UNIVERSITY FOR DEVELOPMENT STUDIES, TAMALE

COMMUNITY-BASED ASSESSMENT OF NUTRITIONAL STATUS OF 24 TO 59 MONTHS CHILDREN IN SAGNARIGU DISTRICT

BY

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DECLARATION

Student

I hereby declare that this thesis is the result of my own original work and that no part of it has been presented for another degree in this university or elsewhere:

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ABSTRACT

Child malnutrition continues to be a major public health concern in Ghana. Nutritional status is primarily measured by a child's growth in height and weight and is directly influenced by food intake and the occurrence of infections. The aim of this study was to assess the nutritional status of preschool children in the Sagnarigu district. A cross sectional analytical study was conducted in 28 communities of the Sagnarigu District involving 280 preschool children and their mothers/caregivers. Cluster sampling procedure was used in the selection of the communities, each community represented a cluster whiles systematic sampling was used in selecting the households of the respondents. Both qualitative and quantitative methods were used in the data collection. Breastfeeding practices were assessed using a questionnaire whilst nutritional status was assessed using anthropometric measurements of the children (weight, height and Mid-upper arm circumference). Dietary diversity scores (DDS) were also calculated for the children. Results showed that 72.8% of the mothers initiated breastfeeding within the first hour after delivery. Prelacteal feeding was practiced by 29.6% of the mothers whilst 63.9% fed their children with the first yellowish milk (colostrum) after delivery. The lowest consumed food group was eggs with a consumption score of 9.3%. The incidence of diarrhoea in the two weeks prior to the study was 27.9% whilst prevalence of fever was 16.8%. An Analysis of Variance (ANOVA) showed that children of younger mothers/caregivers had the least DDS because teenage mothers had a DDS of 5.88±1.34 whilst those within 40-49 years had the highest DDS of 7.98 ± 1.50. As age of mother increased, the DDS also increased ($P<0.003$, $\chi 2= 8.24$). The factors that influenced dietary diversity of the households were, wealth index or Socio Economic Status (AOR = 0.8, CI: 0.7 to 0.9),

educational level of mothers/caregivers (AOR = 14.08, CI: 12.42 - 14.09). The level of child underweight in the study was 11.1%, wasting 5.0% and stunting 12.3%.

The study found that 11.1% of children from households with high wealth index were underweight, whilst 25.7% of children from households with low wealth index were underweight. The results also showed that 12% of the children from households with high index were stunted as compared to the 20.0% of stunted children from households with low wealth index. Wasting was very low (5.0%) among children from households with high wealth index as compared to 20.0% of wasted children from households with lower wealth index. It is recommended that more education should be done by the Ghana Health Service to increase the knowledge of mother/ caregivers on dietary diversity. Also good Infant and Young Child Feeding Practices, the use of locally produced foods and empowering households to increase their household income which will improve their dietary diversity.

DEDICATION

I dedicate this work to almighty Allah for all that he has done for me, the entire Zakariah family, my lovely boys and their mother.

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AIDS	Acquire Immune Deficiency Syndrome
ANC	Antenatal Care
DHD	District Health Directorate
GDHS	Ghana Demographic and Health Survey
GSS	Ghana Statistical Service
HIV	Human Immune Virus
IPT	Intermittent Preventive Treatment
ITN	Insecticide Treated Net
LBW	Low Birth Weight
MDGs	Millennium Development Goals
MICS	Multiple Indicator cluster Survey
MUAC	Mid-upper arm circumference
NMCSP	Nutrition and Malaria Control for Child Survival Project
SPSS	Statistical Package for Social Sciences
STI	Sexually Transmitted Infection
WAZ	Weight-for-Height Z-score

HAZ	Height-for-age Z-score
WHZ	Weight-for-age Z score
WHO	World Health Organization

CHAPTER ONE

INTRODUCTION OF THE STUDY

1.1 Background of the Study

Assessment of the nutritional status of children 5 years old and younger has been used as a proxy for the nutritional well-being of an entire population because this age group suffers the effects of malnutrition more severely (WHO, 1995). While the prevalence of malnutrition in the under 24 to 59 months age group is important, in 2002 the UN's Standing Committee on Nutrition (SCN) began to promote research and interventions on malnutrition in school-age children, because of this age groups potential to experience "catch up" growth; for example, school-age children who were underweight early in life can grow to have a normal weight for age if their nutritional environment improves (Burns *et al.*, 2005).

Children's well-being encompasses countless components of quality of life, incorporating such factors as political rights, economic position, opportunities, and peer relations (Ben-Arieh and Frønes, 2005; 2007). It is best conceptualized as a holistic and integrated state with four key domains physical, economic, socio-emotional, and cognitive (Zaff *et al.*, 2003). Physical well-being including safety and security, nutrition, and health care fundamentally reflects children's life circumstances. Physical well-being is crucial at any age but especially during the first five years of life, when children experience rapid growth and development while adjusting to their biophysical and social environments. Physical well-being during this stage of life has a lasting impact on subsequent development.

According to the WHO, in 2011 over 101 million children under the age of 5 were underweight (low weight for age), 165 million were stunted (low height for age), and approximately 52 million were wasted (low weight for height) (WHO, 2012). Consequently, estimates of the prevalence of malnutrition among school-aged children suggest that these indicators do not improve much with age. In 2010, according to the Growth and Assessment Surveillance Unit of the WHO, the global prevalence rate of malnutrition among preschool children as indicated by the prevalence of stunting, was approximately 28% (171 million children), with Eastern Africa suffering a higher rate of 45%.

A study by UNICEF (2013) among 24 to 59 months children from developing countries found the overall prevalence of stunting to range between 48-52% with an overall prevalence of underweight between 34-62%; the SCN notes that among preschool children stunting and underweight are more prevalent than wasting.

Child malnutrition continues to be a major public health problem in Ghana. Nutritional status is primarily measured by a child's growth in height and weight and is directly influenced by food intake and the occurrence of infections. Chronic (stunting) and acute (wasting) malnutrition and general health and nutritional status (underweight) are assessed at the population level through the Demographic and Health Surveys.

African children generally face higher health risks and are subjected to plights more severe than children elsewhere, due to a combination of poverty, infectious diseases, and detrimental political economic realities at multiple scales. Kempe (2005) asserts that Africa is the only continent where the number and proportion of children at risk of poverty, sexual and labour exploitation, malnutrition, infectious disease, orphan hood, and mortality have been increasing

over the past several decades. Sub-Saharan Africa has the world's highest child and adult mortality rates (WHO, 2006). Many national governments in Africa lack sufficient financial resources to achieve children's rights as stipulated by the United Nations convention on the Rights of Children (UNCRC) and to achieve the U.N. Millennium Development Goals. Sadly, many apparently lack the political will to implement the measures that are financially feasible.

Excessive dependence on street foods probably contributes to child malnutrition and morbidity in Ghana. These foods are an important component of the diet in many low-income households (Maxwell et al., 2000). While the safety of street foods has received attention (Bhat and Waghray 2000; Garin *et al*., 2002; King *et al*., 2000), less is known about the choice and nutritional quality of street foods purchased for children. Mensah *et al*., (2002) report that both the type of food and serving method affect the microbial quality of food purchased, with the least contaminated being *koko,* the nutrient poor porridge that is a common weaning food (Colecraft *et al.,* 2004).

Of the three anthropometric indicators of malnutrition (stunting, wasting and underweight), stunting is the most prevalent among children aged 0-4 years in Ghana. About 28% are stunted (height-for-age below 2 SD) compared to 9% wasted (weight-for-height below 2 SD) and 14% underweight (low weight-for-age) (GDHS, 2008). Stunting is higher among rural (32%) than urban children (21%), and children of the poor in both rural and urban areas are worse off relative to the national average (GSS *et al*., 2009). UNICEF (2006) classifies Ghana in the medium-to-high range of severity of malnutrition. The Northern region has one of the highest number of cases of malnutrition among children with 32% of the children being stunted (GDHS, 2008). Malnutrition is said to vary among children in rural and urban areas and also influenced by the educational level of mothers. The northern region has a higher proportion of people

without formal education especially women which is translated into the high endemicity of poverty among mothers with little or no formal education. This inevitably affects the nutritional status of their children. This study focused on assessing the nutritional status of 24 to 59 months children (2-5 years) in the Sagnarigu District of Northern region of Ghana.

1.2 Problem Statement

Malnutrition among children affects them throughout life and weakens their immune system. It also reduces their cognitive abilities. The northern region has the highest malnutrition indices, the region has 37% children 24 months to 59 months stunted, 13% wasted and 19% underweight.

A report by the Sagnarigu District Health Directorate in 2013 indicated that 24% of children who reported in the Child Welfare Clinics were malnourished, underweight was 11%.The district did not have any documented figures on stunting and wasting. This study therefore assessed the nutritional status 24 to 59 months children in the Sagnarigu district in relation to infant and young child feeding practices among mothers, also measured the dietary diversity score among 24 months to 59 months children. Estimate the prevalence of stunting, wasting and underweight and identify factors that influence the nutritional status of 24 months to 59 months children in Sagnarigu district, hence this study.

1.4 Research Questions

1. What are the infant and young child feeding practices among mothers?
2. What are the dietary diversity scores among 24 to 59 months children?
3. What is the prevalence of the three indicators of malnutrition among 24 to 59 months children?
4. What factors influence the nutritional status of 24 to 59 months children?

1.4.1 General Objective

The main or general objective of the study was to assess the nutritional status of pre-school children in the Sagnarigu District

1.4.2 Specific Objectives

The study specifically sought;

1. To assess the infant and young child feeding practices among the mothers of 24 to 59 months children.
2. To determine the dietary diversity score among 24 to 59 months children.
3. To determine the prevalence of stunting, wasting and underweight among 24 to 59 months children.
4. To determine the factors that influences the nutritional status of 24 to 59 months children.

1.5 Significance of the Study

One of the proxies used in measuring the level of development of a nation is health status of women and children. Several studies have been conducted nationally to assess the nutritional status of children 24 to 59 months; however, no specific study has been conducted in the Sagnarigu District to assess the nutritional status of children. Since maternal and child health is one of the Millennium Development Goals, it is therefore important for a study like this to be conducted to serve as a baseline information for interventions and future research works. The findings of this study will help Non-governmental Organizations and the Ghana Health Service in their interventions towards improvement of child health in the Sagnarigu District.

1.6 Conceptual Framework of the Study

A generalized understanding of how the nutritional status of children is related directly to dietary intake and health status of the individual child is presented by the United Nations Children's Fund malnutrition framework shown in figure 1.1(Benson and Shekar, 2006; Reinhard and Wijayaratne, 2002). This was adopted in conducting this study. The concepts espoused by the framework were explored by this study.

From the framework, it is noted that diet and health status are shaped not only by the food security of the household in which a child resides, but also by the environment, the utilization of health services, and the quality of care the child receives. While none of these elements is sufficient in itself, all are necessary for satisfactory nutritional status. A generalized understanding of how the nutritional status of children is related directly to dietary intake and health status of the individual child is presented by the United Nations Children's Fund

malnutrition framework shown in figure 1.1 (Benson and Shekar, 2006; Reinhard and Wijayaratne, 2002). These are partially shaped by the food security of the household in which a child resides, the availability of health services, a healthy environment and the quality of care the child receives. The extent to which these determinants result in the desired outcome further depends on the availability and distribution of resources. In addition to food, these resources include the physical and economic access that a child or his or her caregiver has to that food, the caregiver's knowledge of how to use available food to properly care for the child, the caregiver's own health status, and the control the caregiver has over other resources within the household (Benson and Shekar, 2006). Furthermore, children's health status is affected by the availability and quality of such resources as shelter, sanitation, water supply, health education, and preventive and curative health services.

When the distribution of resources within society is central to explaining why some are undernourished and others are not, consideration moves from the realm of the individual and household to the larger political context (Rogers and Leavitt, 2003). In this realm, the UNICEF framework links the availability of resources to a set of basic determinants, which are a function of how society is organized in regard to economic structure, political and ideological expectations, and institutions through which activities are regulated and potential resources are converted into actual resources. Consequently, this conceptual framework, among other things, identifies child well-being as a subject for political debate and an issue of immediate concern to any national development strategy. There are multiple causes of malnutrition. It is not a simple problem with a single, simple solution. Multiple and interrelated determinants are involved in

why it develops, and a similarly intricate series of approaches, multifaceted and multisectoral are needed to deal with malnutrition.

Conceptual framework

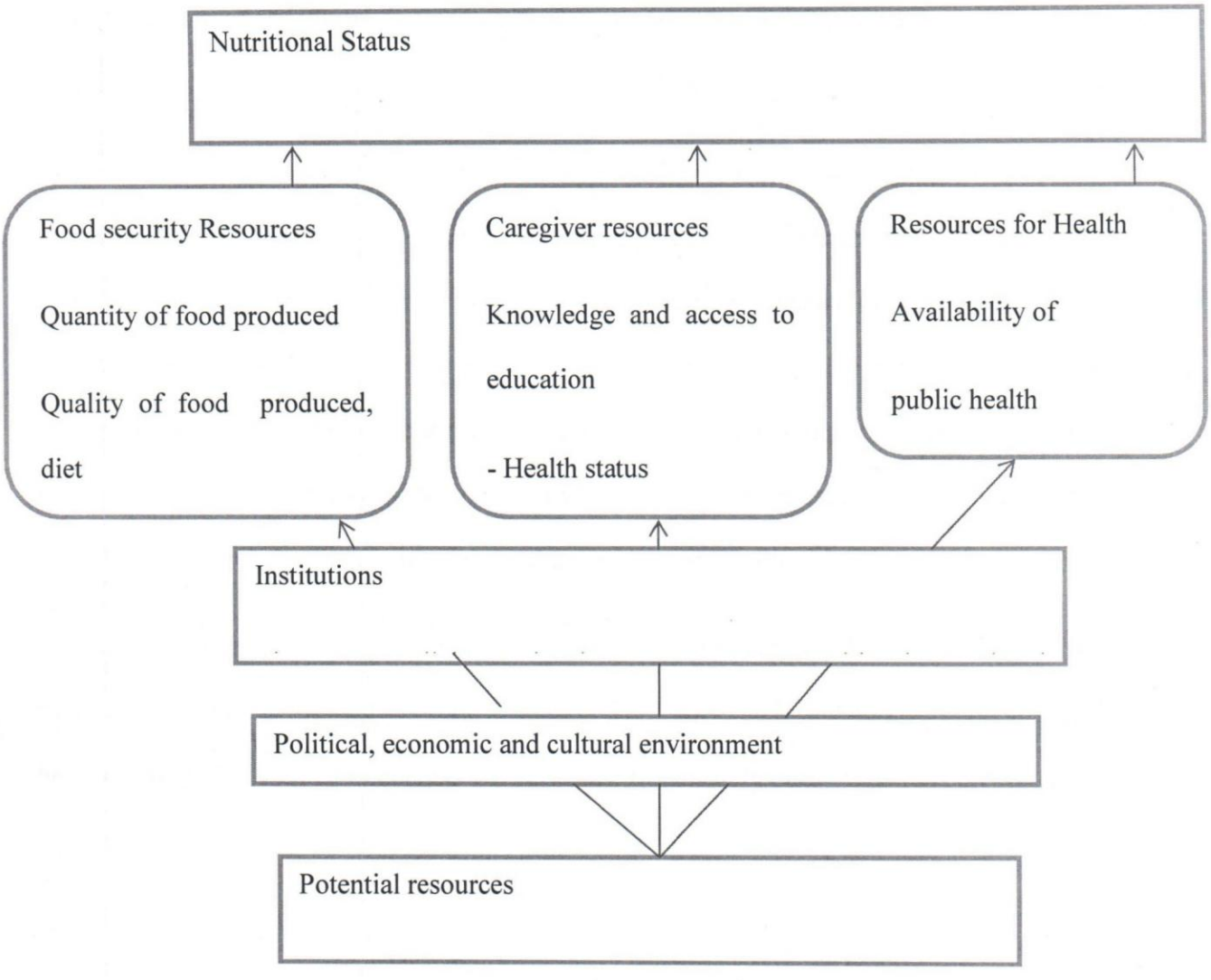


Figure 1.1The conceptual framework of the determinants of nutritional status

Source: Adopted and modified from UNICEF,2013

1.7 Organization of the Thesis

This thesis has been organized into six chapters. Chapter one includes the introduction to the study, background to the study, the problem statement, the study objectives, research questions, the significance of the study, conceptual framework and the operational definition of terms of the study.

