

**REGIONAL INSTITUTE FOR POPULATION STUDIES
UNIVERSITY OF GHANA, LEGON**

**DIETARY PATTERNS AND NUTRITIONAL STATUS OF
CHILDREN UNDER FIVE YEARS IN GHANA**

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**THIS DISSERTATION IS SUBMITTED TO THE UNIVERSITY OF
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FOR THE AWARD OF MA POPULATION STUDIES DEGREE.**

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DECLARATION

I, DAVID ATOMBIRE ADUMBIRE hereby declare that, with the exception of references made to literature used which have been duly acknowledged, this work is the efforts of my original research with the guidance of my supervisor and that this work has not been presented anywhere partially or wholly for the award of another degree. Any lacunae that this research may entail are my responsibility.

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ACCEPTANCE

This dissertation has been accepted by the Regional Institute for Population Studies (RIPS), College of Humanities at the University of Ghana, Legon, in partial fulfilment of the requirement for the degree of Master of Arts (MA) in Population Studies.

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DEDICATION

To my amazing and wonderful children,

Atariwine and Atiwine, I love you.

ABSTRACT

Food insecurity and malnutrition remain global food and health challenge. This is likely to be severe in developing countries where statistics on food insecurity and malnutrition are high. This study examined the association between dietary pattern and child nutritional status using the weight-for-age as indicator.

A child was defined as having poor nutritional status (underweight) if his or her weight-for-age index was less than minus two standard deviations below the WHO reference median. Guided by previous studies, dietary diversity was measured by a composite index score based on different food components. Bivariate and multivariate analyses were used to examine the effects of dietary pattern on child nutritional status. The 2014 Ghana Demographic and Health Survey which is the main data source of this study, is based on a nationally representative sample survey of about 12,831 household interviews conducted in Ghana. This study sampled a total of 1195 children aged 6–23 months in the 2014 GDHS data set children's file.

About 17% of children under five years in Ghana were found to have poor nutritional status. Child's age, child birth size and household wealth status were found to be significant predictors of child nutritional status. However, sex of child, region, maternal education, incidence of diarrhea, place of residence and dietary pattern were found to be not significant predictor of child nutritional status.

The study did not establish any relationship between dietary pattern and child nutritional status. The study recommend that more education should be provided to pregnant women by Ghana health service to improve on the child birth size of yet born children which is key to improving the health and nutritional status of children under five years in Ghana.

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LIST OF ABBREVIATIONS

GDHS	Ghana Demographic and Health Survey
GDP	Gross Domestic Product
GSS	Ghana Statistical Service
MDGs	Millennium Development Goals
PHC	Population and Housing Census
SDGs	Sustainable Development Goals
SPSS	Statistical Package for Social Sciences
UNICEF	United Nations International Children's Emergency Fund
UNSCN	United Nation System Standing Committee on Nutrition
WHO	World Health Organisation

CHAPTER ONE

INTRODUCTION TO THE STUDY

1.1 Introduction

Good nutrition is an essential factor in children wellbeing and research on child nutritional status has gained considerable popularity in both developed and developing countries (Smith & Haddad, 2000). This increased research is partly due to the consequence of childhood malnutrition which has remains a global health problem over the decades (Amugsi et al, 2014; Ukwuani & Suchindran, 2003).

Children under five years are more vulnerable and susceptible to under nutrition (Amugsi et al., 2014; Fallis, 2013; Khalid et al, 2011). This may be due partly to their feeding pattern and habits which largely depends on caregivers. Yet some studies (Danquah, 2013; Smith & Haddad, 2000) have found evidence for negative effects of malnutrition on children's health, capacity to learn, growth, life expectancy and economic productivity when they grow into adulthood.

There are two main forms of malnutrition; under nutrition and over nutrition. According to WHO, (2013) and Yalew, (2014), about 35% of deaths in children under age five in the world are attributed to the double burden of under nutrition and over nutrition. More evidence suggests that, many children in the world especially in developing countries continue to suffer from preventable diseases such as anaemia and malaria.

Studies (Danquah et al 2013; Obiri-Yeboah, 2012) have associated the distribution of protein energy malnutrition and micronutrient deficiencies among populations to socio-economic, education, sanitation, environment, season and climatic conditions. Yet health outcome such as

nutritional status is complex and ambiguous. It is the manifestation of multiple factors or interplay of food eating habits. This study described the association of dietary patterns of children under age five in Ghana and their nutritional status focusing on underweight.

