some effect on child health and nutrition which is in agreement with the findings of Wamani et al (2004). Formal education helps individuals to make informed decisions that impact their health and well-being as reported in GDHS (2003). The opportunities for acquiring well paying jobs are limited for these women in the district. Not only does this high illiteracy rate affect their economic status, but it has health implications also on the household at large.

Underweight was statistically significant with children whose mothers had some level of primary education (unadjusted: OR=0.46, 95%CI=0.22-0.96and P=0.038) compared to children whose mothers never had any education. This supports the view that maternal education is linked with child nutrition. In addition, child undernutrition (stunting and underweight) were both more strongly statistically significant with mothers who had some level of primary education compared to the children whose mothers had no education after controlling for the effect of other variables as shown on table 4.15. This depicts the public health importance of maternal education with respect to child undernutrition. Probably, educated mothers have better understanding of complementary feeding education or information provided at the health institutions than their colleagues. They may also practice this knowledge on complementary feeding better as recommended. Educated mothers are more likely to earn high incomes than their counterparts therefore, improving their household food security and increasing child care and complementary food intake.

The findings of the study also showed some relationship between religion and child undernutrition. Stunting had a borderline statistically significance with children whose parents were traditionalists (unadjusted: OR=0.41, 95%CI=0.17-0.99 and P-Value=0.049) compared to the children who had Christian mothers. For instance, some social grouping can influence what is consumed by an individual, and how it is treated or cooked before consumption. The safety of the foods consumed is equally important for good nutrition as the quantity. Failure to eat hygienic and quality/safe food, could contribute largely to morbidity and undernutrition among individuals especially in children. For example dog meat and pork are commonly consumed in the Kassena-Nankana District by majority of the inhabitants, but Muslims do not eat such products. This implies that educational programmes to reduce child undernutrition should also target religious groups as well.

Underweight was associated with the children whose parents were Nankam/Frafra by tribe before and after adjusting for the effects of other variables compared to children who had Kassena Mothers. These variations may be as a result of the settlement in the district. The Kassena tribe is mostly found closer to the urban centre (Navrongo) than the Nankana/Frafra. The Nankana/Frafra tribes largely live in the rural communities. Based on this unplanned difference, many more mothers in the rural parts are illiterates because of the unfair distribution of schools. They solely depend on the agricultural sector for survival, because that is the main occupation available and within their reach. It is well known that this method of subsistence agriculture is unreliable and may encounter frequent food insecurity and undernutrition as observed .It also means that their access to health facilities, social services/amenities and information may be lower compared to their counterparts who live in the Kassena areas (Navrongo).

Maternal employment status is inversely related to educational background in this study. This is in agreement with what was reported in GDHS (2003). Very few mothers were employed in the formal sector as shown on table 4.1. The study results did not identify statistically significance with regard maternal occupation and child undernutrition. Even though, mothers' education, marital status and ethnicity as shown on table 4.14 all had some level of relationship with child undernutrition. During years of drought or floods like what was experienced in the year 2007 in the Northern part of Ghana, women and their children are more likely to be affected severely. There was no association between child undernutrition and occupation of mothers as shown on table 4.14.

The findings estimate that 50.4% of the children were male. The variations in child sex may either be as a result of early childhood mortality difference or reproductive condition where one gender was commonly conceived more frequently than the other. The other reason apart from biological chance may be family preference for male child than female. Therefore, adequate care and attention is provided for the male child relatively resulting in their survival. However, many more males had high prevalence of stunting, underweight and wasting as shown in figure 4.6. Again, variation in growth rates among gender at the different physiological stages may be contributing to this observation. At certain points in the developmental stages, girls or boys grow at different rates. As noted, child undernutrition varies among gender significantly in this study.

Both stunting and underweight were more strongly statistically significant with the children in the age group 6-8 months of age (unadjusted OR=0.07, 95%CI=0.00-0.52, and P-Value=0.009) and (unadjusted OR=0.19, 95%CI=0.57-0.67, and P-Value=0.009) compared to the children in the age group 12-17 months of age respectively. Child undernutrition increases with age of the child and

this is in agreement with what is reported in MDHS (2004) and GDHS (2003). Therefore, the age of the child is one of the important determinants of child undernutrition as shown on table 4.15.

The age at which a woman gets married directly affect her fertility and probably the number of pregnancy. It does not only affect the length of time a woman is exposed to the risk of pregnancy, but also tends to lead to early childbearing and higher fertility. Women with no formal education are more likely to give birth, to many children than educated mothers and this is similar to the view in GDHS (2003). Frequent child births may compromise maternal health and also affect quality of care provided for older children. During pregnancy, the unborn child drives nutrients from the mother for its growth and development. As a result, it may be more prudent to allow some "good" interval for replacement of these losses.

5.2 Continued Breastfeeding and Introduction of CF in Kassena-Nankana District

The respondents reported that 82.8% of the children were exclusively breastfed for the first 6 months of life. The figure presented on exclusive breastfeeding could grossly over-estimate the true exclusive breastfeeding rate and contrast what is reported in the GDHS (2003). Even though the prevalence of breastfeeding was high, majority are not fed in compliance with WHO (2003) recommendations. Information on prelacteal feeds was not collected in this study and it may be accounting for the high estimates of exclusively breastfed children in the district. The other possible deductions or explanation for the high prevalence exclusively breastfed children may include the level of awareness created on exclusive breastfeeding due to the long-standing health research activities of the Navrongo Health Research Centre particularly on children, pregnant and lactating women. The children who were not exclusively breastfed and subsequent failure to consume adequate micronutrients may also have unwanted consequences which may lead to child morbidity.

A significant proportion of the children were still breastfeeding, even though there was no information on how the feeding was done. In most rural communities, it is common to see children being breastfed up to 2 years of age and beyond. Stunting was statistically significant (risk) with children who were already weaned before 2 years of age in the district (unadjusted OR=3.19, 95%CI=1.03-9.91, and P-Value=0.044) compared to the children who were still taking breast milk. Early weaning is also known to be associated with increased infant morbidity and mortality in poor communities as noticed in Gupta et al (2007). Early weaning of the children should be considered a matter of concern in order to reduce the prevalence of child undernutrition as shown in figure 4.6. Even though Kakuma and Kramer in 2001 suggested that early introduction of CFs had little effect on child growth. Mostly, the complementary foods prepared by rural mothers are insufficient in terms of quality for good nutrition. Those children who were weaned before 2 years of age, especially among 6-8 months of age may be more vulnerable to child undernutrition. Generally the number of children breastfeeding reduces in the second year of life, similar to what is reported in GDHS (2003). The study results showed high prevalence of children who were still breastfeeding. This is very important for the growth and development of children less than two years of age and it is a common practice for poor and rural households.