The second chapter reviewed relevant literature in relation to the study. Literature was reviewed on malnutrition among children in Ghana, nutritional status and anthropometric measurements, dietary diversity and factors that influence dietary diversity. Chapter three is made of the methodology, which comprises the study design, study type, study variables (independent and dependent variables), data collection instruments, sampling procedure and sample size, study population, data collection methods, determination of educational level, quality control measures, anthropometric measurements and ethical considerations.

The fourth chapter contains the results and findings of the study whilst the discussion of the results and findings of the study is done in chapter five. The conclusion and recommendations of the study are also presented in chapter six. A sample of the study questionnaire is presented as an appendix.

CHAPTER TWO

LITERATURE REVIEW

2.0 Introduction

This chapter contains a review of relevant literature in relation to the study. The literature review was done in direct relation with study objectives and variables. The literature review was done in the following areas; an overview of malnutrition, under nutrition, nutritional status of children, dietary diversity and factors that influence dietary diversification.

2.1 An Overview of Child Nutrition in the World

In 2009, 8.1 million children under age five died, with most deaths concentrated in low-income countries (WHO, 2011). Nearly two-thirds of these deaths were caused by preventable infectious diseases (WHO, 2011). An underlying cause of just over half of 24 to 59 months deaths is under-nutrition (UNICEF, 2008).

The United Nations (2005) Millennium Development Goals (MDG), adopted in 2000, proposed to halve the proportion of people living in extreme poverty between 1990 and 2015 and to insure that all children can complete a full course of primary education by 2015. Yet another goal was to reduce the prevalence of underweight among children 24 to 59 months. As of 2006, East Asia/Pacific and South Asia experienced the greatest declines in underweight. The Middle East/North Africa and Sub-Saharan Africa exhibited the smallest declines. Nearly three-quarters of the 62 countries that made little or no progress in child survival between 1990 and 2006 are in Africa (UNICEF 2008). Among other factors, armed conflicts and natural disasters have

impeded progress Child Well-being in Africa UNICEF (2008) estimates that nearly one third of children 24 to 59 months in Sub-Saharan Africa are underweight. In thirteen Sub-Saharan countries, underweight prevalence rates are expected to *increase* by 2015 (Chhabra and Rokx, 2004). Eastern and Southern Africa have shown no improvement in underweight in children 24 to 59 months since 1990 due to a combination of declines in agricultural productivity, recurring food crises associated with drought and conflict, increased poverty, and HIV/AIDS and malaria. In five countries elsewhere in Africa (Sierra Leone, Niger, Central African Republic, Burkina Faso, and Cameroon), prevalence of underweight has not improved or has worsened (WFP and UNICEF, 2006). The high levels of child malnutrition in Sub-Saharan Africa reflect the region's struggling economies and high fertility. Meagre resources are spread among many family members, often unevenly, in a way that increases the risk of malnutrition for the most vulnerable children (UNICEF, 2006). Furthermore, public health services are generally inadequate, and caregivers are often unable to insure that children have access to effective health services as well as food (Benson and Shekar, 2006).

Only six countries in Sub-Saharan Africa (Botswana, Congo, Ghana, Guinea Bissau, Malawi, and Mauritania and Sao Tome and Principe) are expected to meet the MDG target of halving the proportion of people who suffer from hunger by 2015. These countries have increased budgetary allocations to health and education. They have increased immunization coverage and achieved nearly universal primary school enrolment (ACPF, 2008). They have demonstrated that widespread adoption of such basic health interventions as early and exclusive breastfeeding and vitamin A supplementation.

Adequate nutrition during early childhood is fundamental to the development of each child's potential. It is established that the period from birth to two years of age is a "critical window" for the promotion of optimal growth, health and overall survival of children (Ali *et al.*, 2006). Nutrition plays a major role in maintaining health, and malnutrition appears to generate vulnerability to a wide variety of diseases such as malaria and general ill health (Semba and Bloem, 2000). Malnutrition is particularly prevalent in developing countries, where it affects one out of every three 24 to 59 months children (UN SCN, 2004).

Nutritional status spread from severe under nutrition such as underweight, stunting and wasting to over-nutrition and obesity (Otoo, 2008). It is however known that, Ghana and other developing countries are faced with the burden of under nutrition.

Under nutrition continues to be a public health crisis that kills millions of children each year. In addition to this tragic loss of life, in countries where there are great numbers of undernourished, the costs to society are high. Undernourishment under the age of two results in life-long consequences, including increased risk of death, disease, and poor cognitive development; lower school performance; reduced productivity; and increased risk of chronic disease later in life (Allen, 2001; Barker, 1998). The effects of malnutrition on human performance, health and survival have been the subject of extensive research for several decades and studies show that malnutrition affects physical growth, morbidity, mortality, cognitive development, reproduction, and physical work capacity (Pelletier *et al.*, 2008, FANTA, 2002).

WHO (2010) stated that children 24 to 59 months, together with pregnant women, have been identified as the most vulnerable risk group for malaria and malnutrition, with 88% of all deaths in sub-Saharan Africa attributed to malnutrition and malaria occurring in children 24 to 59

months. Children who are underweight are thought to have increased susceptibility to diseases for a variety of reasons, most notably through a reduction in the function of the immune system. When a child is undernourished, he or she may be unable to mount an appropriate immune response to the malaria parasite due to reduction in T lymphocytes, impairment of antibody formation, decreased complement formation, and atrophy of thymus and other lymphoid tissues, among others (Scrimshaw and SanGiovanni, 1997). Moreover, malnutrition may be even more important risk factor for anaemia than malaria itself. In contrast, some studies have indicated that malaria control alone effectively reduces the prevalence of childhood anaemia.

Malnutrition is a widespread concern in developing countries affecting more than 200 million children (UNICEF, 1998). It is as a result of both inadequate food intake and illness. Inadequate food intake is a consequence of insufficient food availability at the household level, improper feeding practices, or both (ANCB, 2005).When severe, immunity is impaired, wound healing is delayed and operative morbidity and mortality increased. Malnutrition worsens the outcome of illness, example; malnourished children are susceptible to diseases and more apathetic. These behavioural abnormalities are rapidly reversed with proper feeding, but prolonged and profound malnutrition probably does cause some permanent delay in intellectual development (Clayden and Lissaurer, 2005).

It is also an established fact that after a child reaches 2 years of age, it is very difficult to reverse stunting (one of the indicators of malnutrition) that has occurred earlier in life (Martorell *et al.*, 1994). UNICEF (2013) stated that poor nutrition in the first 1,000 days of children's lives can have irreversible consequences and for millions of children, it means they are, forever, stunted. As a result of these, the cornerstone for child survival, health and development for current and

succeeding generations is good nutrition. Well-nourished children are known to perform better in school, grow into healthy adults and in turn give their children a better start in life (UNICEF, 2006).

In spite of all the known benefits associated with good nutrition, as many as 800 million persons worldwide are affected by malnutrition and more than half of the childhood deaths in developing countries are related to malnutrition (Benson *et al.*, 2004).

Therefore one of the key measures in a strive to combat malnutrition is to provide sustainable diets rich in micronutrients and minerals although the causes of childhood malnutrition are multi-faceted (Victora *et al.*, 2008).

2.2 Under nutrition

Under nutrition occurs when the levels of micronutrients such as iron, vitamin A, iodine and zinc are inadequate (James *et al.*, 2000). Nutrient deficiencies affect physiologic systems broadly leading to potentially severe developmental consequences (e.g. impaired cognition, stunted growth, reproductive problems, reduced immune function, physical deformities, blindness, etc.) and increased morbidity and mortality (Bhan *et al.*, 2001; PAHO, 2003).

The causes of under nutrition are many and complex and as such UNICEF in 1990 developed a conceptual framework that systematically elicits all the factors that contributes to malnutrition. UNICEF (2003) in their publication indicated poor breastfeeding and complementary feeding practices, coupled with high rates of infectious diseases, as the principal causes of under nutrition during the first two years of life.

Nutritional status is influenced by three broad factors: food, health and care. Optimal nutritional status results when children have access to affordable, diverse, nutrient-rich food; appropriate maternal and child-care practices; adequate health services; and a healthy environment including safe water, sanitation and good hygiene practices. These factors directly influence nutrient intake and the presence of disease. The interaction between under-nutrition and infection creates a potentially lethal cycle of worsening illness and deteriorating nutritional status (Andoh *et al.*, 2007).

Food, health and care are affected by social, economic and political factors. The combination and relative importance of these factors differ from country to country. Understanding the immediate and underlying causes of under-nutrition in a given context is critical to delivering appropriate, effective and sustainable solutions and adequately meeting the needs of the most vulnerable people (UNICEF, 2013).

Ferguson *et al.*, (1993) in their study on 'Seasonal food consumption patterns and dietary diversity of rural 24 to 59 months Ghanaian and Malawian children' revealed indicators of nutritional status as being suggestive that, diets of Ghanaian children are often inadequate. With cereals and root staples such as maize and cassava being the major sources of energy and of several micronutrients including iron and zinc. These core foods are bulky and tend to have low micronutrient density, or if the density is reasonable they contain other factors, which can inhibit nutrient absorption (Brown, 1991, Neumann *et al.*, 2002).

As a result, it is difficult for most Ghanaian children to consume the recommended levels of micronutrients essential for healthy growth and development. Colecraft *et al.*, (2006) indicated the low consumption of animal source foods as a further cause for concern for Ghanaian

children. Animal source foods are known to be energy-dense, provide high quality protein, and are rich in bioavailable micronutrients essential for healthy growth and development (Bender, 1992).Animal source foods are rarely included in the diets of young Ghanaian children, and when they are, it is often in very small quantities or may be preferentially allocated away from young children to older family members (Colecraft *et al.*, 2006). These among other factors account for the poor nutritional status of most Ghanaian children.

2.2.1 Stunting, Wasting and Underweight

Under-nutrition manifests itself in the form of stunting, wasting and underweight. Malnutrition in all forms has diverse consequences for individuals, families and communities. The immediate consequences of malnutrition in the early years of a child's development include significant morbidity, mortality, delayed mental and motor development (Agar, 2008).

Malnutrition is an underlying factor in many diseases in both children and adults, and it contributes greatly to the disability-adjusted life years worldwide (Murray, 1996). The long-term consequences include early impairments in intellectual performance; work capacity, reproductive outcomes and overall health during adolescence and adulthood, which can be traced back to early nutritional deficits. An example of long-term effects lies in the continuous cycle of malnutrition. Such that a girl who is malnourished stands the chances of giving birth to a malnourished or low birth weight infant later in her reproductive age (WHO, 2003). In addition, a child whose intellectual performance is impaired may face the challenge of poor academic performance, hence less opportunity to economic development and low socio- economic status which will also contribute to a low productivity to the country later in life.

Stunting reflects chronic under nutrition during the most critical periods of growth and development in early life. It is defined as the percentage of children aged 24 to 59 months whose height for age is below minus two standard deviations (moderate and severe stunting) and minus three standard deviations (severe stunting) from the median of the WHO Child Growth Standards. Globally, more than a quarter (26 percent) of children 24 to 59 months were stunted in 2011 that's roughly about 165 million children worldwide (UNICEF, 2013).

Stunting or low height for age is caused by long-term insufficient nutrient intake and frequent infections. This generally occurs before age two and its effects are largely irreversible. These effects include delayed motor development, impaired cognitive function and poor school performance. Nearly a third of children under five in the developing world are stunted yet there are certain countries where the prevalence exceeds this estimation (UNICEF, 2008). Examples of such countries are sub-Saharan Africa and South Asia where 40 percent of children 24 to 59 months are stunted; and 39 percent are stunted respectively (UNICEF, 2013).

According to the 2008 GDHS report, more than one-quarter (28%) of all children under 24 to 59 months are stunted that is, they are too short for their age. This implies that one in ten children are severely stunted in Ghana. Regionally, Eastern region recorded the highest rate of 38% for stunting whiles Greater Accra had the lowest rate of 14% of stunting. Brong Ahafo Region also has a stunting rate of 25% (GDHS, 2008). Stunting is a reflection of chronic malnutrition status in children. The consequences of stunting cannot be overlooked as it has both short and long-term consequences.

When a child is stunted, it means that essential physical and mental growth processes are being compromised. Further research have shown that if the root causes of stunting are not addressed

during the first two years of life, the impacts of the growth restriction prevail through adulthood (Victora *et al.*, 2010).

Stunting is associated with a weaker immune system and higher risk of severe infectious diseases for infants and young children (The Lancet, 2008).It is also estimated that children under the age of five who are born to the shortest mothers (less than 145 centimetres) have a 40 percent increased risk of mortality (Ozaltin *et al.*, 2010) and stunted women have higher maternal mortality rates and are more likely to have small and underweight babies leading to a cycle of poor nutrition and poverty later in life.

In addition to the above, stunted children are also more likely to start school later and drop out, and are as well less able to learn due to compromised brain and mental development at a young age (Martorell *et al.,* 2010; Kar et al, 2008).

Wasting reflects acute under nutrition. It is defined as the percentage of children aged 0 to 59 months whose weight for height is below minus two standard deviations (moderate and severe wasting) and minus three standard deviations (severe wasting) from the median of the WHO Child Growth Standards (UNICEF, 2013).

Wasting otherwise known as low weight for height is a strong predictor of mortality among children under five. It results from acute significant food shortage and or disease (UNICEF, 2007).

Globally in 2011, 52 million children under 5 years of age were moderately or severely wasted, and 11 percent decrease from the estimated figure of 58 million in 1990. More than 29 million children 24 to 59 months, an estimated 5 percent, suffered from severe wasting (UNICEF, 2012).

South Asia, is known to have the highest wasting prevalence where approximately one in six children (16 percent) is moderately or severely wasted. It was estimated in 2011 that nearly 1 in 10 children 24 to 59 months (9 percent) in sub-Saharan Africa were wasted a prevalence that has decreased about 10 percent since 1990. Other countries like South Sudan, India, Timor-Leste, Sudan, Bangladesh and Chad have a very high prevalence of wasting above 15 percent. Of the 10 countries with the highest wasting prevalence, 7 also have rates for severe wasting above 5 percent. It is also estimated worldwide that, of the 80 countries with available data, 23 have levels of wasting greater than 10 percent (UNICEF, 2013).

The 2008 GDHS revealed that 14% of children under age five in Ghana are underweight that is, they are too thin for their age and almost 1 in 10 children 24 to 59 months are wasted (99%). Even though the percentage of children underweight has decreased slightly over the past five years (from 18% to 14%), there is still a need for intervention in this area.

Underweight is a composite form of under nutrition that includes elements of stunting and wasting. It is defined as the percentage of children aged 24 to 59 months whose weight for age is below minus two standard deviations (moderate and severe underweight) and minus three standard deviations (severe underweight) from the median of the WHO Child Growth Standards (UNICEF, 2013)

Global estimates in 2011 indicated that 101 million children 24 to 59 months were underweight, that is, approximately 16 percent of children 24 to 59 months. Underweight prevalence is highest in South Asia, at a rate of 33 percent, which is about 59 million children, and sub-Saharan Africa, being the next with 30 million children at a rate of 21 percent.

Underweight prevalence in children 24 to 59 months is an indicator to measuring progress towards MDG 1, which aims to halve the proportion of people who suffer from hunger between 1990 and 2015. To this effect there have been a decline in underweight prevalence globally, from 25 percent in 1990 to 16 percent in 2013, indicating a 37 percent reduction.

Progress in other regions however, remained slow; in sub-Saharan Africa underweight prevalence dropped by 26 per cent.

As at 2011, 30 countries were on track to meet the MDG 1 target, 25 countries had made insufficient progress and 12 countries had made no progress (UNICEF, 2013).

Ghana has also made progress in decreasing underweight prevalence over the past five years for children 24 to 59 months although not too significant. There has been a decrease from 18% to 14% (GDHS, 2008).