1.2 Background

The wealth of a nation is strongly connected with the health of its population. A nutritionally well-fed population is essential for economic growth and development (Gross et al, 2000). Amosu et al, (2011) posit that children under-5 years nutritional status are the basic indicator of any community's or country's nutritional status. They are the future of every nation and "malnourished infants are likely to grow into malnourished adult who are vulnerable to diseases and death"(Chandran, 2009) thereby affecting the nation's population and productivity.

According to Smith & Haddad, (2000) and Solaces, (2013) infant and young children feeding practice directly influences their nutritional status and survival. Therefore, improving nutrition, health and development of children, adolescent and women is critical to achieving goal two of the Sustainable Development Goals which is aimed at ending hunger, achieve food security and improved nutrition, and promote sustainable agriculture. Good nutrition as an essential factor in children wellbeing is therefore, closely linked to their food intake pattern.

Undoubtedly, research on child nutritional status has gained considerable popularity in both developed and developing countries (Smith & Haddad, 2000). Despite this increased research, childhood malnutrition has remains a global health problem over the decades (Amugsi et al, 2014; Ukwuani & Suchindran, 2003). Studies (Danquah, 2013; Smith & Haddad, 2000) have found evidence for negative effects of malnutrition on children's health, capacity to learn, growth, life expectancy and economic productivity when they grow into adulthood. According to WHO,

(2013) and Yalew, (2014), about 35% of deaths in children under age five in the world are attributed to the double burden of under nutrition and over nutrition.

Globally, children under five years are more vulnerable and susceptible to under nutrition (Amugsi et al., 2014; Fallis, 2013; Khalid et al, 2011) which may partly be attributed to their feeding pattern and habits which largely depends on caregivers. Studies (Danquah et al 2013; Obiri-Yeboah, 2012) have associated the distribution of protein energy malnutrition and micronutrient deficiencies among populations to socio-economic, education, sanitation, environment, season and climatic conditions.

Yet among factors, dietary pattern or food intake pattern is a key determinant of nutritional outcomes (Gross et al., 2000; Smith & Haddad, 2000). Malnutrition is not age specific, however it is worth noting that malnutrition affects children cognitive development, psychomotor development, school performance (Huong et al, 2014; Kudlová et al, 2012; Ramalho et al., 2013). Poor nutrition also affects children physical and psychological development, increase their risk to morbidity as a result, can lead to death.

Poverty according to UNICEF, (2013), is one of the underlying causes of malnutrition since poor people have low purchasing power and limited access to adequate food supply. Yet poverty is endemic in many developing countries (FAO, 2009) and Ghana is not an exception. Global statistics have indicated that, about 162 million children under the age of 5 years suffers from one form of malnutrition or the other and it is estimated that 127 million children under 5 years will be stunted in 2025 (WHO, 2014).

The SDGs report (2016) has indicated that, about 5.9 million children under five years still die from preventable causes. Many of these causes are aggravated by childhood poor nutrition which

remains a global health problem orchestrated by lack of breastfeeding, poverty, and maternal illiteracy (UNICEF, 2013, Ngnie-teta et al, 2007). By inference, the risk of and vulnerability to malnutrition in sub-Saharan African countries where poverty is widespread, is likely to be high (United Nations, 2016).

With these statistics presented above, a gloomy situation of poor nutrition is projected in the future and sub Saharan Africa and many developing countries may continue to be the worst victims. For instance, while the 5th report of the United Nation Standing Committee on nutrition have observed an increasing trend of overweight among children under the age of five in the world, the numbers are predicted to be high in sub Saharan Africa (UNSCN, 2004). According to WHO (2011), 42 million children are said to be overweight, and of this number, 35 million are living in developing countries.

In parts of Africa such as Cameroon, Egypt, Ghana and Nigeria, the prevalence of malnutrition and other related illness among children still remains high. In their study of nutritional status of under-5 children of low-income earners in a South-Western Nigerian Community, Amosu et al., (2011:578) recorded high prevalence of underweight to be 82.13% and wasting 85.15% while stunting is 33.52%.

In Cameroon, the statistics are not different. The prevalence rate of stunting and underweight were found to be 42.22% and 6.67% respectively among children under age five in Bangang rural community, Cameroon in 2014 (Mananga et al, 2014:1). Vinod et al, (2011:143) documented that, “out of 11.6 million deaths among under-five children in 1995 in developing countries, it is estimated that 6.3 million—or 54% of young child mortality—were associated with malnutrition”.