The children were breastfed differently during the day time and at night. Even though the recommendation for breastfeeding of children above 6 months of age is on-demand, the mothers reported the following using 24 hour call. Breastfeeding at night, 77.3% of the children were breastfed between 5-9 times, and 4.7% less than 5 times. The trend of breastfeeding is similar during the day time, 83.0% of the children were breastfed 5-9 times, and only 6.3% less than 5 times. Only 18.1% and 10.7% of the children were breastfed on-demand both during the day and at night. There are many reasons responsible for the above frequency of breastfeeding. Many women

are often engaged in several physical activities during the day, including income generating ventures and traditional roles in their various communities which may account for this practice of breastfeeding. Due to this, some mothers are unable to breastfeed on-demand during the day compared to night breastfeeding. The practice of breastfeeding was good even though positioning and attachment during breastfeeding were not accounted for, especially among young mothers.

The respondents reported that majority (61.2%) of the children were introduced to complementary foods at the recommended age (6 months). Some of the children may not be getting sufficient food and nutrients as a result of the inappropriate feeding practice stated above. Either early or late introduction of complementary foods could be the problem. Both practices are undesirable and, unfortunately can not be ruled out in the Kassena-Nankana District. There was no association with stunting (unadjusted OR=0.70, 95% CI=0.31-1.59, P=0.400), underweight (unadjusted OR=1.04, 95%CI=0.48-2.23, P=0.920) and wasting (unadjusted OR=0.65, 95%CI=0.21-1.96, P=0.442) for children who were introduced to complementary foods before the age of 6 months compared to other children who received to complementary foods at the right time (6 months of age).

The estimates indicate that, 57.0% of the respondents think that complementary foods should be introduced to young children in/soon after 6 months of age. The mothers' opinion of when complementary foods should be introduced and the time the index child was given first food/drink was, 57.0% and 61.2%, respectively. The possible deduction could be that, the true prevalence of exclusive breastfeeding in the district is between 57.0%-61.2%. For the fact that some of the women think that complementary foods should be given to young children on the 7^{th} month after birth is worrying. The possible explanation could be that some of the respondents did not understand what complementary feeding and foods really meant. It was noted that some mothers limit the term

"complementary foods" to only include ceremonial meals. The implication therefore, is that a significant proportion of the children were probably given these ceremonial meals after 6 months of life and were reported as receiving complementary foods at the age of 6 months. The study was limited by not collecting data on prelacteal feeds which could help arrive at the true prevalence of exclusively breastfed and timely introduction of complementary foods.

The use of a bottle with a nipple to feed children is high. The nipple of the bottle may "house" disease causing agents transferable to the baby. Finally, this study may not be conclusive on the feeding practices in the district, as many of the religious and cultural beliefs of this population, as well as the geographic location and accessibility to clean water may be unique. However, because there is limited information on children nutritional status in the district, these findings may be highly valuable despite the limitations observed.

5.3 Frequency of Food Intake among Young Children 06-23 months of age in Kassena-Nankana District

The majority (88.2%) of the children in the aged group 6>9 months received solid food less than twice daily, 11.8% received 2-3 times and none received 3-4 times. The children aged 9>24 months, 39.2% received solid food less than twice daily, 55.6% received 2-3 times and 5.1% did receive 3-4 times. The children who were consuming the right frequency of meals based on their age group are very limited as shown in table 4.4. Additionally, the results indicate that 92.6% of the children in the age group 6<9 months received semi-solid food less than twice daily, 7.4% received 2-3 times and none received 3-4 times. Again, the children aged 9>24 months, 75.9% of them received semi-solid less than twice daily, 22.5% of the children received 2-3 times and 1.5% did receive 3-4 times of semi-solid food.

This indicates that a significant proportion of the children were receiving less than the recommended number of times of complementary foods, as stated in WHO (2003). Less intake of food among children 6-23 months of age could lead to child undernutrition since breastmilk alone is not sufficient for healthy growth and development at that stage. However, failure to meet these nutritional requirements for the children could be accounting for the observed high prevalence of child undernutrition with increased age in the study. Also at each stage, the children become more active and exhaust their nutrient stores and need to replace them in order to prevent child malnutrition. Children often come to contact with the soil and they are exposed to microbes and therefore child morbidity and undernutrition may occur.

Household food insecurity may be one of the attributable factors the low food intake. It may also be an indication that, young children are only fed on complementary foods when the family meal is prepared. Majority of the mothers reported that they were peasant farmers who usually get poor crop yield annually which directly affect their ability to provide adequate food for family members including children. Household food insecurity and low maternal income may be the two major factors influencing the low intake of complementary foods. Naturally during the lean season, families adopt different coping strategies such as skipping of meals and reduction in quantity and consumption of foods that result in frequent water intake (for example hot pepper foods).

Furthermore, 43.0% of the children received porridge which is commonly consumed in Ghana. Often the density of this porridge is an issue of concern and others also remove the outer cover of the cereals which contains the B Vitamins. Considering the type of porridge that the children consumed, the nutrient content may probably be insufficient and contribute to child undernutrition.

Apart from the mere intake and consistency of the porridge, the frequency of intake is equally relevant for good nutrition and should be of public health concern to ensure quality health.

Provision of dairy milk to children was more likely to be practiced among the wealthy or the least poor. This discrepancy appears to imply that lack of specific resources in terms of assets might act as barriers for mothers in their efforts to put complementary feeding knowledge into practice. It indicates that the nutrient requirements for young children may not be met if their feeding pattern is not changed. Minority of the mothers reported that 7.1% of their children received traditional medicine or herbs, and, 11.1% of the children were fed with baby feeding bottle. This suggests that baby feeding bottles may be a major source of microbial contamination and could contribute to morbidity as also noted in GDHS (2003) and Menon et al., (2003).