In Ghana the most commonly reported anthropometric indicator in the health facilities is the weight for age or underweight for children under age five. It is common to find data on this than there is for stunting and wasting.

2.3 Factors that Influence Nutritional Status of Children

The concept "socioeconomic status" highlights the position of individuals, families, or other units on one or more dimensions of stratification (Fergusson *et al.*, 2008). Socioeconomic status has been measured in many ways, including educational and occupational attainment, exposure to poverty, income and exposure to adverse life events such as unemployment or mono parental families (Fergusson *et al.*, 2008).

According to Sanusi *et al.*, (2006) household income as a proxy indicator for socio-economic status has been found to be strongly associated with access to adequate dietary intake and food security. Mayoux (2006) also stated that food access that household members have is strongly associated with the control they have over household resources or income, particularly for women and their children.

Webb and Block (2003) in their studies found significant association between maternal nutrition knowledge and child nutritional status. Mckeever and Miller (2004) also added that a child's nutritional status is enhanced by the mothers' background characteristics, which includes age, employment status and educational status. Hence mothers socio-demographic and economic characteristics, plays a major role in determining the nutritional status of children especially those who are under five years. Ojeifeitimi *et al.,* (2003), in assessing determinants of nutritional status among children less than five years in a study involving 300 rural Nigeria women, found that there was a strong association between age of the mother, occupational status and employment and the risk of under nutrition among the children.

Dietary diversity has also been shown to be strongly associated with household socioeconomic status (Hatloy *et al*., 2000, Hoddinott and Yohannes 2002), and linkages between socioeconomic status, child nutrition and health outcomes have long been established. Interpretation of associations between dietary diversity and nutritional status is therefore complicated by the fact that both are strongly linked to household socioeconomic factors. For instance families with greater incomes and resources tend to have more diverse diets, and they are also likely to have better access to health care and better environmental conditions. Apparently, children in wealthier households are better off and grow better for a number of reasons, but improved

nutrient adequacy may be one important way in which household wealth and resources translate into better outcomes for children (Arimond and Ruel, 2004).

2.4 Dietary Diversity and its Usefulness

Dietary diversity has long been recognized as a key element of high quality diets. Increasing the variety of foods across and within food groups is recommended in most dietary guidelines, because it is thought to ensure adequate intake of essential nutrients and to promote good health (US Department of Agriculture Human Nutrition Information Service, 1992; Health Canada, 1992; WHO, 1996). It is defined as the number of different foods or food groups consumed over a given reference period (Hatloy *et al*., 1999).

Dietary diversity is also a qualitative measure of food consumption that reflects household access to a variety of foods, and is also a proxy for nutrient adequacy of the diet of individuals (Kennedy *et al*., 2010).

Dietary diversity which is defined as the consumption of an adequate variety of food groups has been accepted as an aspect of dietary quality and can indicate nutritional adequacy (Becqueyet al., 2009; Mpontshane *et al.,* 2008; FAO, 2007). It postulates the concept that increasing the variety of foods and food groups in the diet helps to ensure adequate intake of essential nutrients and promotes good health (Becquey *et al*., 2009; Mirmiran *et al*, 2006).

Depending on the objectives of a study, dietary diversity can be measured by using several methods such as a household or individual dietary diversity questionnaire in which dietary diversity score is used (FAO, 2007). Dietary diversity scores are created by adding either the

number of individual food items that have been consumed over a reference period or the various food groups. Individual Dietary Diversity Score (IDDS) uses 16 food groups which include. Cereals; Vitamin A rich vegetables and tubers; White roots and tubers; Dark green leafy vegetables; Other vegetables; Vitamin A rich fruits; Other fruits; Organ meat; Flesh meat; Eggs; Fish; Pulses/Legumes, nuts and seeds; Milk and milk products; Oils and fats; Sweets and sugar and condiments and spices. The IDDS aims to capture nutrient adequacy and studies have shown that an increase in individual dietary diversity score is related to increased nutrient adequacy (Foote *et al.,* 2004).

A number of studies have been able to link dietary diversity to the intake of nutrients specifically among adults in the developing countries of which Kenya is one of them (Thorne-Lyman *et al.,* 2009; Arimond and Ruel, 2004). Another study done among women in Malaysia affirmed that after adjusting for other variables, dietary diversity score has remained a significant protective factor against health risks where women with a higher DDS were more likely to have <3 health risks (Mohamadpour, Sharif and Keysami, 2012). However, as there is limited information on dietary diversity among pregnant women, this study aimed to determine the dietary diversity and its relation to nutritional status.

Dietary diversity score (DDS) is from a count of food groups consumed over a given reference period. The measurement period most commonly ranged from 1 to 3 days or 7 days. Dietary diversity score can be measured at both the individual and the household level (Lowik *et al.*, 1999). Although most dietary diversity measures consist of a simple count of foods or food groups, some scales developed in developed countries take into consideration the number of servings of different food groups in conformity with dietary guidelines (Ruel, 2003).

The proposed numbers of food groups to be included in the household dietary diversity score (HDDS) or Individual dietary diversity score (IDDS) are based on synthesis of currently available research results.

The household dietary diversity score reflects the economic ability of a household to access a variety of foods. Studies have also shown that an increase in dietary diversity is associated with socio-economic status and household food security (household energy availability) (Hoddinot and Yohannes, 2002; Hatloy *et al*., 2000).

Individual dietary diversity scores aim to reflect nutrient adequacy. Studies in different age groups have shown that an increase in individual dietary diversity score is related to increased nutrient adequacy of the diet. One other difference that lies between household and individual dietary diversity survey is that household include foods eaten by any member of the household, and excludes foods purchased and eaten outside the home, whiles individual dietary diversity does not (Kennedy *et al*., 2010).

Dietary diversity scores have been validated for several age and sex groups as proxy measures for macro and or micronutrient adequacy of the diet. Scores have been positively correlated with adequate micronutrient density of complementary foods for infants and young children (FANTA, 2006), and macronutrient and micronutrient adequacy of the diet for non-breast-fed children (Hatloy *et al*., 1998; Ruel *et al*., 2004; Steyn *et al*., 2006; Kennedy *et al*., 2007), adolescents (Mirmiran *et al*., 2004) and adults (Ogle *et al*., 2001; Foote *et al*., 2004; Arimond *et al*., 2010).

Dietary diversity is considered an outcome measure of food security mainly at the level of individual or household food access, but can also provide information about food availability in

the community and reflect seasonal changes in dietary patterns, an aspect of the sustainability of the food supply (Kennedy, 2009).

Consumption of a large variety of foods is an internationally accepted recommendation for a healthy diet which has greatly been associated with positive health outcomes such as reduction in the incidence of cancer or mortality (Drescher *et al.*, 2007). Low dietary diversity has been associated with specific nutrient deficiencies and with stunting, an important health indicator, independently of socioeconomic status (Mpontshane *et al.*, 2008). A study done by De Sa *et al.*, in Democratic Republic of Congo identified the need to emphasize the diversification of diets by pregnant women as a way to improve nutritional status and in turn the health of the foetus (De Sa *et al.*, 2012).

A diversified diet has been associated with a number of improved outcomes in areas such as birth weight, child anthropometric status and improved haemoglobin concentrations. A more diversified diet has been highly correlated with such factors as caloric and protein adequacy, percentage of protein from animals' sources which are considered as high quality protein, and household income (FSAU, 2006). In addition, it has been found that the consumption of a varied diet leads to a reduced risk of developing a deficiency or excess of any one nutrient and is therefore associated to the dietary nutrient quality (Mirmiran *et al.*, 2006).

2.5 Relationship between Dietary Diversity Score and Nutritional Status of Children

A number of studies have looked at the association between dietary diversity and child nutritional outcomes and has shown statistically significant association between dietary diversity and nutritional status of children even though Brown *et al.*, (2002), in their bivariate analyses,

using a sample of children aged 9 to 11 months old in Guatemala showed, no evidence of an association between dietary diversity and nutritional status (height-for-age and weight-for-height) that is stunting and wasting respectively. That notwithstanding majority of studies indicates strong associations between dietary diversity and nutritional status.

For instance, studies in Mali and Kenya documented strong associations between dietary diversity and children's nutritional status (Welsh *et al.*, 1992 and Hatloy *et al.*, 2000). In urban areas of Mali, lower food variety or dietary diversity scores were associated with twice the risk of being stunted or underweight, whiles controlling for socioeconomic factors (Kant *et al.*, 1993).

In Kenya, dietary diversity measured by the number of individual foods consumed in 24 hours was found to be significantly associated with five nutritional status indicators namely stunting, underweight, wasting, triceps skin fold and mid- upper arm circumference (MUAC) among children aged 12 to 36 months old (Onyango *et al.*, 1998).

Using data from the Ethiopia 2000 Demographic and Health Survey (DHS), Arimond and Ruel (2002) in their analysis indicated a strong and statistically significant association between food-group diversity measures based either on a 24-hour or seven-day recall and children's height-for-age Z-scores (HAZ).

In another study conducted by Nti (2011) in the Manya Krobo District in the Eastern region of Ghana among children between the ages of 6 and 18 months to examine whether dietary diversity, was associated with nutrient intake and child nutritional status; it revealed significant

differences between dietary diversity and nutrient intakes of the children. Children whose diets were highly diversified had higher energy and nutrient intake from complementary foods.

Nti (2011) also established a relationship between dietary diversity and child nutritional status. Dietary diversity was significantly associated with underweight, stunting and wasting in the children. Child nutritional status improved with increasing dietary diversity.

These findings are said to be consistent with other studies conducted in Mali, Kenya and Vietnam. In Mali, Hatløy *et al*., (1998) reported significant association between dietary diversity and nutrient intake. High dietary diversity based on food groups proved to be a stronger determinant of nutrient intake. Similarly, in Kenya, Onyango et al, (1998) also confirmed a positive association between dietary diversity and intake of a variety of nutrients.

Again in Vietnam, Ogle et al, (2007) reported a significant association between dietary diversity scores and nutrient intake. Those who consumed from more food groups had a higher intake of most nutrients, indicating that increasing the number of food groups has a greater impact on nutrient adequacy.

In addition, Kariuki (2011) also conducted a study on the relationship between dietary diversity and nutritional status of children under-five years in Katui district, Kenya using a sample of 283 non-breastfeeding children with their mothers/caretakers as respondents. The findings revealed that Stunting was at 47.3 %, underweight at 29.8 % and wasting at 4.6 % and had positive correlation between dietary diversity and nutritional indicators of stunting, wasting, underweight and MUAC. Nutritional status was found to improve with an increase in dietary diversity. All these are indications that dietary diversity is associated with child nutritional status.

2.6 Dietary Diversity Survey Instrumentation

Usually a questionnaire is used to collect data on both individual and household dietary diversity based on food and meals consumed within the past 24 hours or more as well as according to the purpose of the survey. But FAO recommends the use of a reference period of the previous 24 hours. Even though using one 24-hour recall period does not provide an indication of an individual's habitual diet, but it does provide an assessment of the diet at the population level and can be useful to monitor progress or target interventions (Savy *et al.*, 2005). The other valid timeframes for recall, are the previous 3 or 7 days, and in the case of some foods, the previous month.

The 24- hour dietary recall period was however chosen by FAO as it is less subject to recall errors, less cumbersome for the respondent and also conforms to the recall time period used in many dietary diversity studies (Kennedy et al., 2007; Ruel *et al.*, 2004; Steyn *et al.*, 2006; Savy *et al.*, 2005; Arimond *et al.*, 2010). In addition, analysis of dietary diversity data based on a 24-hour recall period is easier than with longer recall periods.

It should be noted that during festive periods food consumption patterns can be atypical which may not reflect a typical diet. It is as such recommended not to collect data based on foods consumed during such periods. As a result researchers must find out if the previous day was a festive day as it is common to find many household consuming special diets on such occasions and this may not be reflective of the typical day's consumption. In such cases the previous 48-hours recall could be used (Kennedy *et al.*, 2010).

2.6.1 Dietary Diversity in Developing Countries

In developing countries, single food or food group counts have been the most popular measurement approaches for dietary diversity, probably because of their simplicity. Studies conducted in developing countries have tended to use only single food counts or food group counts although other researchers have further analyzed food intake such that the number of servings of different food groups may be accounted for or food items are differentially weighted (Kant *et al.*, 1993).

The number of servings based on dietary guidelines have not been considered in any of the developing country studies reviewed (Reul, 2003). Ferguson *et al.*, (2003) in their study on seasonal food consumption patterns and dietary diversity of rural preschool children conducted among Ghanaian and Malawian children used the number of individual foods consumed.

2.6.2 Effects of Dietary Diversity on Nutritional Status

Lack of access to adequate and diversified diet has been identified as one of the severe problems among poor populations especially in countries where resources are limited and the results various forms of nutrition problems (Ekesa, Blomme and Garming, 2011). It has been found out that chronic energy deficiency, inadequate energy intake and micronutrient deficiencies are the top priority nutritional problems that affect women of reproductive age (GoK, 2008b). Moreover, other studies have shown that when energy and protein deficiency occurs in the mother it is associated with intrauterine growth retardation (Fall, 2009).

Micronutrient malnutrition has remained a problem of public health concern in most developing countries, partly due to the consumption of monotonous, cereal-based diets that lack diversified

(Kennedy *et al.,* 2007). Low micronutrient intake has been found to be a problem even in countries undergoing transition in terms of development and has been a dominant problem in many of the poorest regions across the world (Arimond *et al.,* 2010). However, it is noted that in many parts of sub- Sahara Africa, Kenya included, the scenario is that most women will enter pregnancy with a relatively poor nutrition status suffering from under nutrition and many will already be affected by a micronutrient deficiencies or may develop a deficiency during pregnancy (Anarfi *et al.*, 2003). Maternal under nutrition, including chronic energy and micronutrient deficiencies, is prevalent in many regions, especially in South-Central Asia, where in some countries more than 10 percent of women aged 15–49 years are shorter than 145 cm (Black *et al.,* 2008). Women who suffer from chronic energy deficiency have an increased risk of obstructed labour as a result of a contracted pelvis which is more common when malnutrition is prevalent. There is an increased risk of mortality especially in communities in which under nutrition in childhood is common and it accounts for eight percent of maternal deaths worldwide (Neilson *et al.*, 2003). There is also an increased risk of giving birth to low birth weight babies which is a well known risk factor for neonatal and infant mortality, increased morbidity, impaired mental development, and the risk of chronic adult disease. The study sought to give information on the pregnant women in West Pokot County who were consuming a non-diversified diet thereby reflecting the population at risk of adverse outcome of non-diverse diets.

2.6.3 Factors Affecting Individual Dietary Diversity

2.6.3.1 Socio-economic Factors and their Effect on Dietary Diversity

Dietary diversity has been strongly associated with socioeconomic status (SES) of a household (Arimond and Ruel, 2004). A study done among Mexican men by Ponce et al. (2003), found that a higher socioeconomic status was associated with higher dietary diversity and better micronutrient adequacy (Ponce *et al*., 2006). Another study which was done by Murakami *et al* in 2003 among children in Japan found that children from households with a higher socio economic position were found to consume diets that were considered to be of a higher quality than those with a lower socio economic position (Murakami *et al.,* 2009). Other studies have shown that families which have greater incomes and resources tend to have more diverse diets as food access is determined by income and the prices of foods (Brinkman *et al.,* 2009 and Ponce et al,2006) .

Studies have been done and it has been demonstrated that high food prices are a challenge to accessing a diverse diet as they contribute to the erosion of the coping capacities of many households and countries across the developing world. The high food prices and the global financial crisis have an impact on the underlying factors of malnutrition which include insufficient access to food, inadequate maternal and child care practices together with poor public health and inadequate health services (Brinkman *et al.,* 2009). For instance, a study done by Tarasuk *et al*., (2007), found that, resources were minimal and constrained women will either reduce their consumption or deprive themselves of food in order to give to their children so as to spare the children from deprivation and hunger. This shows that food intakes of the women are likely to be more sensitive to diminishing household resources when compared to the intakes of

other family members who may not be depriving themselves of food (Tarasuk, McIntyre and Low socioeconomic status is associated with the consumption of poor and monotonous diets, food insufficiency and the risk of a variety of micronutrient deficiencies is high. Dietary intakes and food insufficiency are highly determined by the availability or the lack of resources (Arimond *et al.,* 2010; Mazur, Marquis and Jensen, 2003). Women from a low socio economic background are generally likely to be underweight (Corsi, Kyu and Subramanian, 2011). The study used ownership of household assets to assess socio-economic status and its relation to dietary diversity among pregnant women.