In Ghana, the prevalence of stunting (28%) is more pronounced than underweight (14%) (UNICEF, 2013). One in ten children in Ghana is reported to be severely stunted. Stunting is an indicator of chronic malnutrition and it reflects a failure to receive adequate food intake over a long period of time (ICF Macro, 2010).

One's state of health is associated with his or her nutritional status which depends on the quality of nutrients consumed as well as the ability of the body to utilize such nutrients for its metabolic needs. Unfortunately, a child under 5 years' diet intake basically depends on the feeding practices and dietary patterns offered by mothers or care-takers.

The statistics above suggest that, the battle against childhood malnutrition is challenging. The fight to maintain good nutrition and a healthy life in the world is confronted with challenges of household's access to food, poverty and hunger (Ruel, 2013). Urbanization, cultural, socioeconomic, demographic, behavioral, environmental, methods and frequency of feeding, changes in lifestyle and food habits have been recognized as some factors or practices that are directly related to nutritional status and dietary aspects of feeding (Popkin, Carolina, & Hill, 1999; Yalew, 2014) . Access to quality water and eating healthy diets are ways toward improving nutritional status of children in a developing country such as Ghana because consuming healthy diets and diversity may has influence on individual's nutritional and health outcomes.

Studies (Agbale et al, 2009; Nti, 2008) have shown evidence of the positive effects of dietary intake on nutritional wellbeing and the role dietary intake play in an individual's health promotion and development. Globally, interventions have been made to reduce poverty and food hunger by ensuring increase in food production, distribution, availability and access (Osborn, Cutter, & Ullah, 2015). Promotion of good dietary practice maybe seen as a mechanism through which

malnutrition, morbidity and mortality can be reduced within a population hence the study of the dietary pattern among a population group particularly children in Ghana is fundamentally crucial.

Therefore, more documentation need to be focused on the nutritional status of children under-five years to unearth factors that are significant predictor of child nutritional status so as to provide recommendations that would help reduce childhood stunting, anaemia and other illness prevalent among children in Ghana. This study examined the relationship between dietary patterns and nutritional status among children under-five years in Ghana.

1.3 Statement of the Problem

Under-nutrition is one of the serious health problems in the world but rather sadly the least addressed health challenge (Yalew, 2014). Globally, about 161 million children under five years were found to be undernourished in 2013 (UNICEF, 2015). In Africa, anaemia which is a form of malnutrition continues to be a major public health concern especially among children and pregnant women while stunting and underweight prevalence are high (Ewusie et al, 2014; Milman, 2011). Many studies (Eweh, 2013; Ewusie et al., 2014; Woldie et al, 2015) have linked childhood anaemia and other malnutrition conditions to maternal anaemia, food insecurity and iron deficiency. Others attribute anaemia to deficiencies in Vitamins A, D, B₁₂ and folate and infections (both Acute and chronic) (Ayoya et al, 2006; Halileh & Gordon, 2005; Milman, 2011; Woldie et al., 2015).

In public health literature, malnutrition is observed to be a major factor accounting for the total global disease burden of the world children suffering from stunting, wasting, obesity, anaemia, malaria, and pneumonia. Poor nutrition is closely related to food insecurity (Osborn et al., 2015).

In sub-Saharan Africa for instance, more than 50% of the adult population suffered food insecurity

in 2015 while one out of four children under age five suffered from stunting (Osborn et al., 2015; United Nations, 2016). The different stages of the human development process require different quantum or amount of nutrient. Studies (Osborn et al., 2015; UNICEF, 2013) argued that, the most delicate and critical transition period of human growth is the period between pregnancies, birth to five years. This period require sufficient nutrition for the growth and development of a child's full human potential.

Nutritional status outcome involves complex interactions between food consumption, the physical environment and the overall state of health and health care practices (WHO, 2001). However, few studies have recognized the impact of dietary pattern on the attainment of good nutrition or meeting nutrient requirement and reducing under nutrition (Taruvunga et al, 2013).

Therefore, the assessment of the relationship between dietary patterns and nutritional status of children in a rapidly urbanizing country like Ghana is crucial. Notably, the period of 0-59 months remains a critical state in human growth and therefore, malnourished children within this age may grow into malnourished adult who are likely to be at greater risk of death and severe illness due to common childhood infections.

Overweight and obesity are associated with common diseases such as diabetes, hypertension, cancers and other related illness, which are prevalent in Ghana. If the current trend of childhood malnutrition in Ghana persists, the country is likely to face an increase in child mortality, reduction in future labour force and economic productivity.