Children who are in the age group 6-23 months are physically active and require high energy. Inadequate intake of these energy giving foods may lead to rapid depletion of the body nutrients store resulting in child undernutrition. Grains are the common food crops cultivated in the district and comparatively well consumed by the respondents. There was less diversity in the foods consumed. The reason could be the high dependence on their farm produce leading to minimal diversity in the food consumed. Seasonality has an influence on food availability and consumption pattern in rural communities. Most households eat what is commonly available than what they may prefer. The micronutrients needed for healthy growth and development may not be met as a result of the eating pattern of the children.

Micronutrients are very critical in brain development and subsequent intellectual ability of the individual in later life. Under consumption of these foods believed to be rich in micronutrients may lead to low productivity, low income earning and poverty in adulthood. Even though most of the

major food sources of protein were consumed, the quantity of the foods eaten could not be ascertained. Failure to consume adequate food may affect the possibility of meeting the protein requirements of children which can affect their growth and development including child undernutrition.

The children consumed some of the complementary foods listed, the findings show that meals prepared from/with grains, vegetables, fish and eggs were relatively consumed more than the others. The frequency of consumption also increased with increasing age of the children as shown on table 4.10 which is similar to what was documented in GDHS, 2003. The findings of the study, only measured the frequency of food intake, whilst the quantity and quality were not considered. The factors that may account for low consumption of complementary foods include availability, affordability and accessibility among the respondents in the district. The Kassena-Nankana District is prone to frequent droughts, irregular rainfall patterns, and low soil fertility all of which account for poor crop yield and food insecurity. Though food availability is severely constrained, affordability is another challenge for household food and nutrition security, since the majority of the people do not work in the formal sector for salaries due to high illiteracy rate among other reasons as shown on table 4.1.

The frequency of mango/pawpaw consumption, other fruits and animal meat among the children were also identified to be minimal as shown on table 4.10. The essential question to ask is to what extend does the increase in fruit intake meet the nutritional requirements of the children at the various ages for healthy life? Factors such as characteristics of diet or child's appetite are known to influence frequency of complementary feeding but information was not collected on this. Although

these were not measured in the study, it is unlikely that such factors could adequately explain the observed consumption patterns.

Comparatively, beans, nuts, oil/palm oil were minimally consumed among the children. The results indicate that some of the children may not be meeting their energy requirements from the above foods as shown on table 4.9. The consumption of other proteins and energy giving foods also increased with ages of the children. Complementary feeding has to be done with care such that it does not lead to child overnutrition which is unacceptable, but becoming common in the developing countries including Ghana, GDHS, 2003; MDHS, 2004. This suggests a need for adequate infant feeding promotion and research so that relevant health education messages are disseminated.

5.4 Hygienic Practices Associated with CF by mothers/caregivers in Kassena-Nankana District

The sources of drinking water may affect the health and nutrition of children and mothers. The major source of drinking water for rural households is a well or borehole in the district. This was also reported in GDHS (2003). During the rainy season majority (77.8%), of the respondents had their drinking water from borehole whilst 11.3% of the mothers reported that their source of drinking water was from a standing pipe, 7.4% from open well without cover, and few (1.3%) fetched from deep wells with fitted pumps. The findings during the dry season are similar to the rainy season where, 78.4% of the respondents had their drinking water from boreholes, 11.1% of them also reported that they collected their water from standing pipes, 7.4% fetched from open well without cover, few (1.3%) also collected water from deep wells with fitted pumps and negligible (1.1%) number of the households fetched from shallow wells with fitted pump. Even though, about

89.1% of the respondents had their water either from the borehole or pipe, the possibility of tap or borehole water contamination should also be considered.

Most mothers preferred tap/borehole water for its presumed hygienic superiority. Filtering and treatment practices varied widely and were reported mainly among those using open water sources, but not among those using tap water. The microbial load from these two sources of drinking water in the district may be low, however, the period from fetching and drinking could be exposed to other microbes that can still lead to water-borne diseases by drinking contaminated water. Similar suggestions were made by Gupta et al (2007).

To ensure quality and safety of their drinking water, 12.9% reported that they did treat the water before drinking as show on table 4.13. Probably the treatment given to the water before drinking could be inappropriate to eliminate the microbial organisms if already contaminated. Drinking safe water helps prevent the occurrence of diarrhea and other diseases among young children and this directly reduces the prevalence of child undernutrition.

Socioeconomic status of the respondents was also indirectly measured by determining where the mothers stored left over-foods of young children for later consumption. The type of storage facility determines the nearest level of exposure to microbes and subsequently child morbidity and undernutrition. Food stored for later use may rather be exposing their children to micro-organisms. Depending on the type of microbes that get into the food, morbidity may occur when it is later consumed by the children, even after heating which is often inappropriately done. A small proportion of the mothers probably had the appropriate facility for storage of child's food for later use.

In order to reduce the level of contamination and improve hygienic practices of the respondents and their children, the mothers were asked about hand washing habits commonly observed to prevent the outbreak of diseases. The majority (95.5%) of the respondents used soap during the washing of their hands on the previous day. A significant proportion, (78.1%) of the respondents washed their hands before food preparation, (78.6%) washed hands before eating, (54.1%) washed hands before feeding the child, (83.6%) washed hands after defecation, (33.5%) washed their hands after cleaning the child, (14.2%) washed hands after returning from outside and (51.7%) washed their hands after handling/carrying of garbage. Assuming that these are the basic hygienic practices of the mothers in order to prevent food contamination and occurrence of diseases during feeding; then the deductions are that significant proportion children were at high risk based on the poor practices reported. The least scored in hand washing was after returning from outside. Usually, individuals come into contact with different microbes through several ways including hand shaking with others. However, this is woefully not considered as one of the exposures for contamination by most people.

The study found that, 34.8% of the children were fed by their grandmothers in the absence of the mother, 24.5% of the children also received food from older children in the absence of the mother, 13.7% of children were fed by other family relatives in the absence of the mother, whilst 6.1% of the children were fed their fathers, 0.5% were fed by the house help who acted as the primary caregivers in the absence of the child's mothers. A significant proportion (20.3%) of the children was not yet eating. This could imply that any intervention to improve child undernutrition must target the grandmothers as well as the fathers of the children to achieve the desired project objectives.

The majority (64.3%) of the children ate with their mothers in the same bowl, 15.6% of the children ate alone, whilst 7.9% ate with other older children, 6.6% ate with other family relatives and 5.3% ate with the child's father. The study estimates that 38.3% of the children use a separate bowl for their food. Those who ate with older children or other family relatives may not be given the desired care during feeding compared to those who ate with their own mothers. The nutritional requirements in terms of appropriate quantity and quality for good nutrition may not be met in this circumstance.