2.6.3.2 Maternal Factors and their Effect on Dietary Diversity

Maternal factors (age, marital status, education level, parity, gestation age) have been shown to influence the dietary diversity. A low education level and unemployment are associated with an unhealthier diet. In addition, dietary patterns have been shown to vary according to demographic profiles, including gender, marital status and acculturation (Me´jean *et al.,* 2010). Less education, specifically, regardless of other factors, is directly associated with poorer food choices due to lack of the necessary knowledge and also lack of the resources. As a result of the low education particularly among women who are charged with the responsibility of food choice and preparation, there is less dietary diversity (Mazur, Marquis and Jensen, 2003). A study done among Japanese women by Murakami *et al* in 2003 found that women with higher education tended to have changes in diet. On the other hand higher education was found to be associated with favourable dietary intake patterns such as a higher intake of protein and other

micronutrients such as iron; vitamins A, D, E, and C; and folate (Murakami *et al.,* 2009). The study focused on maternal factors mentioned above and how they affect dietary diversity.

2.6.3.3 Cultural Factors and their Effect on Dietary Diversity

Culture which is the acceptable way of life of a community of individuals has been found to be very diverse across the world (Lopez, 2008). There have been long term changes in terms of values, norms and even behaviour by individuals and the changes include changes in diet and lifestyle (Mazur, Marquis and Jensen, 2003). Pregnant women in various parts of the world are forced to abstain from nutritious foods due to traditional food habits even if the foods are available in abundance. For example, in a study done by by Patil *et al*., in India in 2010, 63.7 percent of the study population said that some vegetables/fruits should be avoided during pregnancy (Patil *et al*., 2010). Another study done in Tanzania in 2008, found that even though women have some knowledge about some foods and importance they may not necessarily consume the foods. The study indicated that women having some knowledge about Vitamin A rich foods neither healthier or consumed a greater variety of vegetables than other women (Keding and Krawinkel, 2008).

2.7 Household Food Security Status

Household food insecurity has been identified as one of the underlying factors affecting nutritional status. Food insecurity is defined as "limited or uncertain availability of nutritionally adequate and safe foods or limited or uncertain ability to acquire acceptable foods in socially acceptable ways" (González *et al.,* 2008). When the amount of food available is limited, individuals tend to consume less varied diets, less fruits, vegetables, and milk products, and

usually there is lower energy and nutrient intakes in the context of food insecurity. Food insecurity is considered a converse state and has often been associated with poverty and low income, and has important implications for the health and nutrition of individuals. Food security requires nutritional adequacy and therefore when an individual is undernourished or has a micronutrient deficiency, may be construed to be food insecure (Ivers and Cullen, 2011). Generally, the woman's food security status reflects her resilience or vulnerability to dietary compromise when household resources tend to decline (Tarasuk, McIntyre and Li, 2007).

When there is food insecurity, individuals are at risk of employing coping strategies that are either risky or not sustainable especially when there is limited or uncertain ability to acquire acceptable foods in socially acceptable ways. Coping strategies are employed due to vulnerability that results from the lack of a reliable access to food. Women are primary caretakers of children and are generally charged with the responsibility of taking care and maintaining the households, are particularly vulnerable to resorting to risky coping strategies, more so when they have low education and few economic opportunities (Ivers and Cullen, 2011).

Household food security measured by the proxy indicator of coping strategies employed when there is a lack of food compared with socio- economic factors will show access and how it affects the dietary diversity. Food insecurity is related to lower macro and micronutrient intakes, lower intake of fruits and vegetables, and lack of diet diversity. In a study, it was found that among the Women who reported food security were more likely to have a higher mean diet diversity score than those that reported food insecurity (Mohamadpour *et al.*, 2012). One other determinant of a household dietary diversity is climatic conditions or seasons within the year. In their study on changing food patterns across seasons in rural Pakistan, Abid *et al.*, (2014)

revealed a significant difference of household's dietary diversity and calorie intake across the seasons. For instance during the winter, households food basket was more diverse, thus, there was a 30%, 13%, and 8% rise in food variety, dietary diversity, and caloric intake, respectively, which was mainly due to the changes in food choices in winter. Rural households on the other hand preferred to consume items from nutritious food groups (i.e., dried fruits and nuts, oilseeds, and locally preserved foods) during the severe cold weather. However, they did not substitute significantly the items from basic food groups (i.e., cereals, vegetables and legumes, tubers, and dairy products), with those belonging to nutritious groups. Based on these findings, it was concluded that dietary diversity and calorie intake fluctuate across the seasons.

In Ghana, there is variation in rainfall pattern for the Northern sector and the Southern sector. The northern sector experiences one rainy season, lasting approximately from May to October, giving rise to one cultivating season. Crop harvesting in this region generally occurs in the dry season, that is beginning from October. The southern sector on the other hand experiences two rainy seasons that is one from April to June and another from September to November, resulting in major and minor growing seasons. Harvesting generally occurs from July to September then again in November and December (GMSD, 2002).

As a result of the differences in climate between the northern and southern sectors of Ghana the northern sector is most often severely affected by seasonal food shortages than the southern sector, which experiences bimodal rainfall hence two harvesting periods. That notwithstanding, the southern sector also stands the chances of experiencing food shortages especially in times when the rainfall pattern is poor. In addition to that, fluctuation in the availability of staple foods resulting from climatic conditions is a cause for concern for many rural Ghanaian communities.

The majority of Ghanaians (63%) live in rural areas, which depend on subsistence agriculture, United Nations Population Development Fund [UNPDF] (as cited by Harding, 2008). That is, the foods produced are mainly meant to feed their households and most often may not be adequate to feed the household throughout the year before another farming season begins and these results in food shortages. It is estimated that over one billion people worldwide live in environments that are prone to seasonal food shortages and most often young children are particularly vulnerable during such food shortages as they need a constant supply of adequate food for growth and development which they may be denied or not get access to in most instance, Chambers (as cited in Harding, 2008).

In other instances limited resources may be preferentially allocated towards older people or more economically productive members of the household. Even though there is evidence that children in some societies may be protected during food scarce times (Graham, 2003).

The extent to which children are therefore affected by seasonal changes in food availability is a major cause for concern as seasonal food shortages have been tied to deleterious effects on several health status indicators related to children including birth weight and early infant growth, child linear growth and rates of wasting, underweight and stunting as well as weight change during pregnancy and lactation, Adam, and Prentice et al (as cited in Harding 2008)

Climatic conditions resulting in seasonal food availability or shortages as indicated above plays a role in a household's ability to diversify its diets. During food shortages households may adapt certain strategies to help them cope.

2.8 Food Security and Food Prices

Food availability can be described as the extent to which food is within reach of households (for example in local shops and markets), both in terms of sufficient quantity and quality (FAO 2006). A households ability to diversify its diets would also depend on the food availability. Linked to food availability is food access. Food could be available but not accessible.

Household-level food access is considered to be achieved when a household has the opportunity to obtain food of sufficient quantity and quality to ensure a safe and nutritious diet (FAO, 2006). Food access also counts in a households decision to diversify diets. Food intake and nutritional status of households are largely affected by poor access to food (WHO, 2008).

Important drivers of food access are household resources, food prices, food preferences and socio-political factors such as discrimination and gender inequality (Pieters *et al.*, 2013). Food access is to a large extent determined by food prices and household resources. Every household has a limited amount of resources at its disposal, including assets, labour, human capital, and natural resources. These resources are allocated across different income and non income generating activities (Hoddinott, 2012).

Food prices, is a driver of food access and may also influence a household's decision to diversify diets. When there is a rise in food prices households would be compelled to stick to monotonous diets. Households' dietary diversity and intake of energy are reduced when food prices increase and incomes decrease (Subran and Bloem, 2010). Consumption of more expensive food items, portion sizes and the frequency of meals are all reduced. The reduction of food and nutrient consumption increases the severity of nutrient deficiencies and increases the prevalence of malnutrition (Muhilal and Satoto, 2010).

Monthly changes in staple food prices also suggest reduced food availability at certain times of the year. For instance the price of maize, a major staple crop in Ghana, shows seasonal fluctuation, rising in the pre-harvest months when food is less available and falling once harvest begins, Armah and Asante (as cited in Harding, 2008). Nationally aggregated price data on several major staples, including maize, sorghum, millet, rice, cassava and yam also shows strong seasonal patterns corresponding with harvesting times (Harding, 2008).

Food prices, hence will influence a household decision when it comes to food choices. When food prices increases, households with higher incomes will have a greater purchasing power than compared with less income households. Less income households will drift to foods, which are less expensive when food prices increase. Hence the effect of food prices on a household's ability to diversify its diets.

2.9 Influence of meal frequency or food consumption pattern on child nutritional status

Breastfeeding is considered as the first four strategies promoted by UNICEF for improving infant and child survival as reported by Grant (1984). This may enhance child survival up to 3 years of age even in undernourished children (Brined *et a.l*, 1988). Black et al in 2003 found that malnutrition in the form of under nutrition is the underlying cause of a substantial proportion of all child deaths particularly in developing countries like India which has strong association with improper infant feeding practices among preschool children (Kumar *et al*., 2006).

It is well known that both developed (Hediger *et al*., 2000) and non-developed countries (Adair *et al*., 1993), breastfeeding provides adequate and appropriate nutrients for infant's growth

and development (Dewey et al, 1995), reduction in infant mortality and morbidity (Booth, 2001), protects infants against infections and promotes their survival (Ramachandran, 2004).

In 2001, World Health Assembly resolved that exclusive breastfeeding for the 6 months is the most appropriate infant feeding practice (WHO, 2001). On the basis of this resolution the traditional practices of breastfeeding was promoted but exclusive breastfeeding up to 6 months and energy dense semi solid supplements are still problematic in South Asian countries like India (Ramachandran, 2004) and tribal communities are not the exception and probably they are the most vulnerable groups of India.

The importance of child feeding practices for child nutrition is well recognized in the nutrition literature (WHO, 1995). Ruel and Menon (2002) indicated that efforts to however measure and quantify child feeding practices and to assess the strength of their association with child nutritional status have been limited by methodological problems. As most of the research on relationship between child feeding practices and nutrition outcome have been cantered around single behaviour e.g. exclusive breastfeeding, timing of introduction of complementary food, duration of breastfeeding etc (Popkins *et al*., 1990; Victoria et al, 1998; Cohen et al, 1994; Marquis et al, 1997). Although these approaches have been found to be useful for evaluating the role of these individual practices, they do not allow for an examination of the effect of child feeding practices as a whole on children's health and nutrition outcomes (Ruel and Menon, 2002).

Ruel and Menon (2002) were the first to attempt to create composite age-specific feeding and index to see its association with child nutrition for the Latin American countries. Afterwards the WHO provided regulated guidelines for child feeding practices in 2008. WHO (2008) developed

indicators for assessing infant and young child feeding practices. Minimum meal frequency was defined as "Proportion of breastfed and non-breastfed children 6–23 months of age who receive solid, semi-solid, or soft foods (but also including milk feeds for non-breastfed children) the minimum number of times or more." "Minimum" is defined as: 2 times for breastfed infants 6–8 months, 3 times for breastfed children 9–23 months, 4 times for non-breastfed children 6–23 months. "Meals" include both meals and snacks (other than trivial amounts1), and frequency is based on caregiver report.

Feeding frequency for breastfed children includes only non-liquid feeds and that for non-breastfed children includes both milk feeds and solid/semi-solid feeds. The feeding frequency reflects the guiding principles developed by PAHO/WHO (2003) which indicates the minimum feeding frequencies recommended and the number of times a child must be fed with complementary feed. These feeding frequencies depend on the age of the child and whether the child is being breastfed or not. The guidelines for feeding children are: for breastfeeding children at 6-8 months, complementary food should be fed for 2-3 times per day, with 1-2 snacks as desired; and for those 9-23 month complementary food should be fed 3-4 times per day, with 1-2 snacks as desired. For non-breastfeeding children meals should be given 4-5 times a day, with 1-2 snacks as desired (WHO, 2005)

The GDHS (2003) reported that the meal frequency in Ghana among children under age five is low, with 40.0% of children 18-23 months of age being fed less than the recommended three meals per day. The low level of meal frequency was attributed to food insecurity and poverty, or perhaps inadequate knowledge of caregivers on the required feeding recommendation for children.

Adokiya (2010) in his study on complementary feeding practices and nutritional status of children aged 6 to 23 months, conducted in the Kassena- Nankana district of the Upper East region of Ghana revealed a significant proportion of the children receiving less than the recommended minimum feeding frequency of complementary foods, stated in WHO (2003).

Thus, for solid foods, 88.2% of the children aged 6 to 9 months received less than 2 feedings daily, 11.8% received 2-3 times and none received 3-4 times. For the children aged 9 to 24 months, 39.2% received less than 2 feedings daily, 55.6% received 2-3 times and 5.1% received 3-4 times.

For semi-solid foods, 92.6% of the children in the age group 6 to 9 months received less than 2 feeding per day, 7.4% received 2-3 times and none received 3-4 times. Again, for the children aged 9 to 24 months, 75.9% of them received less than two meals a day, 22.5% of the children received 2-3 times and 1.5% received 3-4 times of semi-solid food. These figures apparently indicate that majority of children aged 6 to 24 months do not meet the minimum daily recommended feeding frequency which is a cause for concern as this could impact on child health, development and survival.

Improving child feeding practices in children, especially 6 to 36 months of age is therefore critical to improved nutrition, health and development of children.

A study on dietary diversity in Somalia conducted by the Food and Agriculture Organization [FAO] (2004) of the United Nations indicated that higher malnutrition levels were associated with less number of meal occasions at household level. Households that had more than four meal occasions in a day did not experience any malnutrition amongst the under-fives in their

households whereas households with only one eating occasion experienced malnutrition levels of almost 40%. Thus malnutrition levels decreased as the frequency of eating increased.

2.10 Childhood Obesity

The prevalence of childhood overweight and obesity has increased substantially and is one of the most serious public health challenges of the 21st century (WHO, 2012). The problem is worldwide and is gradually affecting many low and middle income countries, particularly in urban settings. The prevalence has increased at an alarming rate. Globally in 2010, the number of obese children under the age of 5 was estimated to be over 42 million, close to 35 million of these are living in developing countries (WHO, 2012). According to Das *et al.*, (2008), the high prevalence of childhood overweight and obesity has serious health consequences because raised body mass index (BMI) is a major risk factor for diseases such as cardiovascular disease, type 2 diabetes and many cancers.

Ghana is battling the insurgence of lifestyle related diseases it is very crucial for childhood overweight and obesity to be checked before it degenerates in adulthood. Bamji (2003) reported that these diseases, often referred to as non-communicable diseases (NCDs), not only cause premature mortality but also long-term morbidity. In addition, overweight and obesity in children are associated with significant reductions in quality of life and a greater risk of teasing, bullying and social isolation. Due to the rapid increase in obesity prevalence and the serious health consequences, obesity is commonly considered one of the most serious health challenges of the early 21st century.

A study by Mishra and Singh (2003) established a relationship between childhood obesity with socioeconomic status of parents and the development of childhood obesity, risk factors associated with childhood obesity and people's perception on children weight control either directly or indirectly. A study by a group of paediatric researchers; Kathryn et al, (2006) in Chicago Illinois entitled "*parents perceptions of their child's weight*" explored parents' perceptions about their children's appearance, health, and evaluated a tool to determine parents' visual perception of their children's weight. They found that parents were more likely to identify their child as "overweight" or "a little overweight". They also found that Parents of older children were more likely to be worried if they perceived their child as less active/slower than other children.