Notwithstanding this, there is paucity of literature on dietary patterns and nutritional status of children under age five in Ghana (Amugsi et al, 2014). Few studies (Abiba et al, 2012; Danquah et al., 2013; Prince & Laar, 2014), that have examined the relationship between dietary patterns

and nutritional status of infant and young children in Ghana tend to focus on the school age children and not pre-school age category. Other studies on dietary patterns and nutritional status of children have usually focused on adolescent (Awel et al, 2016; Bamidele et al, 2016) and school age children (Abdelaziz et al, 2015). Studies by Abubakari & Jahn (2016), Nti (2008) and Prince & Laar (2014) on dietary patterns and nutritional status of children, adolescent and women in Ghana have reported significant association between dietary patterns and nutritional status.

However, these studies are limited in terms of geographic scope because their focused are on specific communities and districts. The setting specificity therefore, limits these studies ability to generalize their findings. The Ghana Demographic and Health Surveys collect information on nutritional status of children under five years as well as their dietary intake. However, detail analysis of children dietary pattern is ignored. This study therefore, examined the association of dietary patterns on nutritional status among children under age 5 in Ghana by posing the following questions.

1.4 Research Questions

1. What is the relationship between the dietary patterns of children under 5 years and their nutritional status?
2. What is the relationship between household wealth and the nutritional status of children under five years in Ghana?
3. What is the relationship between maternal educational level and the nutritional status of children under five years in Ghana?

1.5 Objectives

1.5.1 General Objective

The general objective of the study is to examine the effects of dietary patterns on nutritional status of children under five years in Ghana

1.5.2 Specific Objectives

The broad objective can be achieved through the following specific objectives;

1. To assess the relationship between dietary patterns and nutritional status of children under five years in Ghana.
2. To examine the relationship between household wealth and the nutritional status of children under five years in Ghana.
3. To assess the relationship between maternal educational level and the nutritional status of children under five years in Ghana.

1.6 Rationale of the Study

This study is relevant for policy making in a country like Ghana, which is undergoing the nutrition transition (FAO, 2009 p.3). The relevance of this study is based on the fact that, it uses the GDHS data which is a nationally representative sample survey to assess the relationship between dietary patterns and nutritional status of children. The findings from this study can serve as a policy guide for the development of strategies and action plans for dietary improvement among children.

The study also unveiled among other things factors that are significantly associated with child nutritional status and provided recommendations for policy makers, health service providers and managers' key measures that can help reduce the prevalence of malnutrition in Ghana. The findings of the study provided knowledge on the consequence of poor nutritional status among

children under five years in Ghana. This knowledge gained would help policy planners to develop strategies to help reduce the increasing rate of preventable diseases such as anaemia, malaria and non-communicable diseases among children in Ghana.

Also, the usage of the GDHS data provides a good foundation for the findings of the study to be used as a nationally representative picture, depicting the dietary patterns and nutritional status of children under age five years in Ghana. The study would also serve as a reference material for future investigation into related issues.

1.7 Definition of Key Concepts

Malnutrition- is defined as lack of proper nutrition, caused by not having enough to eat, not eating enough of the right things, or being unable to use the food that one does eat. It refers to the deficiencies, excesses or imbalances in a person's energy or nutrient intake. The term covers both over nutrition and undernutrition.

Over nutrition- is a chronic intake of food more than the adequate proportion of dietary requirements of carbohydrates, oily and fatty foods chronicling overweight or obesity which results from inadequate food intake or the body's inability to utilize the needed nutrient.

Undernutrition- is as a result of lack of adequate protein, vitamin and other nutrient causing a loss of body weight. Underweight is the proxy used to measure nutritional status in this study.

Dietary patterns- refers to the quantities, proportions, variety or combination of different foods, drinks and nutrients in diets, and the frequency with which they are habitually consumed. Dietary patterns in this study is referred to the diversity of diet consumed. Three main dietary patterns are defined in the study; high, moderate and low dietary diversity.

Food security-is defined as a situation where all people, at all times, have physical, social and economic access to sufficient, safe and nutritious food that meets their dietary needs and food preference for an active and healthy life.