The majority of the children were not receiving appropriate complementary foods and the situation was worsening during or after illness. High proportion (84.7%) of the children received less food than usual during or after illness. This finding is similar to what was reported in Menon et al., 2003. Inadequate food intake during illness further compromises the immune system leading to delay in recovery. It makes the child more vulnerable to other diseases which may not be an issue of concern under good nutrition. Few mothers also reported that their children were stopped from eating at certain times.

5.5 Prevalence of Malnutrition in Kassena-Nankana District

The findings of the study show that child undernutrition differed according to educational status of their mothers. Children whose mothers had no education were; 14.6% stunted, 18.2% underweight, and 10.9% wasted whilst children whose mothers had some level of education were; 16.5% stunted, 13.6% underweight and 7.4% wasted. The prevalence of child underweight and wasting was relatively higher for the respondents who never had any form of formal education in their life. Although the prevalence of child stunting were rather higher among respondents who had some

form of formal education training in the past. A similar relationship where stunting is inversely related to maternal education was documented in Wamani et al (2005). This may be due to better childcare practices adopted by formal educated mothers than those by uneducated mothers. This suggests that education could have some influence on the prevalence of child undernutrition. The high prevalence of stunting among children of educated mothers may be due to their early return to work thereby providing less care through lack of time as compared to children of none educated mothers who probably were less busy. This association may also be accounting for the high prevalence of child undernutrition as shown in figure 4.3.

However, child undernutrition (stunting and underweight) were both more strongly statistically significant with mothers who had some level of primary education compared to the children whose mothers had no education after controlling for the effect of other variables as shown on table 4.15. Prior to the adjusted odds ratio, only underweight was statistically significant (unadjusted) with mothers who had some level of primary education compared to the children whose mothers never had education. Apart from observing that stunting and underweight were both statistically significant after the adjustment, it confirms that inadequate maternal education is a contributing factor to child undernutrition. The opportunities of getting a good job are enhanced when educated. It also facilitates the ability to interpret and make relevant information more useful to the mother and child. In the absence of this, undesirable consequences in all forms of life including low income, poor health and undernutrition may be experienced as observed.

5.5.1 Child Undernutrition by their ages

As shown in figure 4.4 the prevalence of child undernutrition increased with the age; stunting: (2.9%) of the children in the age group 6-8 months, (11.3%) 9-11 months, (21.1%) 12-17 months

and (25.0%) 18-23 months of age. This was also noted in Gupta et al (2007), Wamani et al (2005). The prevalence of stunting in the present study increased with age, reflecting the presumed accumulation of chronic malnutrition particularly undernutrition, illness, weaning or other adverse events. Whilst underweight among different age groups was: (5.9%) of the children in the age group 6-8 months, (12.3%) 9-11 months, (22.6%) 12-17 months and (15.3%) 18-23 months of age and lastly, wasting: (2.9%) 6-8 months, (10.4%) 9-11 months, (12.0%) 12-17 months and (5.6%) 18-23 months of age. The findings are similar to what was reported in GDHS (2003) and Davis et al. (2003).

The highest prevalence of child undernutrition occurred after 12 months of age emphasizing the fact that the second year of life is the most vulnerable period. The impact of infant feeding practices on underweight and stunting but not on wasting can be explained by the fact that wasting describes a recent and severe process that led to significant weight loss as a consequence of acute starvation and/or severe disease. But stunting implies long-term malnutrition and poor health, and underweight implies linear growth retardation. After adjusting for the effect of other variables, there was statistically significance between child undernutrition (stunting and underweight) and age of the children in the groups 6-8 months, 9-11 months and 18-23 months compared to the children in the group 12-17 months of age as shown on table 4.15. This evidence shows that the age of the child is an important determinant of child undernutrition. The nutritional needs of children increases with age and provision of appropriate complementary foods must be considered to ensure that all children receive adequate nutrition after the 6 months of life.

The majority (74.9%) of the mothers were normal with BMI of 18.5-25.0kg/ m^2, (12.4%) were overweight BMI 25.0-30.0kg/ m^2, (10.3%) were malnourished BMI<18.50kg/ m^2 and (2.4%) were

obese BMI>30.0kg/ m^2. Rural women are also more likely to engage in physical activities such as walking for longer distances, carrying of items and babies, fetching of water, whilst the urban woman may not do some of these high energy depleting activities. In addition, the study was conducted during the middle of the rainy season when most households would have exhausted their food stores. It also implies that majority of the respondents were on their agricultural fields working resulting in loss of weight and less care for their children including household food and nutrition insecurity. In the year 2007, the district experienced some drought at the beginning of the rainy season which had an impact on their lives and the food and nutrition insecurity situation among the households. This means that more coping strategies were adopted by the mothers because they had to replant all their crops. Those who did not have seeds had to buy in order that they could cultivate again. Some of these could be accounting for the high prevalence of maternal malnutrition.

The male sex was found to be associated with a high prevalence of stunting, and underweight, as well as wasting. Gupta et al (2007) and Wamani et al (2005) also reported a similar observation where males had high prevalence of malnutrition. Child undernutrition for both sexes was: stunting (15.6%), underweight (15.3%) and wasting (8.7%), whilst for boys only; stunting (17.8%), underweight (17.8%) and wasting (12.6%) and finaly, girls; stunting (13.3%), underweight (12.8%) and wasting (4.8%). This gender difference should be investigated in further studies.

CHAPTER SIX

CONCLUSION AND RECOMMENDATIONS

6.1 Conclusion

In conclusion the results of the study do not show an association between early introduction of complementary foods to young children before the age of 6 months and child undernutrition in the Kassena-Nankana District. These results do not undermine the well-documented benefits of breastfeeding and do not suggest an advantage to early weaning or introduction of complementary foods. However, early introduction of CFs may be a risk factor for increased morbidity and undernutrition of children.

The findings of the study estimate that 96.3% of the children in the district were still being breastfed, whilst 61.2% of the infants were given complementary foods at the age of 6 months. The complementary feeding practices and the nutritional status of the children in the district are inappropriate. The quantity and safety of these complementary foods which were given to the children are also of public health concern. In most instances; the hygienic practices were inappropriate for effective complementary feeding and may expose some of the children to contaminated foods/drinks accounting for the high prevalence of child undernutrition.