A study conducted by Mogre *et al.*, (2010) found that, proportionally more girls engaged in heavy type of physical activity than boys. However, there was no significant differences in the type of physical activity participated by the children when the studied population was classified by gender.

Concerning frequency of physical activity, they found that almost half (48.5%) of the studied population engaged in a physical activity of any kind, 2-3 times within a week. Almost the same proportion of boys and girls engaged in a physical activity once in a week (23.6% vs. 24.5%) and more than 3 times in a week (28.4% vs. 26.6%).

Childhood overweight and obesity are highly prevalent in the developed countries, affecting one-third of children and adolescents (Eisenberg, 2013). Since 1980, rates of obesity doubled for children aged 2 to 5 years and tripled for children aged 6 to 11 years and adolescents aged 12 to

19 years. The risk of obesity is also higher among minority and underserved populations (Eisenberg, 2013).

Overweight children and adolescents are at greater risk for health problems when compared with their normal-weight peers and are more likely to become obese adults. Obese children and adolescents are more likely to have serious illnesses such as type 2 diabetes, hypertension, high cholesterol, obstructive sleep apnea, stroke, heart disease, and non-alcoholic fatty liver disease, certain types of cancer, and bone and joint problems. Other reported health consequences of childhood obesity include eating disorders (such as bulimia nervosa, restrictive eating, binging, purging, generalized food preoccupation, and distorted body image) and mental health issues such as depression and low self-esteem (Assis *et al.*, 2013). Childhood obesity has been identified as a major threat to children's health (Micic, 2001). Swartz and Puhl, (2010) argued that society needs to respond to the health crisis of childhood obesity and approach it with the attention given to other environmental risks which affect the well-being of children.

CHAPTER THREE

METHODOLOGY

3.0 Introduction

The various methodologies that were used to conduct the study are presented in this chapter. Information is provided on the sampling procedure, study area, data collection techniques, data analyses, quality control measures and ethical considerations are presented in this chapter.

3.1 Study design

A cross sectional analytical study was conducted in 28 communities of the Sagnarigu District. This type of study is cross sectional because it was conducted at one point in time. Data collection was done at one point in time in all the study units. The data collection was done in July and August of 2014. Cross sectional studies measure certain phenomena or events in a study population. In this study, the main variable that was measured was the nutritional status of the children and dietary recall. The study was analytical because the study sought to establish the relationship between household dietary diversification and its influence on the nutritional status of 24 to 59 months children in the Sagnarigu.

3.2 Study Area

The study was conducted in the Sagnarigu District which was established under the Legislative Instrument 2066. Sagnarigu District with its capital Sagnarigu was carved from Tamale Municipal and forms part of the new districts and municipalities created in the year 2012. The district has 22 health facilities with 10 being owned by the state whilst 7 are owned by private

individuals. Three of the facilities are quasi private facilities. It shares boundaries with other districts namely, Savelugu-Nanton Municipality to the North, Tamale Metropolitan to the South and East, Tolon to the West and Kumbungu to the North-West. The population of the District is estimated at 170,860. It has 182 communities.

The district has land area of 114.29 km2 with 170,860 habitants on it. The district has 1,092 persons per 1 km2 of land. The people of Sagnarigu are pre-dominantly Dagombas. However, there are few others people of different ethnic origins like Gonja, Mampurusi, frafra, Asantes, Ewes etc,all engaged in farming, rearing of animals and other commercial activities such buying and selling. Indeed the highest proportion of the population practice Islam, followed by Christianity and traditional practices. There are several churches in Sagnarigu district. Among these are Assembly of God, Catholic, Presbyterian, Anglican, Methodist, and other charismatic Churches.

The inhabitants of Sagnarigu are farmers. Farming is their main economic activity and source of income for the people of the district. The crops produced are corn, rice, yam, beans, groundnuts and others. Some farmers rear animals like sheep, goats, cattle,pigs and fowls. The women engage themselves in sheabutter production.

There are markets in almost every community, where people buy and sell. One can also find in the town hair salons, carpenters, electricians, fitters and tailoring shops. The district has 21 health facilities that serve a population of 170, 860,of the number;1 polyclinic,3hospitals,2 health centres,3CHPS compounds,2Quasi hospitals and other smaller health facilities. About eighty percent (80%) of the health facilities in the district are private and Christian Health Association of Ghana (GHAG).

24 to 59 months living in the Sagnarigu District were eligible for the study. mothers or Caregivers who were willing to participate and available throughout the period of the study were recruited for the study.

The exclusion criteria were children who were below 2 years and those above 5year. Children who were sick during the time of the study were also not eligible.

3.4 Sample Size determination

Since the study was a cross sectional study, the sample size was determined using the formula $N=z^2\ pq/d^2$ (Snecdector and Cochran, 1989)

Where;

N is the required sample size

z is the z-score corresponding to a 95% confidence level which is estimated to be = 1.96

p is the estimated prevalence of malnutrition = 0.24 (Sagnarigu District Health Directorate's Report, 2013)

q is the proportion of well-nourished children or the probability of children who are not malnourished = 1-p = 1-0.24 =0.76

d is the precision or margin of error = 0.05 (5%)

Substituting;

: $N = (1.96)^2 \times (0.24)(0.76)$

$(0.05)^2$

$N = 3.8416 \times 0.1824$

0.0025

therefore $N = 280.2 = 280$

3.5 Sampling techniques

Since the study was a community-based study; multistage sampling procedure was used to select respondents for this study.

Before the sampling began, the population was divided into a complete set of non-overlapping subpopulations, defined by geographic or political boundaries, that is, *clusters*.

In the first stage, 28 of these clusters were sampled with probability proportionate to the size (PPS) of the population in the cluster in the entire Sanarigu District. This technique has been recommended by UNICEF as appropriate for community-based studies. The individual populations of the communities were listed and the sampling interval calculated. This was calculated using the formula n = cumulative population ÷ number of clusters.

The next stage of sampling or selection was the selection of houses from which the children and caregivers/mothers were selected. This was done using systematic sampling which involves a random start from a house whilst a travel direction is used and then proceeds with the selection of every *k*th element from then onwards. In this case, *k*= (population size/sample size). The selection was done in using an interval of 5. This implies that the 1^{st}, 5^{rd}, 10^{th}, 15^{th} .....n^{th} households selected.

The last stage of selection was done by selecting households from the sampled houses. In every sampled house, only one household was selected for the study. In houses where there were more than one household, the household of the youngest child was selected.

3.6 Data Collection Methods and Tools

The tools that were employed for the study included a semi-structured questionnaire designed by the researcher taking into consideration literature that has been reviewed as well as a standard questionnaire detailing food groups consumed adapted from FANTA (Swindale & Bilinsky, 2006).

Also, a Salter weighing scale with a capacity of 25 kgs with 100g increments was used to take weight. Weight measurements were taken to the nearest 0.1kg.

To measure length or height a locally constructed length board referred to as an infantometer was used and the measures were taken to the nearest 0.1 cm.

In addition, a UNICEF Mid- Upper Arm Circumference tape (MUAC tape) for the ages 6 to 59 months, which measures up to 25 cm with colours-coded in red, yellow and green were used to measure mid-upper arm circumference (Cogill, 2003). Only quantitative data was collected. Both primary and secondary data were sourced for this study. Secondary data that were used include the bio- data from the Health Records Cards of the children on the date of births of children and profile of the study area sourced from the Municipal health directorate.

3.6.1 Questionnaire

A semi-structured questionnaire was designed by the researcher and a standard questionnaire adapted for ease of data collection from the FANTA Household Dietary Diversity Score

Indicator Guide (Swindale and Bilinsky, 2006) was used to solicit information from respondents (caregivers). The questionnaire contained both open and close-ended questions this enabled the researcher to gather relevant information on different foods consumed and its relation with the nutritional status of children aged 6-36 months in the study area. Other information collected include the demographic characteristics and socio-economic factors of caregivers in addition to data concerning each child, such as age, gender, breastfeeding, child feeding practices, nutritional status and occurrence of illness.

3.6.2 Dietary Diversity Assessment

The number of different food groups consumed within the previous 24 hours preceding the survey was investigated through the 24-hour dietary recall. A simple count of food groups in the previous 24-hour period was employed. The defined food groups was based on foods consumed within the Sagnarigu district taking into consideration dietary recommendations from FANTA Household Dietary Diversity Score Indicator Guide (Swindale and Bilinsky, 2006). Specific to eliciting information on dietary diversity based on this guide, twelve (12) food groups would be used for this study namely: 1) Cereals, 2) Meat and meat products, 3) Roots and tubers, 4) Vegetables, 5) Fruits, 6) Beans and other pulses, 7) Dairy products, 8) Fats and oil, 9) Sugars and honey, 10) Fish and sea foods, 11) Eggs, 12) beverages, spices & other products. This study focused on measuring dietary diversity through a Dietary Diversity Score (DDS) representing the number of different food groups consumed over a given period of 24 hours. Dietary consumption patterns were assessed based on food consumed in three periods thus breakfast, lunch and supper.

3.6.3 Anthropometric Measurements

Anthropometry was used to assess the nutritional status of children. A Salter scale was used to weigh children for their weight and a locally constructed length or height board was used to measure height or length. For children who are below 24 months recumbent length was measured instead of standing height.

Verification of the actual ages of children was determined by the assessment of their growth monitoring or weighing cards or birth certificates.

MUAC was measured using the UNICEF MUAC tape for children aged 6 to 59 months. The MUAC was carried out to estimate skeletal muscle mass and fat stores using a flexible, non-elastic measuring tape. The measurement was taken in centimeters with the nonelastic tape measure placed firmly on the left mid upper arm, at the mid-point between the acromion process of the scapular and the olecranon process of the ulna bone (Jellife, 1996). The clothing that may cover the child's left arm were removed in order to enable easy measurement of the MUAC.

The midpoint of the child's left upper arm was calculated by first locating the tip of the child's shoulder with the fingertips. The child's elbow was then bent to make a right angle. The tape was placed at zero and pulled straight down past the tip of the elbow. The number at the tip of the elbow was read to the nearest centimeter and divided into two to estimate the midpoint. The mid-point was marked with a pen on the arm. The tape was then wrapped round the arm at the mid-point making sure that the tape was not too tight or loose. The measurement obtained was then read to the nearest 0.1cm (Cogill, 2003).

The body weight of each child in light clothing and without shoes was taken using a portable bathroom scale (Hanson model) to the nearest 0.2 kg (Jellife, 1996). In the case of infants, a weight balance with suspended bag was used. The infant was placed inside the bag with minimum clothing on and the weight was recorded. Standing height was measured using a constructed vertical wooden rod affixed with graduated fibre glass tape. Subjects stood bare footed and readings were taken to the nearest 0.1cm (Iohman *et al.*, 1991).

For infants, a length board with a headpiece or infantometer was used in determining their lengths. They were placed in a lying position, ensuring that their heads touched the headpiece with their back, back of knees and heels touching the board and their hands relaxed by the size. The horizontal plane (head piece) was lowered firmly into the head until it is of the same height with the head while the subject inhaled and the readings were taken at an accuracy of 0.1 cm, and at observed eye level.

3.6.4 Determination of Household Wealth Index

A household wealth index based on household assets and housing quality was used as a proxy indicator for socio-economic status (SES) of households. An absolute measure of household wealth (wealth index) used in this study is based on an earlier concept developed by Garenne & Hohmann (2003), whereby the sum of dummy variables created from information collected on housing quality (floor, walls, and roof material), availability of electricity, water and type of toilet facility, and ownership of household durable goods and livestock (e.g. bicycle, television, radio, motorcycle, sewing machine, telephone, cars, refrigerator, mattress, bed). These facilities or durable goods are often regarded as modern goods that have been shown to reflect household wealth. A household of zero index score for example means that household had not a single

modern good. The scores were thus added up to give the proxy household wealth index. The index varied from 0-18. Households that had a wealth index score of 13 and below were classified as having a low wealth index score and those that had a wealth index score of 14 and above were classified as having a high wealth index score.

The main aim of creating the index was to categorize households into SES groupings in order that we could factor in socio-economic status in multiple regression analysis and to compare the difference in the uptake of family planning services between the groups of lowest and highest SES.

The economic status of the respondents was assessed by analyzing data on the economic activities of the caregivers/mothers and that of the household heads. An assessment of the household assets was also done after which a composite index was created to categorize the households into low and high household wealth index.

The variables that were used in creating the an absolute measure of household wealth (wealth index) include housing quality (type of floor, walls, and roof material), availability of electricity, water and type of toilet facility, and ownership of household durable goods and livestock (e.g. bicycle, television, radio, motorcycle, sewing machine, telephone, cars, refrigerator, mattress, bed). The scores were thus added up to give the proxy household wealth index. The index varied from 0-16. Households that had a wealth index score of 11 and below were classified as having a low wealth index score and those that had a wealth index score of 11 and above were classified as having a high wealth index score.

3.7 Focus Group Discussion

Qualitative data was gathered according to some selected topics or themes of interest which include knowledge of infant feeding practices, knowledge on dietary diversification and the factors that influence dietary diversification. These were again compared or linked to the results of the quantitative data. The FGDs were conducted among mothers/caregivers who were not interviewed with semi-structured questionnaires. This was to avoid repetition of responses from mothers/caregivers.

3.8 Data Analyses

Data gathered was analyzed using the Predictive Analytic Software (PASW) version 20.0 formerly called Statistical Package for Social Science (SPSS).

The questions were coded and treated as nominal variables. During the analysis, categorical variables such as sex, educational status of caregivers, marital status, religion, and occupation of care givers, for which data was gathered were not presented in any ordered form, but were treated as nominal variables whereas other categorical variables such as daily feeding pattern, dietary diversity score for which data were gathered were analyzed and presented in an ordered manner, and as such treated as ordinal. In each case the responses to these variables were predetermined and coded.

All variables, such as MUAC, height, weight, length, and age, were primarily treated as continuous variables and the raw values gathered during data collection were used for analysis.

Univariate, bivariate and multivariate analyses were done for the variables of study. Univariate analyses were done to present the socio-demographic characteristics, household assets and household food consumption.

Bivariate analyses was done to assess the relationship between DDS and age, marital status, household wealth index, educational level and occupation of the mothers/caregivers.

Chi square values of these bivariate analysis were considered to be statistically significant with P <0.05 and a confidence level of 95 % for all main outcome measures that met the normality and homogeneity criteria. Independent variables found to be statistically significant at the 0.1 level based upon the results of the bivariate tests.

Multivariate analysis were done to explore the determinants of household dietary diversity. The variables that were included in the regression model were age, wealth index and educational level of respondents or caregivers.

In the second stage of the multiple logistic regression analysis, factors that were included in the analysis were gender of baby, household dietary diversity, food group frequency score, occupation of mother.

Data on child anthropometry was analyzed using the procedure stipulated by the WHO Anthro software (2005). The researcher and the research team ensured adherence to this procedure. The following protocols were ensured:

Chi-square test was used to establish possible associations between consumption of different food groups and demographic and socioeconomic status of the households. Analyzed data was presented in the form of frequency distribution tables and charts and narratives.

Weight-for-age, height for age, and weight-for-length z scores were calculated on the basis of the gender- and age-specific growth chart references (revised) that were developed by the National Center for Health Statistics and the Center for Disease Control and Prevention and recommended for international use by (WHO 2006). The MUAC tape was also used to determine the level of malnutrition of children based on the following classification: Severe Acute malnutrition, Moderate malnutrition and Normal nutritional status. These were a measure of underweight prevalence in the district.

3.7.1 Reliability and Validity of the Study

Validity deals with the extent to which the instrument measures what it is intended to measure (Babbie & Mouton 2001). This was ensured by administering the same questionnaires to respondents (caregivers). The reliability of an instrument deals with its ability to produce the same results over a period of time when used with the same participants (Burns & Grove 2005). The questionnaires were pretested in one Health Centre among children aged 6 to 36 months who also formed part of the final study. The pretesting enabled the researcher to determine the clarity of the items and consistency of responses.

Reliability is the degree of consistency that the instrument of procedure demonstrates whatever it is measuring it does so consistently. In order to establish the reliability of the tool the Cronbach's alpha was calculated. This was found to be 0.8622 which is high and closer to 1. This represents a higher internal consistency of the variables or scale.