1.8 Organization of the Study

The study is organized into six chapters. The first chapter which is the introductory chapter covers background of the study, statement of the problem, rationale of the study, objective of the study and organization of the study. Literature review, descriptions of concepts, conceptual framework, and proposed hypotheses are discussed in chapter two. Explanations of the independent, control and dependent variables in the study are discussed in Chapter three which also covered areas such as the source of data and methodology, sampling design, data analysis techniques and sampling size. Discussions and description covering background characteristics of the respondents are captured in chapter four. The analyses and presentation of key findings, results and discussion of bivariate analysis are also discussed in chapter four. Discussions of key findings and results of multivariate analysis are featured in chapter five while Summary of key findings, conclusions and recommendations of the study are discussed in chapter six.

CHAPTER TWO

LITERATURE REVIEW

2.1 Introduction

There is considerable literature on nutritional status assessment. In general, a review and summary of the numerous nutrition assessment studies show that four main methods exist; anthropometric, biological, clinical and dietary methods. This section examines literature in all four methods with main focus on dietary methods and the three anthropometric indices. Conceptual framework, theoretical perspective, studies conducted at the global, continental and country levels that are relevant to the concept of dietary pattern and nutritional status of children are reviewed and discussed in this section.

The section examined Becker's microeconomic model of household production which sought to explain the determinants of child nutritional status. Also, the UNICEF's framework on malnutrition which forms the theoretical perspective of the present study as well as the study's conceptual framework, adapted from the UNICEF framework are all discussed in this section.

2.2 The Concept of Nutritional Status

Nutritional status is basically measured by a child growth in height and weight (ICF Macro, 2010a). Food intake directly influences an individual's nutritional status (Brhane & Regassa, 2014). However, inadequate food and poor health contribute to under nutrition (Gross et al., 2000). Good nutritional status of an individual indicates an absence of malnutrition, either over nutrition or under nutrition.

In nutrition transition, children under five years are considered important and particularly vulnerable to malnutrition because there is an increase demand for nutrient for rapid growth during this life period of the individual (Danquah et al., 2013). The cognitive, psychosocial and physical development of children occurs during this early period of childhood (Danquah, 2013; Huong et al., 2014; Smith & Haddad, 2000). Therefore, adequate nutrition is critical at this stage for the psychological and physiological development of the child as well as having good immune system to fight infectious diseases.

Thus, poor child health and nutrition have long-term economic and human development consequence in the near future because malnourished children who survived into adulthood are likely to be vulnerable to many diseases (Gross et al., 2000). The state of not having adequate nutrition is termed malnutrition which is further divided into under nutrition and over nutrition. Nutritional status is based on two main domains; growth faltering and malnutrition. Stunting, wasting, obesity are forms of growth faltering due to protein energy deficiencies whereas overweight and underweight are forms of malnourishment.

Underweight is often used as a composite measure of malnutrition whereas stunting is a long run consequence of malnutrition. The current study focused on only underweight as proxy for child nutritional status. The study also examines factors that directly or indirectly influence children under five years nutritional status in Ghana.

2.2.1 Measurement of Nutritional Status

Nutritional status is assessed through four main methods: anthropometric measurement, biological, clinical assessment and dietary recall. Among these methods, anthropometry is widely used as a technique to assess growth and nutritional status among populations. Three indices such weight-

for-height, height-for-age and weight-for-age which provides different information on growth and body composition are often taken to measure nutritional status of an individual or population. Each of these indices or anthropometric measurements taken is compared with the WHO growth standard reference.

Height-for-age index is used to measure linear growth retardation and cumulative deficit. Stunting or chronically malnourished children are those whose height-for-age Z-score is less than minus two standard deviations below the WHO child growth standard median (Ghana Statistical Service, 2015).

Weight-for-age index on the other hand, measures current nutritional status. Children with Z-scores below -2 SD from the median of the WHO reference population are acutely malnourished or wasted (thin). On the other hand a child whose weight-for-age Z-score is less than -2 standard deviations below the WHO child growth standard median for children aged under 5 years is classified as underweight (WHO, 2013). Children whose weight-for-height Z-scores are greater than +2 and +3 standard deviations above the standard median are considered to be overweight and obese respectively. This study used the weight-for-age index as a proxy for underweight which is a composite measure of current nutritional status.

2.3 Factors Associated with Nutritional Status

Several factors have been observed in literature to have a significant influence on the nutritional status of children. For instance, Chandran,(2009) documented among others some factors that account for the distribution and prevalence of malnutrition which include levels of employment, food availability, food consumption pattern, purchasing power of the people, distribution of income, intra-household food distribution, level of nutritional knowledge, literacy, availability of

government schemes and awareness. This section discussed other works that have examined the factors that determines the nutritional status of children either in Ghana or elsewhere.