The prevalence of child undernutrition was: stunting (15.6%), underweight (17.8%) and wasting (13.3%). The results also depict high prevalence of maternal malnutrition (10.3%) were malnourished BMI<18.50kg/ m^2 and (2.4%) were obese BMI>30.0kg/ m^2.

Even if breastfeeding is practiced at a very high rate, the use of prelacteal feeding and early introduction of other food items is the norm.

6.2 Recommendations

In order to change the observed trend of maternal and child malnutrition in the Kassena-Nankana District, the following recommendations are suggested;

- Females particularly, adolescent girls, pregnant and lactating mothers and also the grandmothers should be educated on the promotion and protection of appropriate child feeding practices to improve the nutritional status of the children in the district.

- Mothers should be encouraged to avoid the use of baby feeding bottles and also to practice recommended hygienic practices to prevent microbial contamination of children's foods and subsequent morbidity and undernutrition.

- Attention should also focus on socio-economic empowerment, especially education of the girl child, promotion of the use of oil/paste to increase the energy and nutritive value/content of complementary foods and the timeliness of complementary feeding so as to optimize the benefits of breastfeeding and complementary feeding.

- Capacity building of the mothers to diversify their occupation to improve their income, household food and nutrition security.

- Family planning education in the district has to be intensified considering the fact that majority (34.8%) of the children were born to women below the ages 25 years.

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APPENDICE

Appendix I

Complementary feeding practices and Nutrition Status among Infants and young Children 06-23 months of age in the Kassena/Nankana District, Ghana

Ask the mother if she has a child 06-23 months of age who lives with her. If yes, proceed with the interview, if no thank the mother and end the interview.

Consent Page

INFORMED CONSENT:

Hello. My name is _____, and I am (student) working with (KNUST and the Navrongo DHMT). We are conducting a survey and would appreciate your participation. I would like to ask you about your health and the health of your youngest child under the age of two years. This information will help (KNUST and the Kassena-Nankana DHMT) to plan health services and assess whether it is meeting its goals to improve children's health. The survey usually takes 20-25 minutes to complete. Whatever information you provide will be kept strictly confidential and will not be shown to other persons.

Are you ready to participate in this survey? Yes…..1 No……2

Do you want to ask me anything about the survey?

Signature of Interviewee: _____ Date: _/_____/_____/_____/

You contact the following persons when there is need for additional clarification:

Ms. Rofina Asuru (Director for Health Services, Kassena/Nankana District).

Dr. Anthony K. Edusei (Principal Investigator/Supervisor-School of Medical Sciences, KNUST, Kumasi).

Martin Nyaaba Adokiya (Resident: MPH-Population & Reproductive Health, KNUST, Kumasi).

	Identification		**Identification**
Cluster number		Community Name	
Household number		Name of Interviewer……..	
Record number		Name of supervisor	
Data entered by:			Date:…/……/……/……/ Day/month/year/

Questionnaire

ALL QUESTIONS ARE TO BE ADDRESSED TO MOTHERS/CAREGIVERS WITH A CHILD 06-23 MONTHS OF AGE

Module A: Socio-Demographic Characteristics

Q01. Respondent ID	**Q02.** Age of respondent	**Q03.** Marital status of respondent
		Never married/single……1 Married……..2 Divorced, Separated, or Widowed……3 Others (specify)…….9

Q04. What religion does respondent practice?		**Q05.** What is ethnicity of respondent?	
Christianity……1	Islam……..2	Kasem……..1	Nankam……2
Traditionalist…….3	Other (specify)……..9	Builsa……3	Mamprusi……..….4
None……..5	Don't know……..8	Frafra……5	Other (Specify)……9
		Don't Know……8	

Q06. Has respondent ever attended school?	Yes……1 No…….2 Don't know…..8 **If No, skip to Q08**
Q07. What is the highest level of education attained?	Primary……..1 JSS/Middle……..2 SSS/O Level/Post Secondary…..3 Tertiary……4 School for life……..5 Other (specify)……9 Don't know……..8

Q08. What is the occupation of mother/caregiver?	Salary worker……..1 Pitobrewing…….2 Sheabutter extraction…..…3 Malt/rice processing……4 Farming/By-day..…….....5 Pottery/craft working……6 Petty Trading…….7 Others (specify)……..……9

Q09. What is the age of Index child?	DD/MM/YY…/……/……/……../ Age in months…/……/…….

Q10. What is the Sex of the (Index) child?	Male……..1 Female…….2

Q11. What is the age of the child before the youngest (Index) child?	Date of birth../……/……./…./ Age in Months../……./

Q12. How many children (those in Navrongo and outside Navrongo or any other places or boys and girls) do you have?	Total number of children……/……../

Continued Breastfeeding

Q13. Did you ever breastfeed (NAME) index?	Yes….1 No……2 Don't know……..8 **If No, skip to Q20**

Q14. Did you exclusively breastfeed (Name) during the first 6 months of life?	Yes…..1 No…2 Don't Know….8

Q15. If **NO**, when was (NAME) given foods/liquids?	<a week after birth……..1 < a month after birth…….2 < 2 months after birth……3 within 2-5 months after birth……4 Don't Know……8

Q16. Are you still breastfeeding (Name)?	Yes……1 No……..2 **If Yes, Skip to Q18**

Q17. If NO, how many months did you breastfeed (NAME)?	/……/ Don't know…….8
Q18. If YES, How many times did you breastfeed last night between sunset and sunrise?	/…../ Don't know…….8 On Demand….1
Q19. How many times did you breastfeed yesterday during the day light hours?	/…../ Don't know……8 On Demand….1

Q20. How old was (Name) when you introduced foods/complementary foods to him/her?	< 2 months……..1 3-5 months……..2 On 6th month……...3 Soon after 6 months..…..4 after 7 months…….5 Don't know…….8 Others (specify)…….9

Q21. In your own opinion when should complementary feeding be introduced?	< 6 months……1 On 6th month……2 Soon after 6th month…….3 Any time……4 ≥ 7 months……5 Don't know……...……8 Others (specify)…….……9

Energy Intake and Feeding Frequency

Q22. How many times did (name) eat solid foods, ***other than porridge*** yesterday, during the day or at night?"	/……./

Q23. How many times did (name) eat semi-solid foods***, other than porridge*** yesterday, during the day or at night?"	/……./

Q24. Did (name) eat porridge yesterday during the day or at night?"	**Yes…….1 No…..2 Don't Know…..8** **If No, Skip to Q27**

Q25. If yes, "What was the consistency (very thin like tea, cream)?"	Thick with paste/sheabutter…….1 Very thin…….2 Thick without paste/sheabutter…....3 TZ Porridge……..…4

Q26. How many times did (name) eat the porridge (yesterday)?"	**< 3 times……1 4-6 times……2** **7 or more times…….3**

Now I would like to ask you about the types of liquids (NAME) drank yesterday during the day and at night.