3.7.2 Quality Control Measures

Training: There was a training session for the research assistants who assisted in the data collection to ensure that valid and reliable data were collected. The training gave the data collectors much insight into the questionnaires and what it sought to achieve.

Pre-testing of questionnaires:

Pre-testing of the tool was done to check clarity of items, ambiguity of the language and feasibility of the tool. Formal permissions were obtained from the Sagnarigu Health Directorate and community leaders. The structured questionnaire were administered to the caregivers/mothers who were selected by probability sampling methods. The time taken by each respondent to answer the questions varied from 20-30 minutes. The tool was found to be clear feasible and there was no ambiguity in the language

Double entries of data: The quantitative data was entered by two persons after which the two data sets were compared to check inconsistencies in the data.

3.8 Ethical Consideration

Approval was sought from the University Ethics committee prior to the data collection. Permission was also sought from the Sagnarigu Health Directorate before embarking on the study.

Informed consent was obtained from caregivers (respondents) before the administration of the questionnaire and taking of anthropometry data. The relevance, benefits and consequences of the study was made known to caregivers with children aged 6 to 36 months who availed themselves for the study.

Four ethical principles of autonomy, confidentiality, anonymity, justice and beneficence were adhered to. The participants' (caregivers/mothers) rights were respected and they were told that they could withdraw from the study at any time without consequences. The participants were also briefed on the benefits of the study which included contributing to existing knowledge on the topic as well as increasing awareness on integration programme. Participation was voluntary and only caregivers/mothers who consented were interviewed.

3.9 Limitations of the Study

It was anticipated that some participating caregivers may not be able to recall all the foods consumed within the last 24 hours or by mentioning foods that were not consumed with the intention of impressing the researcher. Caregivers may not also be able to recall foods consumed by children outside the household.

This did not affect the outcome of the dietary diversity score.

CHAPTER FOUR

RESULTS

4.0 Introduction

A total of 280 participants were recruited for the study. Demographic data, household characteristics, dietary consumption and anthropometric data were collected. The results of the study are presented in this chapter. Univariate analysis, bivariate and multivariate analysis were done for the quantitative data whilst the qualitative data was analysed using framework analysis. Descriptive and inferential statistics were used to explain the results.

4.1 Socio Demographic Characteristics of Mothers/Caregivers

The mean age of the mothers/caregivers was 23.72 ± 8.33 with a minimum age of 13 and a maximum of 41. The proportion of teenage mothers/caregivers in the study sample was 23.9% (67) whilst those within the age group of 20-29 years were 26.4% (74). Most of the mothers/caregivers were within the age group of 30-39 years and formed 32.6% (91) of the study sample whilst those who were beyond 40 years formed 17.1% (48) of the study sample as shown in table 4.1below.

The study also found that majority of the mothers/caregivers were married and formed 92.0% (258) of the study sample whilst those who were single and have never married formed only 4.3% (12) of the study sample. There were only 1.2% (3) widows in the study sample whilst 2.5% (7) were divorced.

Table 4.1: Socio demographic characteristics of caregivers/mothers

Variable	Frequency (n=280)	Percentage
Age group		
10-19	67	23.9
20-29	74	26.4
30-39	91	32.6
40-49	48	17.1
Marital Status		
Single	12	4.3
Married	258	92.0
Divorced	7	2.5
Widowed	3	1.2
Religion		
Islam	211	75.3
Christianity	64	22.8
Traditionalist	5	1.9
Ethnicity		
Dagomba	151	53.9
Gonja	78	27.8
Dagaaba	18	6.5
Others	33	11.8
Educational Level of Mothers		
No formal education	126	45.0
Basic education	99	35.4
Secondary education	34	12.1
Tertiary	21	7.5

With regards to the tribal or ethnic distribution of the mothers / caregivers, the results show that Dagombas were the dominant tribe in the study sample and formed 53.9% (151) of the study

sample. Gonjas formed 27.8% (78) of the study sample whilst Dagaabas formed 6.5% (18) of the study sample. Some of the s mothers /caregiver belonged to other minority tribes and formed 11.8% (33) of the study sample. The results also showed that Muslims were the majority of the study sample and formed 75.3% (211) whilst Christians formed 22.8% (64). Traditionalists were the least religious group in the study sample and formed 1.9% (5) of the study sample. Table 4.1 above shows the socio demographic characteristics of the caregivers/mothers.

In table 4.1 above, the assessment of the educational level of the mothers /caregivers showed that majority of the mothers /caregivers did not have any level of formal education. The proportion of mothers /caregivers who were not formally educated was 45.0% (126) whilst 35.4% (99) were only educated to the basic level. The study results also showed that 12.1% (34) of the mothers / caregivers were educated to the secondary level whilst 7.5% (21) were educated to the tertiary level.

4.3 Assessment of Infant and Young Child Feeding (IYCF) Practices

The feeding practices of the mothers / caregivers were assessed by this study. It was found that majority of the mothers initiated breastfeeding within the first hour after delivery. The proportion of mothers who initiated breastfeeding within the first hour after delivery was 72.8% (204) whilst those who initiated breastfeeding after the first one hour of delivery was 27.2% (76). The results also showed that 29.6% (83) practiced prelacteal feeding whilst majority of them representing 70.4% (197) reported that they did not practice prelacteal feeding. Majority of the newborns 63.9% (179) were given the first yellowish milk (colostrum) as the first feed after delivery, though some mothers 36.1% (101) did not feed their children with colostrum.

Those who practiced prelacteal feeding fed their newborns on food items including plain water herbal concoctions and gripe water. The results showed that majority thus 43.4% (36) of the mothers who practiced prelacteal feeding gave gripe water to their newborn babies whilst 33.7% (28) gave plain water to their babies. Only 22.9% of the mothers gave herbal concoctions to their babies as shown in table 4. 2

The results also showed that some of the mothers did not practice exclusive breastfeeding for the first six months. The results showed that most of the women fed their babies on home-made foods such as porridge and other household foods. Those who fed their babies on home-made foods were 44.0% (59) whilst 17.9% (24) fed their babies on commercially produced infant formulas.

Table 4.2: Analysis of IYCF practice

Breast Feeding Practice	Frequency	Percentage
Timely initiation of breastfeeding		
During the first 1 hour	204	72.8
More than 1 hour	76	27.2
Prelacteal feeding		
Gave prelacteal feeding	83	29.6
Did not give prelacteal feeding	197	70.4
Prelacteal feeds		
Plain water	28	10.0
Gripe water	36	12.9
Herbal concoctions	19	6.8
Not applicable	197	70.3
Colostrum feeding		
Gave it to the baby	179	63.9
Discarded it/spilled it	101	36.1
Food Supplements given to babies in the first 6 months		
Commercially produced Infant formula	24	8.6
Any available infant formula (e.g Cerelac)	51	18.2
Home-made infant foods (e.g porridge)	59	21.1
Not applicable	146	52.1
Breastfeeding in the past 24 hours		
Breastfed in the past 24 hours	63	22.5
Did not breastfeed in the past 24 hours	217	77.5

4.4 Nutritional Status of Children

The magnitude of malnutrition among the children was quantified using three anthropometric indicators:Weight-for-height (acute),Height-for-age (chronic) and Weight-for-age (underweight). The prevalence of chronic malnutrition in the whole sample was 12.3 (Table 4.3).

The underweight of the study was (11.1%), wasting (5.0%) or (12.0%MUAC) and stunting (12.3%).

Table 4.3: Prevalence of underweight, wasting and stunting among the children

	WAZ (Underweight)	WHZ (Wasted)		HAZ (Stunted)
		WH	MUAC	
Moderate	12 (11.1%)	7(5.0%)	13 (12.3%)	13 (12.3%)
Severe	-	-	-	-
Total (Global)	**12 (11.1%)**	**7 (5.0%)**	**13 (12.3%)**	**13 (12.3%)**
Mean Z score	-0.95	0.19		0.79
SD	1.49	2.80		2.69
% below -2 SD	1.81	2.53		2.11

Abbreviations: HAZ, height-for-age- z-score, WHZ, weight-for-height z-score, WAZ, weight-for-age z-score

It was also established that, there is a relationship between household wealth index and the nutritional status of the children. Children from households with high wealth index had a better nutritional status as compared with their counterparts from households with low wealth index.

The results of the study showed that only 11.1% of children from households with high wealth index were underweight as compared to the 25.7% of children from households with low wealth

index. The results also showed that 12% of the children from households with high index were stunted as compared to the 20.0% of stunted children from households with low wealth index.

Wasting was very low (5.0%) among children from households with high wealth index as compared to 20.0% of wasted children from households with lower wealth index. Table 4.4 shows the relationship between household wealth index and nutritional status of children.

Table 4.4: Comparison of Nutritional Status with household wealth index

Nutrition Indicators Against wealth index					
Indicator	**Nutritional Status**	**High wealth index No. (%)**	**Low wealth index No. (%)**	**p-value**	**χ^2- value**
WAZ	Normal	268(88.9)	208 (74.3)	0.001	16.3
	Underweight	12(11.1)	72(25.7)		
HAZ	Normal	267 (87.7)	195(69.6)	0.001	23.5
	Stunted	13(12.3)	85(20.4)		
WHZ	Normal	273(95.0)	224(80.0)	0.001	18.6
	Wasted	7(5.0)	56(20.0)		

4. 5 Childhood Morbidity and Vitamin A supplementation

An assessment of childhood morbidity shows that coverage in child immunization status, and vitamin A supplementation. The coverage of these important public health interventions varied.

Table 4.5: Childhood Morbidity and vitamin A supplementation

Factor	Frequency	Percentage
Diarrhoea among children in the last 2 weeks		
Had diarrhoea in the past 2 weeks	78	27.9
Did not get diarrhoea in the past 2 weeks	179	63.9
Cannot remember	23	8.2
Cough among children in the last 2 weeks		
Had cough in the past 2 weeks	56	20.0
Did not get cough in the past 2 weeks	224	80.0
Vitamin A supplementation in last 6 months		
Received Vitamin A in last 6 months	64	22.9
did not receive vitamin A in last 6 monts	216	77.1
Utilization of Insecticide Treated Net (ITN)		
Used ITN	53	18.9
Did not use ITN	227	81.1
Fever among children in the last 2 weeks		
Had fever in last 2 weeks	47	16.8
Did not get fever n last 2 weeks	180	64.3
Cannot remember	53	18.9

The incidence of diarrhoea in the two weeks prior to the study was 27.9% (78). Prevalence of fever was lower than that of diarrhoea thus 16.8% (47). The proportion of the young children who had a cough was 20.0% (56) whilst 22.9% (64) of the children received vitamin A supplementation. The utilization of ITNs was also assessed. It was observed that 18.9% (53) were using ITNs. Table 4.5 above shows the childhood morbidity and the use of some public health interventions.

4.6 Child Immunization

Bacillus Calmette Guerin (BCG) Vaccination (Presence of BCG scar) coverage was high in the communities with about 94% coverage whilst immunization against measles was 92% in the study area. The proportion of children who were vaccinated against yellow fever was 86.8% children are vaccinated against Poliomyelitis by given them three doses of vaccines. The results of this study showed that majority of the children received all the vaccines and represented 95.7% whilst 3.2% received only two of the vaccines. There was a full or total coverage (100%) for Penta 1 and 2 as all the children received these vaccines. Pneumococcal and Rota vaccines recorded the lowest rates in the study sample as only 43.2% of the children received Rota vaccines whilst 58.6% received Pneumococcal vaccines. Table 4.6 shows the immunization coverage in the study area.

Table 4.6: Comparison of child immunization and availability

Factor	Frequency	Percentage
Children (9-59 months) immunized against measles		
Was immunized against measles	258	92.1
Was not immunized against measles	22	7.9
BCG vaccination coverage		
Had BCG immunization	262	93.6
Did not receive BCG immunization	18	6.4
Yellow fever vaccine		
Was vaccinated against yellow fever	243	86.8
Was not vaccinated against yellow fever	37	13.2
Polio Vaccines (before 6 weeks)		
All the three vaccines(OPV1-3)	268	95.7

OPV(1-2)	9	3.2
OPV (1only)	3	1.1
Penta1	280	100.0
Penta 2	280	100.0
Penta 3	264	94.4
Pneumococcal vaccines		
Received pneumococcal vaccination	164	58.6
Did not receive pneumococcal vaccination	116	41.4
Rota Vaccine		
Received Rota vaccination	121	43.2
Did not receive Rota vaccination	159	56.8

4.7 Economic Status and Household Wealth Index of Respondents

The study found that 186 of the respondents belonged to households with low wealth index whilst 94 were in the high wealth index as shown in table 4.7 on page 84

Table 4.7: Classification of household wealth index

	No.	Mean	Std. Deviation	Lower Bound	Upper Bound
Low	186	4.6	3.2	4.2	5.1
High	94	7.3	2.2	6.7	8.0
Total	280	3.2	3.2	3.0	3.5

The results of the study showed that 27.8% (78) of the mothers/caregivers were petty traders whilst 4.7% (13) were engaged in craftsmanship. Farming was the main occupation of the caregivers/mothers as 38.9% (109) were farmers. The proportion of salaried workers among the

mothers/caregivers was only 7.2% (20). However, about 10% (28) of the mothers /caregivers were unemployed as shown in table 4.6 on page 83.

The occupation of the fathers or household heads was assessed. The results showed that more women were involved in trading activities than men because only 11.5% (32) of the men were involved in trading activities whilst 45.3% (265) were farmers. The proportion of salaried workers among the fathers and household heads and formed 18.9% (53) of the study sample. Table 4. 8 shows the occupational distribution of the caregivers/mothers and the fathers of the children.

Table 4.8 Socio-economic distribution of respondents

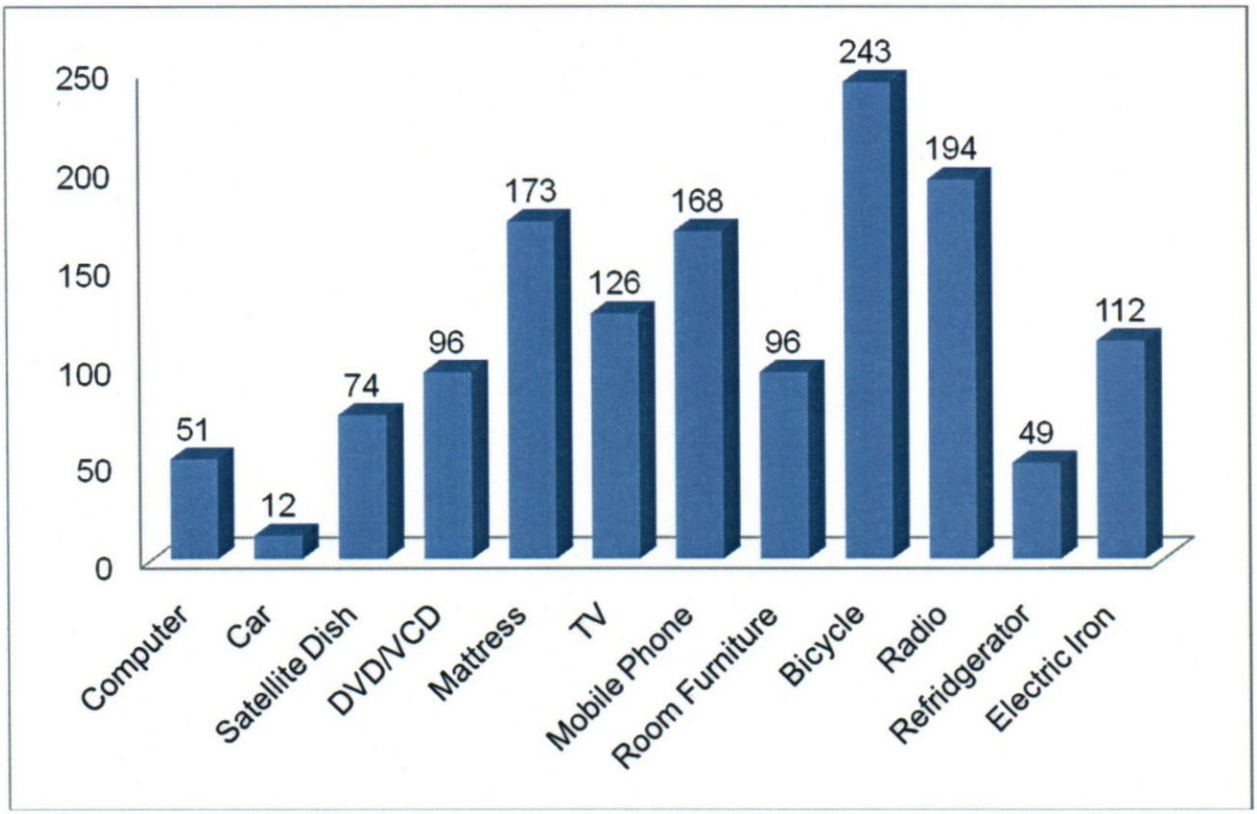
Variable	Frequency	Percentage
Occupation of Mother		
Petty trading	78	27.8
Craftsmanship	13	4.7
Farming	109	38.9
Salaried worker	20	7.2
Others	32	11.4
Unemployed	28	10.0
Occupation of father		
Trader	32	11.5
Craftsmanship	48	17.2
Farming	127	45.3
Salaried worker	53	18.9
Others	14	5.0
Unemployed	6	2.1
Type of Farming		
Subsistence	113	89.0
Commercial	14	11.0
Not applicable	153	

4.7.1 Household Assets

A household wealth index based on household assets and housing quality was used as a proxy indicator for socio-economic status (SES) of households. An absolute measure of household wealth (wealth index) used in this study is based on an earlier concept developed by Garenne & Hohmann (2003), whereby the sum of dummy variables created from information collected on housing quality (floor, walls, and roof material), availability of electricity, water and type of toilet facility, and ownership of household durable goods and livestock (e.g. bicycle, television, radio, motorcycle, sewing machine, telephone, cars, refrigerator, mattress, bed). These facilities or durable goods are often regarded as modern goods that have been shown to reflect household wealth. A household of zero index score for example means that household had not a single modern good. The scores were thus added up to give the proxy household wealth index. The index varied from 0-18. Households that had a wealth index score of 13 and below were classified as having a low wealth index score and those that had a wealth index score of 14 and above were classified as having a high wealth index score.