2.3.1 Dietary Pattern and Nutritional Status

In nutrition literature, considerable number of studies (Abiba et al., 2012; Abubakari & Jahn, 2016; Gyasi, 2008; Nti, 2008) have examined the effects of dietary patterns on nutritional status of women, adolescent and children and argued that, dietary practices and habits play a significant role in a range of things including the state of health and body development.

Some nutrition literature (Bamidele et al., 2016; Shrestha et al., 2016; United States Department of Agriculture, 2014) have argued that diets eaten contribute to the health outcome of an individual. While some studies (Huong et al., 2014) focused on single nutrient or food and nutrition outcome, others (Abubakari & Jahn, 2016; Bhandari et al., 2016; Moreno et al., 2005; Vinod et al., 2011) used dietary pattern as a tool to explore the relationship between dietary intake and nutritional status and found some significant associations.

Information or data on diets that are consumed by children or population are usually obtain by instruments such as Food Frequency Questionnaire, 24-hour dietary recall and dietary frequency (Jitnarin et al., 2010; Krebs-smith & Hoffman, 2014; Shrestha et al., 2016).

However, dietary patterns are derived through several approaches. One approach is the diet-quality score or hypothesis-oriented which uses recommended diets or dietary guidelines to define dietary pattern. This method involves the estimation of the nutrient content or nutritional composition of the various food variables. This method is limited in this study due to the usage of secondary data hence the inability to examine the nutrient content in the food variables.

The second approach is the exploratory approach which derived dietary pattern using Principal component Analysis (PCA) and Factor Analysis (Hoffmann et al, 2003). This method is good for assessing continuous variables within a regression model but it is limited in estimating the relationship between dietary pattern and nutritional status (Thorpe et al, 2016) and because the survey did not obtain data on the number of times the foods are consumed, limits the use of this method in the current study.

Another approach uses information obtained by the food frequency questionnaire to examine dietary pattern (Nti, 2008). This method is good for studies that rely on secondary data hence applicable to the current study which is more of a retrospective research relying on past data (Thompson & Subar, 2001). This method was used in the study to classify food items into food groups.

Some other methods this study used include dietary diversity score method (Taruvunga et al., 2013) and child feeding composite index developed by Arimond & Ruel, (2002). These methods enable the study to derive a children dietary diversity score which is used to examine their nutritional status.

2.3.2 Infant and Young Children Feeding Practices and Child's Nutritional Status

According to Arimond & Ruel (2002) children feeding habits are age specific. Therefore, the quantity of food and frequency of feeding of children largely depend on their age which also has implication for their nutritional outcome. However, literature have shown that children in developing countries minimum feeding frequencies often depend on the energy output of complementary food.

According to Ghana Statistical Service et al, (2015:164), the recommended Infant and Young Children Feeding (IYCF) practices include breastfeeding through age 2, introduction of solid and semi-solid foods at age 6 months. Also, breastfed children age 6-23 months are recommended to receive animal-source foods and vitamin A-rich fruits and vegetables (WHO 2003).

The WHO has proposed that three food groups be considered as the appropriate minimum number of food groups for children under five years (Arimond and Ruel 2004; WHO, 2008; WHO 2010). Breastfeeding infants age 6-8 months are required “to receive complementary foods two to three times a day, with one or two snacks; breastfeeding children age 9-23 are to receive meals three to four times a day, with one or two snacks while non-breastfed children age 6-23 should receive milk or milk products two or more times a day for them to meet their body calcium needs” (GSS et al., 2015). By implication, a child who eats more than one food group is more likely to have good nutritional outcomes compared to one who eats food from a single food group. Yet eating diversity of diets depend on food security and its pillars (access, utilization and availability) (Taruvunga et al., 2013).

2.3.3 Micronutrients Intake and Nutritional Status

Studies (Ayiri, 2011; FAO, 2009; Gouado, 2014) have associated childhood malnutrition to micronutrients deficiencies. This means that micronutrients such as vitamins and minerals are vital for the body development, physical growth and health of children.

According to the 2014 Ghana demographic and Health Survey key findings report (2015:10) “Vitamin A, which prevents blindness and infection, is particularly important for children, pregnant women, and new mothers”. Yet projection made by United nations System Standing

Committee on Nutrition, (2004) indicates that, about 140 million preschoolers and more than 7 million pregnant women suffer from vitamin A deficiency yearly.