Q27. Did (NAME) drink any of the following liquids yesterday during the day or at night?

READ THE LIST OF LIQUIDS (A THROUGH J, STARTING WITH "BREASTMILK"). PLACE A CHECK MARK IN THE BOX IF CHILD DRANK LIQUID IN QUESTION

A). Breast milk?	**Yes.....1 No.....2 Dont know.....8**
B). Plain water?	**Yes.....1 No.....2 Dont know.....8**
C). Commercially produced infant formula eg lactogen?	**Yes.....1 No.....2 Dont know.....8**
D). Any fortified, commercially available infant and young child food" [e.g. Cerelac]?	**Yes.....1 No.....2 Dont know.....8**
E). Any (other) porridge e.g flour ?	**Yes.....1 No.....2 Dont know.....8**
F). Any other milk such as tinned, powdered, or fresh animal milk?	**Yes.....1 No.....2 Dont know.....8**
G). Fruit juice?	**Yes.....1 No.....2 Dont know.....8**
H). Coffee or tea?	**Yes.....1 No.....2 Dont know.....8**
I). Any other liquids such as sugar water, carbonated drinks?	**Yes.....1 No.....2 Dont know.....8**
J). Liquid or semi-liquid traditional medicine (herbs)?	**Yes.....1 No.....2 Dont know.....8**
Q28. Did (NAME) drink anything from a bottle with a nipple yesterday or last night?	Yes.....1 No.....2 Dont know.....8

Q29. Did (NAME) eat any of the following foods yesterday during the day or at night? ***(24 Hour recall)***	
READ THE LIST OF FOODS. Circle the appropriate answer	
A). Any foods made from grain (for example, made with millet, sorghum, maize, rice, wheat, or other local grains, porridge, bread)?	**Yes.....1 No.....2 Dont know.....8**
B). Carrots, or yellow sweet potatoes?	**Yes.....1 No.....2 Dont know.....8**
C). Any other food made from roots or tubers (for example, white potatoes, yams, cassava, or other local roots/tubers)?	**Yes.....1 No.....2 Dont know.....8**
D). Any dark green leafy vegetables (for example, cassava leaves, bean leaves, or other dark green leaves eg kenaf etc)?	**Yes.....1 No.....2 Dont know.....8**
E). Ripe mango, ***ripe*** pawpaw (or other local vitamin A-rich fruits)?	**Yes.....1 No.....2 Dont know.....8**
F). Any other fruits and vegetables (for example, bananas, avocadoes, tomatoes, onions, apples, oranges, others)?	**Yes.....1 No.....2 Dont know.....8**
G). Any beef, pork, lamb, goat, rabbit (or wild game meat)?	**Yes.....1 No.....2 Dont know.....8**
H). Any chicken, duck, or other birds?	**Yes.....1 No.....2 Dont know.....8**
I). Any fresh or dried fish?	**Yes.....1 No.....2 Dont know.....8**
J). Any eggs?	**Yes.....1 No.....2 Dont know.....8**
K). Any foods made from beans (for example, made with cowpeas, soybeans or others)?	**Yes.....1 No.....2 Dont know.....8**
L). Any groundnuts/peanuts, or any other nuts?	**Yes.....1 No.....2 Dont know.....8**
M). Any cheese or yogurt?	**Yes.....1 No.....2 Dont know.....8**
N). Any food made with oil, fat, or butter?	**Yes.....1 No.....2 Dont know.....8**
O). Organ meats (for example, liver, kidney, others)	**Yes.....1 No.....2 Dont know.....8**
P). Insects, other small protein food	**Yes.....1 No.....2 Dont know.....8**
Q). Foods made with red palm oil, palm nut, palm nut pulp sauce	**Yes.....1 No.....2 Dont know.....8**

Safe Preparation and Storage of Complementary Foods

Q30. What is the main source of drinking water for members of your household, during the dry and the rainy season?	
RAINY	**DRY**
Piped water……..1	Piped water……..1
Borehole……..2	Borehole……..2
Deep tube well with hand pump……..……3	Deep tube well with hand pump……..……3
Shallow well with hand pump……..……....4	Shallow well with hand pump……..……....4
Open well without cement cover (ring well)…...5	Open well without cement cover (ring well)…...5
Spring/river/stream……..6	Spring/river/stream……..6
Pond/lake/dam……7	Pond/lake/dam……7
Other (specify)……9	Other (specify)……..……9

Q31. Do you treat your water in any way to make it safe for drinking?
Yes……1 No……2 Don't know……8 **If No, skip to Q33**

Q32. If yes, what do you usually do to the water to make it safer to drink?

Let it stand and settle/sedimentation….....1 Strain it through cloth……..……2

Boil……..…3	Add bleach/Chlorine……..4
Water filter (Ceramic, sand, composite)…….5	Solar Disinfection……..….6
Other (specify)….....9	Don't Know……..……..8

Q33. How/where do you store food for (NAME)?	Baby Bowl…..1 Food Flask…..2 Pot……..3 Fridge…….4 Others (Specify)……..9

Now I would like to ask you about hygienic practices on child feeding, **Q34.** Under what circumstances do you usually wash your hands?	Before food preparation……..…1 Before eating…….……..2 Before feeding children……...3 After defecation……...4 After cleaning babies……..…..…5 After returning from outside….6 After handling garbage……..…..7 Other (specify)……...….9

Q35. Did you use soap of any kind for any reason yesterday during the day/night?	Yes….1 No….2

Care during Feeding

Q36. Who is the primary feeder of (name) when you (the mother) are not present?"	Grandmother……1 House help..…...…2 Older children……..3 Other relatives…….4 Others (Specify)……9

Q37. Who does (NAME) eat with in the family or at home?	Baby and mother……1 Baby and other children……2 Baby alone……3 Baby and other relatives……..4 Others (Specify)……9

Q38. Is (NAME) fed from a separate bowl?	Yes…….1 No……..2

Q39. (Name) during and after illness, was he/she offered less than usual to drink/eat, about the same amount, or more than usual to drink?	Less…..1 Same……2 More….3 Nothing to drink…..4 Don't know……..8

Module G: Anthropometric Assessment

Mother

Q40. Weight of mother in kilograms……. ☐☐ . ☐

Q41. Height of mother in centimeters…… ☐☐☐ . ☐

Q42. Physiological status of mother:

Pregnant…….1 Lactating……2 Pregnant/Lactating…….3 Don't know……8

Child

Date of interview: Day month year

Q43. Date of birth……./……/……./……/

☐☐

Q44. Age of child in months……

Q45. Weight of child in kilograms…..☐☐.☐

Q46. Length (Lying) of child in centimeters……☐☐.☐

*Weight-for-Age……..……...