Majority of mothers/caregivers assessed of the household assets showed that bicycle was the commonest asset owned by the households as 86.8% (243) of the study households owned bicycle. Only 4.3% (12) of the households owned cars whilst 18.2% (51) owned computers. The proportion of respondents or households that owned mobile phones was 60.0% (168) whilst 61.8% (173) owned mattresses.

Figure 4.1: Household assets



An assessment of the household assets was also done after which a composite index was created to categorize the households into low and high household wealth index.

The variables that were used in creating the an absolute measure of household wealth (wealth index) include housing quality (type of floor, walls, and roof material), availability of electricity, water and type of toilet facility, and ownership of household durable goods and livestock (e.g. bicycle, television, radio, motorcycle, sewing machine, telephone, cars, refrigerator, mattress, bed).

4.8 Dietary Intake and Dietary Diversity of the Respondents

Dietary diversity scores are calculated by summing the number of food groups consumed in the household or by the individual respondent over the 24-hour recall period.

Calculating Dietary Diversity Score (DDS) a code was assigned from 0-*n* where *n* represented number of food groups being consumed. The household dietary diversity score was then based on twelve (12) food groups as proposed by FANTA. Therefore in this study the food groups were assigned with numbers from Zero (0) to twelve (12). This implies that the score range for household dietary diversity was 0-12. The number one (1) was assigned to any food group consumed. The dietary diversity scores was calculated by summing the number of food groups consumed in the household or by child over the 24-hour recall period (Swindale and Bilinsky, 2006).

4.8.1 Consumption of Foods Based on Food Groups

The food groups consumed by children were assessed. The food consumption score was calculated by counting the number or frequency of consumption of the individual food groups over the past 24 hours prior to the study.

A 24 hour dietary recall assessment showed that all the respondents representing 100% consumed cereals whilst 98.5% consumed root tubers. The lowest consumed food group was eggs with a consumption score of 9.3%. The consumption of organ meat like kidneys, liver or heart in the study sample was 47.9% whilst 95.3% consumed meat or flesh in the past 24 hours preceding the study.

Table 4.9: Household food consumption

Food Group	Frequency (n= 600)	Percentage
Roots and Tubers	276	98.5
Dark green leafy vegetables	261	93.2
Vitamin A rich vegetables	179	63.9
Cereals	280	100.0
Other vegetables	216	77.1
Milk and milk products	82	29.3
Other fruits	121	43.2
Flesh meat	267	95.3
Eggs	26	9.3
Fish and sea food	104	37.1
Legumes, nuts and seeds	259	92.5
Vitamin A rich fruits	234	83.6
Oils and fat	276	98.6
Sweets	103	36.8
Spices, condiments and Beverages	98	35.0
Organ meat	134	47.9

Fish consumption was found to be low as compared to flesh meat as only 37.1% consumed fish in the past 24 hours. The consumption of vitamin A rich vegetables was found to be lower than that of flesh meat because only 63.9% consumed vitamin A rich foods. Consumption of milk and milk products was only 29.3% as shown in table 4.8 below.

4.9 Factors that Influence Households Dietary Diversification (Bivariate Analysis)

There are different factors that influence. The mean dietary diversity score (DDS) of the study sample was 7.40 ±1.81 and this implies dietary diversification was high in the study sample. An Analysis of Variance (ANOVA) showed that children of younger mothers / caregivers were found to have the least DDS because teenage mothers had a DDS of 5.88±1.34 whilst those within 40-49 years had the highest DDS of 7.98 ± 1.50 as shown in table 4.9

The results showed that as age of mother increases, the mean DDS also increased thus older mothers were found to have a higher dietary diversification than the younger mothers ($P<0.003$, $\chi^2= 8.24$). This trend could be attributed to the ability of these persons and their husbands to afford to buy the food stuffs because as age increases the person becomes well established in her career.

There was also a variation in dietary diversification between married and unmarried caregivers/mothers. Married mothers/caregivers had a higher mean DDS of 7.01 ± 1.12 whilst those who are single had a mean DDS of 5.42 ± 1.22. Widows and divorced mothers had the least DDS of 5.01 ± 1.02. The test of significance was $P< 0.001$ and a Chi square ($\chi^2= 13.22$). The educational level of caregivers/mothers was also a significant determinant of dietary diversification of households. Higher level of education was significantly associated with high mean DDS thus 7.92± 2.51 whilst caregivers/mothers without any formal education were found to have the least mean DDS of 5.1 ± 2.62. The results showed that, as the maternal level of formal education increased, the mean DDS also increased ($P<0.001$, $\chi^2= 23.01$) as shown in table 4.10 below.

Table 4.10: Factors that influence household dietary diversification

Variable	Frequency (n= 600)	Percentage	Mean DDS	P-value
Age group				
10-19	67	6	5.88±1.34	
20-29	74	21.2	7.03±1.41	
30-39	91	35.5	7.57±1.48	χ^2= 8.24
40-49	48	24.7	7.53±1.49	0.003
Marital Status				
Single	12	13	6.01±1.23	
Married	258	85.7	7.31±1.37	
Divorced	7			χ^2= 13.27
Widowed	3	1.3	5.11±1.61	0.001
Educational Level				
No formal education	126	45.0	5.40±2.62	
Basic	99	35.3	5.51±2.24	
Secondary	34	12.1	7.54±2.46	χ^2= 20.02
Tertiary	21	7.5	7.92±2.51	0.001
Wealth Index				
Low	186	66.4	3.44±1.02	χ^2= 41.61
High	94	33.6	7.54±1.05	0.001

P is significant at < 0.05

An assessment of the household assets was also done after which a composite index was created to categorize the households into low and high household wealth index.

The variables that were used in creating the an absolute measure of household wealth (wealth index) include housing quality (type of floor, walls, and roof material), availability of electricity, water and type of toilet facility, and ownership of household durable goods and livestock (e.g.

bicycle, television, radio, motorcycle, sewing machine, telephone, cars, refrigerator, mattress, bed). The scores were thus added up to give the proxy household wealth index. The index varied from 0-16. Households that had a wealth index score of 11 and below were classified as having a low wealth index score and those that had a wealth index score of 11 and above were classified as having a high wealth index score.

Household wealth index was found to be most significantly associated with dietary diversification. Respondents from households with high wealth index were found to have the highest mean DDS of 7.54 ± 1.05 whilst those from households with low wealth index had a lower mean DDS of 3.44 ±1.22. The relationship between household wealth index and household food diversification is strongly associated with a $P< 0.001$ and $\chi^2= 41.61$. The relationship can be attributed to higher purchasing power of respondents from households with high wealth index. Table 4.10 above shows the factors that influence dietary diversification.

4.10 Determinants of Household Dietary Diversity (Multivariate Analyses)

Multivariate analyses were applied to the variables that were found to have significant relationship with dietary diversification in the bivariate analyses.

To determine the contribution of each independent variable on household dietary diversity by confounding variables were controlled. The independent predictors of household dietary diversity. The set of predictors accounted for 63.4 % of the variance in mean DDS (Nagelkerke R Square = 0.52).

Compared to households with lower wealth index, households with high wealth index were 82.0 % were more likely to have a mean DDS of more than 8.2 (AOR = 0.22, CI: 0.7 to 0.9). Again, compared to women of no formal education, women who attained at least secondary level education were 6.8 times more likely of having a DDS of 6.5 (AOR = 41.8, CI: 12.42 - 14.09).

The child's nutritional status was also assessed by this study. It was found that household wealth index and educational status of caregivers/mothers were again found to be strong determinants of nutritional status of children. The occupation of the mother and food group consumption score was also found to be significant predictors of child's nutritional status. These two set of predictors accounted for 26 % of improved nutritional status of children. Using the beta coefficients, the strongest predictor of nutritional status was the frequency of food consumption from the various food groups. A unit increase in food groups consumption increased the child's weight by 0.93 standard units (beta coefficient = 0.93). Similarly a unit increase in household dietary diversity increased child's weight by 0.76 standard units (beta coefficient = 0. 76). Type of occupation of household head was a stronger predictor of weight and height of the child than the age of caregiver/mother. Women of high educational status had children with weight high by 0.62 standard units compared to women without formal education (beta coefficient = 0.62). Female babies were had a better nutritional status than male babies by 0. 41 standard units.

Table 4.11 Determinants of nutritional status of children

Model	Standardized Coefficients	T	Sig.	95.0% Confidence Interval for B	
	Beta			Lower Bound	Upper Bound
(Constant)		5.602	<0.001	0.55	1.14
Gender of baby	0.53	4.410	<0.001	0.08	0.24
Household Dietary diversity	0.60	8.556	<0.001	0.08	0.13
Food group frequency score	0.76	5.467	<0.001	0.03	0.06
Occupation of mother	0.10	2.911	0.004	0.06	0.30
High educational level	0.62	-6.688	<0.001	-0.24	-0.13

4.11 Socio Economic Status and its Relationship with MUAC

The MUAC reading as an indicator of nutrition status is highly dependent on the socio economic status of a person. In this study, household asset ownership was used as a proxy indicator of the socio-economic status. When Pearson, correlation was done, there were significant positive correlations between MUAC reading and the ownership of assets (r= 0.229, p = 0.02) (Table 4.11). The higher the number of assets owned, the higher the MUAC denoting a better nutrition status.

There was a positive linear relationship between the MUAC reading and the total assets owned whereby the MUAC reading increased with an increase in the number of total assets owned and therefore the total assets owned were significant predictors of the MUAC of the child.

The Linear regression equation: MUAC=19.767+0.251(Total assets owned), p=0.028. Pearson correlation showed that DDS was positively correlated with ownership of assets and therefore an increase in the assets owned indicates an increase in the DDS. The relationship was significant (p <0.005) or P<0.001). When regression was done, there was a positive linear relationship between the DDS and the total assets owned whereby DDS increased with an increase in the number of assets owned. DDS=4.687 (constant) +0.110 (total assets), p=0.43.

Table 4.12 : Relationship between socio-economic status and MUAC reading

		MUAC reading	**Total Assets out of 14**
MUAC reading	Pearson Correlation	1.00	0.342
	sig (2-tailed)		0.02
	N	280	
Total Assets	Pearson Correlation	0.342	1.00
	sig (2-tailed)	0.02	
	N	280	280
Total Assets out of 14			

Correlation is significant at the 0.01 level (2-tailed).

4.12 Results from Focus Groups Discussion

Qualitative data was gathered according to some selected topics or themes of interest which included knowledge of infant feeding practices, knowledge on dietary diversification and the

factors that influence dietary diversification. These were again compared or linked to the results of the quantitative data.

Knowledge of infant feeding practices:

During the Focus Group Discussions (FGDs), the knowledge of the caregivers/mothers was assessed on infant and young child feeding practices. The findings revealed that over 60% of the discussants were having adequate knowledge on exclusive breastfeeding and complementary feeding .They were able to provide information on the various food groups necessary for the proper growth of children. These are some of their statements;

…"*we were told that a child should be breastfed exclusively for six months after delivery. The child should not be given any liquid, food, concoction and drugs apart from those prescribed by medical officers*"……**(woman from Malshegu)**

…."*during the antenatal care, I was advised that a child should not be fed on anything apart from breast milk for the first six months after delivery. It makes the child to be healthy and brilliant*"…….***(woman from Choggu hilltop)***

…."*after six months, the child should be given some semi-solid foods to supplement the breast milk because at that period the child needs more energy and nutrients to grow which the breast milk alone cannot provide*"….***(woman from Dungu)***

…" *I was advised by the nurses and midwives to breast feed the child to maximum of two years. The child should be fed on green leafy vegetables, eggs, beans and organ meat. They are mentioned in the antenatal records card*"….***(woman from Zagyuri)***

*...."it is not advisable to feed the child on the food prepared for the entire household. The child's food should be prepared separately from the households' foods because the child needs special nutrients to grow healthy"..... **(woman from Malshegu)***

*..."I think that a child should be fed on beans mixed with green vegetables and fish. This will make the child to grow healthy and strong"....**(woman from Choggu Mmaaayili)***

*..."during antenatal care, we were told to prepare the child's food in clean containers and should not be feeding the child on left-over foods for many days. The child should be fed more green vegetables, eggs, meat and fish"..... **(woman from zagyuri)***

4.12.1 Knowledge of Dietary Diversification and Factors that influence Dietary Diversification

During the FGD sessions, the knowledge of discussants was to assesses the importance of dietary diversification and the factors that influence it. The results showed that respondents know the importance of dietary diversification. The following are some of the statements made by the discussants;

*..."it is not good to be eating one type of food for a long time. You have to make sure you eat different types of food within a day and throughout the week. This will help you to get all the necessary nutrients for good health especially among children. However, because we don't have money it is difficult to get all the necessary food items for consumption"..... **(woman from Dungu)***

*....."doctors and nurses always tell us to eat different types of food especially green vegetables and fruits. They advised us to eat different food items so that we don't fall sick. But some of these foods cannot be gotten all the time especially during the dry season. They are always expensive so you cannot buy them if you are not rich".....(**woman from Malshegu**)*

*...."children need a lot of nutrients to grow very well. They need meat, fish , eggs, milk, vegetables etc because they are still growing. But we the adults are no longer growing so we don't need such food items urgently like the children"...(**woman from Dungu**)*

*...."during my pregnancy, the nurses taught us to eat different types of foods within a week, That we should not be depending on "Tuo-zaafi" or fufu alone but we should be eating different types of foods. They also advised me to prepare different types of foods for the child. I have been trying to do that but sometimes I don't have enough money to buy all the necessary food items. Sometimes I have to feed the child on the available food for the household because of poverty"....(**woman from Katariga**)*

*..." we eat the food stuffs harvested from my husband's farm. He cultivates yams, cassava and beans. So most of the time our meals are prepared from these food stuffs because we don't have money, we are not able to buy foods from the market so we eat what we have"...(**woman from Sognaayili**)*

The findings from the FGDs corroborate that of the quantitative findings analyzed and presented in tables and charts. The FGDs were conducted among mothers/caregivers who were not interviewed with structured questionnaires. This was to avoid repetition of responses from mothers/caregivers.