This has some health implication for Ghana where as low as two-thirds of children age 6-23 months are reported in the GDHS key findings report (2014:10) to have taken foods rich in vitamin A preceding the survey. Minerals such as iron present in food is also crucial for children's cognitive development and low iron intake can contribute to anaemia (GSS et al, 2015).

According to the estimates by the sixth Report on the World Nutrition Situation (2006), close to two billion people (35.2%) worldwide have inadequate iodine nutrition while about 111,000 maternal deaths occurring each year are associated with iron deficiency anaemia. The incidence of anaemia in children therefore, is a major health concern. By implication, a study into the dietary intake of infant and young children in sub Saharan Africa where the prevalence of preschool underweight is increasing is critical.

Different diet provides different nutrient for the body. Foods varieties such eggs, milk, fish, yellow fruits, green leafy vegetables and red palm oil contain some amount of Vitamins which are essential for vision, bone development and reproduction (Obiri-Yeboah, 2012). For healthy growth and mental development, the human body requires adequate iodine.

A child's mental and brain developments are enhance by the presence of iodine in diet. Yet the World Nutrition Situation 5th report, UN Standing Committee on Nutrition (2004) documented that iodine deficiency is a major cause of mental retardation and brain damage, affecting 1.9 billion people worldwide. In Ghana, "6 in 10 children are reported to have taken iron-rich foods the day before the survey"(GSS et al, 2015:11).

2.3.4 Socio-demographic Characteristics and Child Nutritional Status

Some studies (Amugsi et al, 2013; Brhane & Regassa, 2014; Chandran, 2009; Ma'alin et al, (2016b; Yalew, 2014) have related nutritional status of children to demographic factors such as sex, age, child birth weight. Other studies (Popkin & Wen Ng, 2006; Ray et al., 2000; Ukwuani & Suchindran, 2003; UNICEF, 2015) have found significant associations between child nutritional status and socio-economic factors such as maternal education, maternal wealth status.

Studies (Awel et al., 2016; Popkin et al, 1999; Prince & Laar, 2014) have also found significant relationship between nutritional status and factors such as place of residence and geographic location (region of residence). For instance, Ray et al.,(2000) in their assessment of nutritional status and dietary pattern in Siliguri found that, the magnitude of malnutrition was higher in the rural communities as compared to the urban areas. The place of residence influences dietary intake as well as physical activity which all have significant impact on nutritional outcome. Rural residence may engage in physical activities such as farming and other activities that require a lot of energy and burning fats.

Also, the age of children has an effect on their nutritional status. Several studies (Brhane & Regassa, 2014; Yalew, 2013) have admonished the role age plays in the nutritional status of children. For instance, the (GSS et al., 2015:157) has found that, while the prevalence of underweight among children under five years in Ghana was 11.0%, the peak level of underweight was found among children 18-23 months (15%). This exemplified the impact or influence of age on nutritional status.

In their study of nutritional status of children under three years in Ukraine, Nyankovskyy et al., (2014) investigated the important role of age in determining children feeding habits and its

consequence on nutritional status. Amugsi et al., (2014) also found child's and mother age to have a significant association with a child's weight-for-age (WHZ) z-score as well as height-for-age (HAZ). Awel et al., (2016) also found a significant connection between age, place of residence and sex on underweight in their study of nutritional status and associated factors among primary school adolescents. In view of these relationships espoused by previous studies, this study has controlled for the confounding effects of socio-demographic variables.

2.3.5 Maternal Educational Level, Household Wealth Index and Nutritional Status

Socio-economic variables including maternal education and household wealth status are been observed in literature to have an immersed role in child nutritional status, health and growth (Ray et al., 2000; Ukwuani & Suchindran, 2003). In similar vein, Gardner & Halweil, (2000) have documented the significance of socioeconomic variables in determining nutritional status and account that, the quality of diets consumed by a group of people reflects their social and economic status. They opined that, poor agricultural rural residents were more likely to have increased consumption of corn, sugary grain, and use of ceramic pottery (Gardner & Halweil, 2000:6). By inference, children, especially those from lower economic classes may not reach their full potential for growth due to the consumption of lower quality or poor nutritious diets.

According to the 6th report of the United Nation System Committee on Nutrition (UNSCN) (2006), maternal education is a significant determinant of children nutritional status. The report observed that, children whose mothers have higher education have higher probability of being normal weight as compared to their counterparts whose mothers have no education (United Nations System-Standing Committee on Nutrition, 2006).