*Weight-for-Height (Length)…….

*Height (Length)-for-Age…….

Thank you for your time and answers.

Appendix II

List of Communities/Villages

Central Zone: APABIA/BAWIABIA

Central Zone: KASAJAN/JANANIA

Central Zone: KAZINA-LINE/NAMOLO

Central Zone: NOGSINIA

Central Zone: SABORO LOW C/ICOUR

East Zone: GUMONGO

East Zone: GUMONGO/NATUGNIA

East Zone: KANSAA ACHULIGOBISI

East Zone: SABISI/ANYOGSI

East Zone: TARIBISI

North Zone: BAVUGNIA/WUSUNGU

North Zone: BUGANI

North Zone: NAVIO

North Zone: TEKURU

North Zone: TELANIA

South Zone: AZAASI

South Zone: BUNGUM/KANSAA

South Zone: KARANIA/BADANIA

South Zone: LONGO

South Zone: OSAAGO

Appendix III

Sample size determination or selection:

The sample size is computed using the formula: $\mathbf{n= t^{2*} p*(100-p)/d^2}$

$\mathbf{n= (1.96^2*p\ (100-p))/5^2}$, where

n= sample size,

t= parameter related to the error risk **(1.96)**

p= expected prevalence of malnutrition in percentage in the population (district)

100-p= expected percentage of children not presenting malnutrition in the population (district)

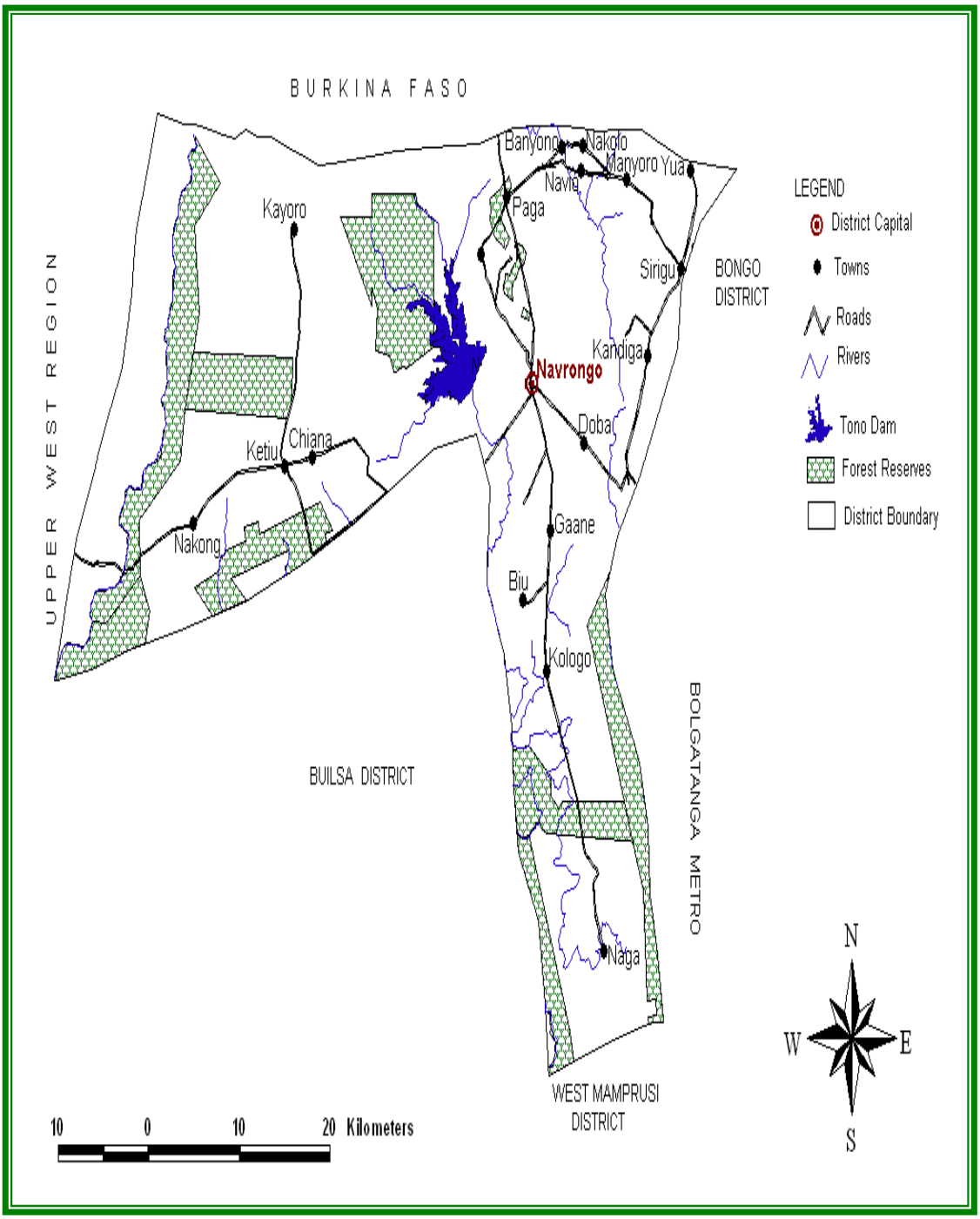
d=absolute precision, expressed as a percentage **(5%)**