CHAPTER FIVE

DISCUSSION OF RESULTS

5.0 Introduction

The discussion of the results of the study is presented in this chapter. The findings have been discussed in relation to findings of similar studies in Ghana and the entire world. In areas where the findings contradict or are not in agreement with that of other studies, reasons are given for the possible causes of the disparities in the findings.

5.1 Socio Demographic Characteristics of Mothers/Caregivers and their Husbands

Some of the mothers were found to be below 20 years or in their teen ages. This is consistent with report of the Ghana Health Service and Ghana Statistical Service (2008) in the Demographic and Health Survey that was conducted in 2008 which found that some of the mothers were teenagers and this was more prevalent in the three northern regions of Ghana. In the GDHS, it was found that 13% of teenagers were already mothers or had given birth. However, in this current study, it was established that about 23% of the mothers/caregivers were teenagers. The high proportion of teenage mothers in the study sample could be attributed to the fact that the district capital of the Sagnarigu District is peri-urban with majority of its communities being rural. Rural communities have been reported to have teenage mothers and high fertility rates (Ethiopian Demographic and Health survey, 2006 and AbouZhar et al, 2010).. This corroborates the assertion by the UNICEF (2011) in its Multiple Indicators Cluster Survey Report that women who are more than 40 years have declining fertility and most of them were not found to be breastfeeding mothers. It is also consistent with the results of a study conducted

by Stephenson et al (2007) in Kenya which states that as the age of women increases, there is a decline in child bearing because most of them especially those from the rural areas start child bearing early and their interest in sex and child bearing reduces or declines after 40 years. The results of the study showed that 92.0% of the respondents were married. This percentage of married women is higher than the national figure of 42.9% in Ghana as found by the 2010 Population and Housing Census. The findings are also consistent with that of Mahama and Mariam (2013) who found that Muslims dominate the whole of the Northern region of Ghana.

This study also found that most of the caregivers/mothers did not have any level of formal education. About 45% of the study sample were not formally educated to any level whilst 35.0% were only educated to the basic level. The study results also showed that 12.1% of the caregivers/mothers were educated to the secondary level whilst 7.5% were educated to the tertiary level. From this current study, the percentage of caregivers/mothers without formal education was twice higher than that of the national average of 21% provided by the Ghana Demographic and Health Survey of 2008. However, the findings are consistent with GDHS assertion that two-thirds of women in the Northern region of Ghana have no formal education. The results are again, not consistent with the findings by the GDHS that 4% of women in Ghana were educated to the tertiary level because the proportion of mothers/caregivers with tertiary education was almost twice of the national average. This could be attributed to the passage of time since the Demographic and health Survey was conducted in 2008. There is therefore an improvement in female education which may be as a result of government policies and interventions to support female education.

The findings on educational level in this study are also consistent with that of the Ethiopian Demographic and Health Survey (2006) that women education in is low due to their reproductive roles.

5.3 Infant and Young Child Feeding (IYCF) Practices

An assessment of the infant feeding practices among the mothers /caregivers indicated that majority of the mothers thus 72.8% initiated breastfeeding within the first hour after delivery. This shows that timely initiation of breastfeeding among the mothers/caregivers is high. This finding corroborates that of GDHS (2008), UNICEF (2011) and Mahama and Mariam (2013) who found that over 70% of mothers initiated breastfeeding within the first hour after delivery. This was attributed to the high level of campaign or education on exclusive breastfeeding. This is good for improved child health.

Significantly, the practice of prelacteal feeding among the mothers was 29.6% in the study sample. The practice of prelacteal feeding is not a good one because children can get infection through it. About 70% of the caregivers did not practice prelacteal feeding which is commendable. This is consistent with the findings of Akpota and Gurung (2009) who found that the practice of prelacteal feeding among rural women living in Nepal was less than 30%. The results are however not consistent with that of Mahama and Mariam (2013) who found that 16% of caregivers/mothers from rural areas in northern Ghana practiced prelacteal feeding. The discrepancy in the practice of prelacteal feeding between this current study and their study could be attributed to the sample size and level of education among these women. However, this study found that majority of the newborns (63.9%) were given the first yellowish milk (colostrum) as the first feed after delivery, though some mothers which is lower than the 84% established by

Mahama and Mariam (2013), and the 70% established by UNICEF (2011). The practice of prelacteal feeding was done by the use of food items including plain water, herbal concoctions and gripe water. But majority of the mothers gave gripe water to the newborn babies. This confirms the findings of Hill et al, (2010) who found that women living in rural areas in Ghana give herbal preparation to their babies before breastfeeding is initiated. The study found that most of the caregivers fed their babies on home-made foods for the entire households. This is consistent with the findings of Khadduri et al, (2008) who reported that infants in Pakistan were fed on available foods for the entire households. The proportion of caregivers who fed their babies on commercially produced infant formulas was about 18% which supports the findings of Hill et al (2008) in their study in rural Ghana.

5.3 Childhood Morbidity and Vitamin A supplementation

The study assessed the coverage of child immunization status, and vitamin A supplementation. The incidence of diarrhoea among children was established at 28% in the study sample. This is higher than the past two weeks prior to the study and the prevalence of fever was lower than that of diarrhoea thus 16.8%. These findings are not consistent with that of GDHS which found that 34% of children had diarrhoea in the two weeks preceding the survey whilst 24% had fever prior to the study. The differences in the findings of this study and that of the GDHS (2008) could be attributed to the sample size differential in the two studies.

About 23% of the children received vitamin A supplementation which is lower than that of the GDHS (2008) which established that more than 30% of children in Ghana received vitamin A supplementation. The low coverage of vitamin A supplementation in the study area could have

negative effect on the health of the children since vitamin A is good for good eye sight and other physiological functions of the human body.

The coverage of BCG vaccination was reported to be 96% in the northern region in the Annual Report of the Ghana Health Service in 2014 whilst immunization against measles was 92% in the northern region which is consistent with the findings of this study. Yellow fever vaccination was found to be 86.8% whilst vaccination against poliomyelitis was 95.7%. These findings support the assertion by the UNICEF (2011) that vaccination against poliomyelitis in Ghana is now universal with over 90% of Ghanaian children receiving vaccination against poliomyelitis. The high coverage of these immunization programmes could be attributed to the education and sensitization on these programmes. There was a full or total coverage (100%) for pentavalent immunizations which is commendable in the study area for the eradication of childhood diseases.

5.4 Effect of Socioeconomic Status on the Nutritional Status of Children

In this study, the economic status of the respondents was assessed by analyzing data on the economic activities of the mothers /caregivers and that of the household heads. The household economic status was measured by creating a composite using household assets and the quality of their housing.

The study results showed that about 28% of the caregivers were petty traders whilst farming was the main occupation with about 39% being farmers. These findings are consistent with that of the Ghana Statistical Service (2012) which found that agricultural sector employ's majority of Ghanaians than any other sector. It also supports the assertion that petty trading is high among women in Ghana. This could be attributed to the fact that the level of female education in Ghana

is lower than that of their male counterparts. Farming was also found to be the main occupation for the husbands of the caregivers/mothers. The high proportion of farmers in the study sample gives an indication that study area is a rural and under-developed area. The proportion of salaried workers in the study sample was low which is consistent with the findings of the Human Development Index (2008) that few Ghanaians are employed by the public sector.

5.5 Factors that Influence Dietary Diversity

The Dietary Diversity Scores (DDS) of the children recruited for the study were calculated. This was done using the 24 hours prior to the study.

Based on various food groups, consumption of root tubers was highest at 100% closely followed by the consumption of cereals which was 98.5%. The staple foods in the study area are root tubers used to prepare *fufu,* cereals used to prepare *Tuo-zaafi* with some green leafy vegetables. A survey carried out in western Kenya observed a 100 percent consumption of cereals and root tubers which were the staple foods of the study communities. It is important to note that the survey in Kenya was done with 24 hour recall as in this current study (Ekesa et al., 2008). The findings of this study also agree with another study done in Burkina Faso in 2010 which found that the common diet included cereals (98.6%), leafy vegetables (87.1%) and root tubers (100%) (Becquey and Martin-Prevel, 2010).

The study showed that except for milk, consumption of animal based proteins which notably, are good sources of micronutrients is very high which is good in the prevention of nutritional deficiencies. The low consumption of milk can be attributed to the fact that milk is very expensive in the study area compared to meat which is relatively sold at cheaper price. The consumption of eggs and fish was low. These agree with findings of a study done in Democratic

Republic of Congo (DRC) and Burundi that indicated less than 50% consumption of foods from eggs and fish (Ekesa et al, 2011). Consumption of legumes and nuts was generally high and from the findings, it is seen that more than 90% consumed legumes which is good source of protein and for the prevention of micro nutrient deficiencies. Consumption of legumes and nuts have been reported to be significantly associated with lower risk of micronutrient inadequacy in a study that was done in Burkina Faso (Becquey and Martin-Prevel, 2010).

There was close to 50% consumption of organ meats. Low frequency of organ meat consumption has been identified as one of the risk factors for Iron Deficiency Anaemia (IDA) in a study done in Vietnam (Aikawa *et al.,* 2006). A study done in Ouagadougou, Burkina Faso found that higher intakes of organ meat and flesh foods, was significantly found to be associated with lower risk of micronutrient inadequacy (Becquey and Martin-Prevel, 2010). Another study done in Kenya in 2009 concluded that pregnant women from low socio-economic status tend to consume diets with iron of low biological value, have low haemoglobin and are generally anaemic (Waweru et al., 2009).

Consumption of Vitamin A rich vegetables and other Vitamin A rich fruits was equally high and as such reduces the risk of the children to Vitamin A deficiency. Vitamin A boosts the immunity of the children and reduces the severity of illnesses especially measles. A higher consumption of vitamin A rich fruits significantly associated with reduction in the risk of micronutrient inadequacy as found by a study done in Burkina Faso in 2010 (Becquey and Martin-Prevel, 2010).

Generally, it was found that the children consumed a diet with a high dietary diversity, however, consumption of some significant food groups such as milk, other animal based proteins such as

eggs and fish and red palm products was significantly low. Studies have found that an increased dietary diversity leads to adequate intake of the various macro and micronutrients (Thorne-Lyman *et al.,* 2009; Arimond and Ruel, 2004). As the children continue to mature there is an increase in nutritional needs in terms of macronutrients and micronutrients and therefore children are expected to increase their dietary intake in order to meet their needs. In the study however, dietary intake among some of the children was found to be below the WHO recommendations and this could be the possible reason for the prevalence of malnutrition indicators (stunting, underweight and wasting) in some children.

The factors that were found to be associated with DDS were assessed by this study. In this study, it was also found that DDS was significantly associated to the household wealth index. The DDS of households with higher wealth index was higher than those with lower household index. Significant differences in the DDS based on marital status was noted with the separated and widows having the lowest DDS compared to the married and the single indicating that socio economic status plays a key role in the determination of food choices. Consumption of poor dietary diversity has been associated with nutritional deficiencies and more prevalent among people with lower economic status and lower educational level (Mpontshane *et al.,* 2008; (Mirmiran et al., 2006). Another study done in Africa showed that nutritional deficiencies was high among younger people and those with lower educational level (Ayoya *et al.,* 2011). The findings of this study confirmed that educational level is significantly associated with dietary diversity score.

5.6 Nutritional Status of Children

The magnitude of malnutrition among the children was quantified using three anthropometric indicators: Weight-for-height (acute), Height-for-age (chronic) and Weight-for-age underweight). The prevalence of chronic malnutrition (stunting) in the whole sample was 21.0

In Ghana, more than one-quarter (28%) of all children under age five are stunted—that is, they are too short for their age. One in ten children is severely stunted. Stunting reflects a failure to receive adequate food intake over a long period of time, and is, therefore, a measure of chronic malnutrition (GDHS, 2008). This shows that stunting in the study sample is lower than the national average of 28% as established by the GDHS. This could be attributed to the passage of time and the increasing human development index recorded in the country. As the wealth index of people increase, their dietary diversity also increases which improves the nutritional status of their children. There was an association between household wealth index and the nutritional status of the children. Children from households with high wealth index had a better nutritional status as compared with their counterparts from households with low wealth index. Only 11.1% of children from households with high wealth index were underweight as compared to the 25.7% of children from households with low wealth index. It was also found that 12% of the children from households with high index were stunted as compared to the 20.0% of stunted children from households with low wealth index. The relationship between socioeconomic status of parents and its influence on the nutritional status of their children was earlier established by the Ghana Health Service and the Ghana Statistical Service (2009) and UNICEF (2011) where they found that children from households with high wealth index had better nutritional status than those from households with low wealth index. This could be attributed to the ability to buy

various types of foods from the food groups which are essential for growth. Duggan (2003) in a study in East Africa also found that children from parents living in low-resource settings were found to be malnourished. The socioeconomic status of parents was also found to be positively associated with the MUAC of the children. This is consistent with the findings of Gautam *et al.*, (2008) and González *et al.*, (2008) who established that socioeconomic status is significantly associated with the MUAC measurement of children.

CHAPTER SIX

CONCLUSIONS AND RECOMMENDATIONS

6.1 Conclusion

These are the key findings of the study;

- The magnitude of malnutrition among the children was quantified using three anthropometric indicators: Weight-for-height (acute), Height-for-age (chronic) and Weight-for-age (underweight). The prevalence of chronic malnutrition in the whole sample was 12.3%.The underweight of the study was (12.3%), wasting (5.0%) or (12.0%MUAC) and stunting (11.1%).
- It was observed that 72.8% of the mothers initiated breastfeeding within the first hour after delivery whilst prelacteal feeding was practiced by 29.6% of the mothers. The study again found that 63.9% fed their children with the first yellowish milk (colostrum) after delivery.
- The incidence of diarrhoea in the past two weeks prior to the study was 27.9% whilst prevalence of fever was 16.8%.
- An Analysis of Variance (ANOVA) showed that children of younger caregivers/mothers were found to have the least DDS because teenage mothers had a DDS of 5.88±1.34 whilst those within 40-49 years had the highest DDS of 7.98 ± 1.50. As age of mother increased, the DDS also increased ($P<0.003$, $\chi^2= 8.24$). The factors that influenced dietary diversity of the households were; wealth index or SES (AOR = 0.8, CI: 0.7 to

0.9), educational level of caregiver/mother (AOR = 14.08, CI: 12.42 - 14.09) and the marital status.

- The study found that 11.1% whilst 25.7% of children from households with low wealth index were underweight. The results also showed that 12% of the children from households with high index were stunted as compared to the 20.0% of stunted children from households with low wealth index. Wasting was very low (5.0%) among children from households with high wealth index as compared to 20.0% of wasted children from households with lower wealth index.

The mean DDS indicated that dietary diversity among the children was good as majority had high and medium dietary diversity based on the FAO categorization. The MUAC and anthropometric data indicated that majority of the children have a good nutrition status. There were significant relationships between the nutritional status of the children and other factors such as socioeconomic status, educational level and marital status. The MUAC, weight and height measurements increased with increase in wealth index. The MUAC, weight and height measurement increased with increase in the number of assets. There is an indication that the nutritional status is better with a higher socio economic status. It can therefore be concluded that socio-demographic and socio-economic factors influence dietary diversity and also the nutritional status of children.

6.2 Recommendations

Based on the findings of this study, the following recommendations are made;

- The Sagnarigu health directorate should promote dietary diversity and modification of diets through practical demonstrations in the community by Community Health Nurses is recommended.
- There is need to promote behavioural changes among mothers /caregivers with regard to intake of certain foods such as eggs and milk which are nutritious but are not eaten frequently. This should be done by the Nutrition Officers and Community Health Nurses.
- More attention should be given to the economic empowerment of women by Non-governmental Organizations and the government because wealth index is linked to the nutritional status of children

6.3 Suggestion for Further Research

It is recommended that further research should be conducted on maternal economic status and its impact on the nutritional status of their children in rural Ghana. This will help to establish the contributory effect of maternal economic status on the nutritional status of their children

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