Appendix IV List of Maps

Africa Map

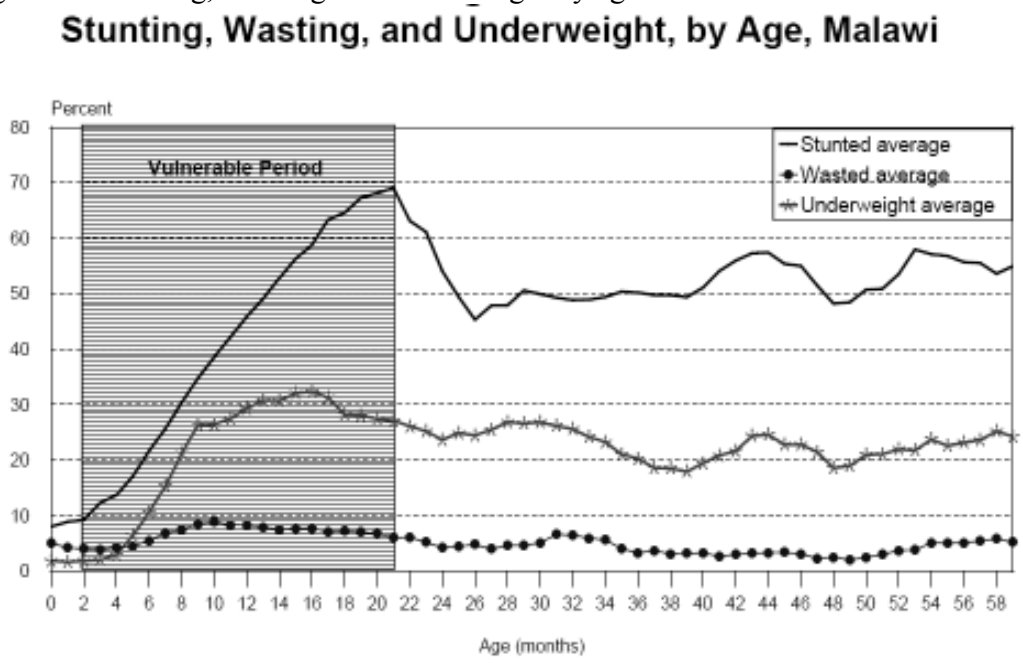
Ghana Map

Kassena-Nankana District Map (Navrongo)

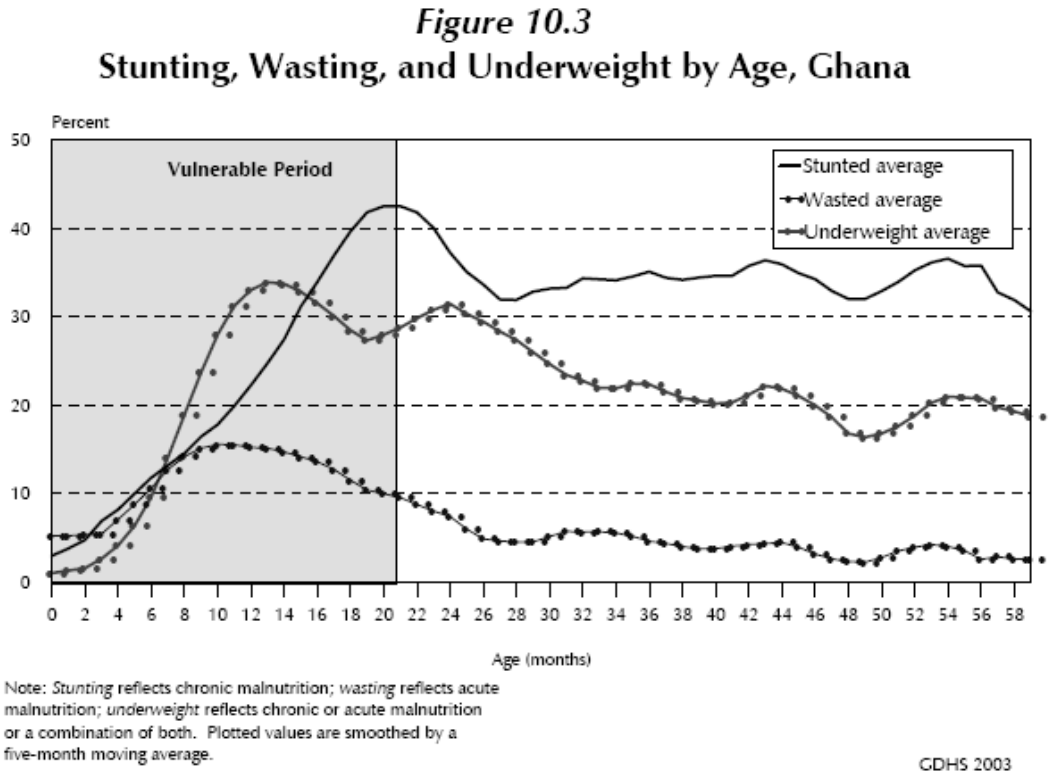


Appendix V

Figure 2.1 Stunting, Wasting and Underweight by age of children in Malawi



Source: MDHS, 2004



Appendix VI

Defining Indices and Indicators

• **Stunting.** The anthropometric index height-for-age reflects linear growth achieved pre- and postnatally with its deficits indicating long-term, cumulative effects of inadequate nutrition and/or health. Shortness in height refers to low height-for-age that may reflect either normal or variation in growth or a deficit in growth. Stunting refers to shortness that is a deficit or linear growth that has failed to reach genetic potential as a result of poor diet and disease. Stunting is defined as low height-for-age at < - 2 standard deviations (SD) of the median value of the National Center for Health Statistics/World Health Organization (NCHS/WHO) international growth reference.[2] Severe stunting is defined as < -3 SD.

• **Underweight.** The anthropometric index weight-for-age represents body mass relative to age. Weight-for-age is influenced by the height and weight of a child and is thus a composite of stunting and wasting, making interpretation of this indicator difficult. In the absence of wasting, both weight-for-age and height-for-age reflect the long-term nutrition and health experience of the individual or population. Underweight refers to a deficit and is defined as low weight-for-age at < -2 SD of the median value of the NCHS/WHO international reference.[2]

• **Wasting** describes a recent and severe process that has produced a substantial weight loss, usually as a consequence of acute shortage of food and/or severe disease. Chronic dietary deficit or disease can also lead to wasting. The anthropometric index weight-for-height reflects body weight relative to height. Wasting refers to low weight-for-height at < -2 SD of the median value of the NCHS/WHO international weight-for-height reference. Severe wasting is defined as < - 3 SD. The statistically expected prevalence of wasting (as with underweight and stunting) is between 2 and 3%, given the normal distribution of wasting rates. This indicator is used extensively in emergency settings (SCN; 2000).