Amugsi et al., (2013) in their analysis of socio-demographic patterns in child malnutrition trends in Ghana, found maternal education as significant predictor of child nutritional status. However, they found a narrow gap in underweight prevalence between children whose mothers have no education and those whose mothers have higher education. Similar study by (Ukwuani & Suchindran, 2003), found negative effects of maternal education on child nutritional status. They found that, children whose mothers have higher education were more likely to be stunted compared to their counterparts whose mothers have no education.

2.3.6 Child Birth Order, Number of Children in Household and Child Nutritional Status

The nutritional status of children can be affected by the number of children in the household. More number of children in a household means more competition for the available household food. This increased competition for food among children negatively affects the nutritional status of a child especially among poor families where food insecurity is likely to be high. The effect of number of children in a household and the rising competition for food are even more pervasive and gendered in environments where sex preference is predominant. For instance, where there is high male or son preference, mothers are more likely to devote more time and food for their sons as compared to their female counterparts (Bhattacharya, 2012).

Similarly, the birth order of a child has the tendency to positively or negatively affect the child nutritional status. Child care and feeding practices are found to be dependent on parity or birth order and vary substantially by sex composition of previous children. Evidence from the literature (Khan, Ali Khan, & Raza, 2015), has documented higher mortality rate for later born children as compared to first order born children. This may be connected to the amount of care or preferential treatment provided to the children in relation to their parity.

2.4 Children Feeding Practices and Nutritional Status

The DHS is nationally representative cross-sectional surveys that are carried out in a number of developing countries. The surveys collect information on various aspects of human life ranging from maternal and household characteristics, contraceptive use, child health and nutrition to HIV/AIDs (GSS et al, 2015). Many countries rely on the rich information provided by these surveys for policy decisions and planning while demographers may use such information for population projections. As stated already, the 2014 GDHS is the sixth round of the DHS which started in Ghana since 1998. The 2014 GDHS questionnaire contained detailed questions on infant and child feeding practices while the report has captured the appropriate minimum feeding standards for both breastfeeding and non- breastfeeding children.

With regard to children dietary information, about twenty-one different food questions were asked. Food items question were mainly into groups according to nutritional composition. Information on child feeding practices such breastfeeding and bottle use; dietary diversity and frequency (a 24-hour recall of intake of various food groups) were also collected.

However, the 2014 GDHS report has put all food items into mainly two groups; Liquids and Solid or Semi-solid food. Common food groups observed are fortified baby foods, food made from grains, fruits and vegetables rich in Vitamin A, food made from roots and tubers and protein rich food such as legumes, nuts, meat, fish, poultry, milk products and yogurt (GSS et al., 2015).

2.5 Theoretical Perspectives

2.5.1 Microeconomic Theory

Several theories have been developed by various theorists to explain the growth processes of children and factors associated with their nutritional status and health outcomes. With different

approaches, they sought to explain the network of factors that interact to shape the outcome of children nutritional status and health. The microeconomic model developed by Becker (Becker 1965) cited in (Strauss & Thomas, 1998) often known as Becker's microeconomic model of household production is one of such models which provides a useful understanding of the concept of child nutrition status which expressed the determinants of nutrition in a household micro function termed "nutrition function" (Chandran, 2009).

According to this theoretical model, as Mattila-Wiro (1999) noted, child's nutritional status is dependent on an array of health inputs such as child's nutrient intake, preventive and curative medical care, quantity and quality of time of the mother spent with child. Educational level and income status of the mother which have potential effects on the purchase of inputs such as food and medical care and implication for the nutritional outcome of children are featured in the production framework.

The nutrition function also examined factors such as obesogenic environment, biological and socio-economic which all influences child's nutritional status. They model also attempt to explain socio demographic variables such health, age, sex, birth order and behavioral factors dictated by parental preferences and how the determines child's nutritional outcome. In this view, nested interrelated variables that are observed to influence child's nutritional status are presented in nutrition function and expressed as: Child's Nutritional Status = f (nutritional input, biological factors, maternal characteristics, child's health, technological factors).

The theory suggests that, the child nutritional status analysis can be estimated at two stages; at the household level and at the child level. At the household level, the focus on the role of parents/caregivers, genetic/biological factors and the influence of other factors that might help

shape the nutrition outcome of the child. These other factors could arise from the national economic situation. In the second stage, the model focus on the child characteristics such as sex, age, birth order, birth weight and nutrients or food intake by the child. At the child level, the model explains that nutrition outcome largely depends on the child's own characteristics while holding some other factors constant.

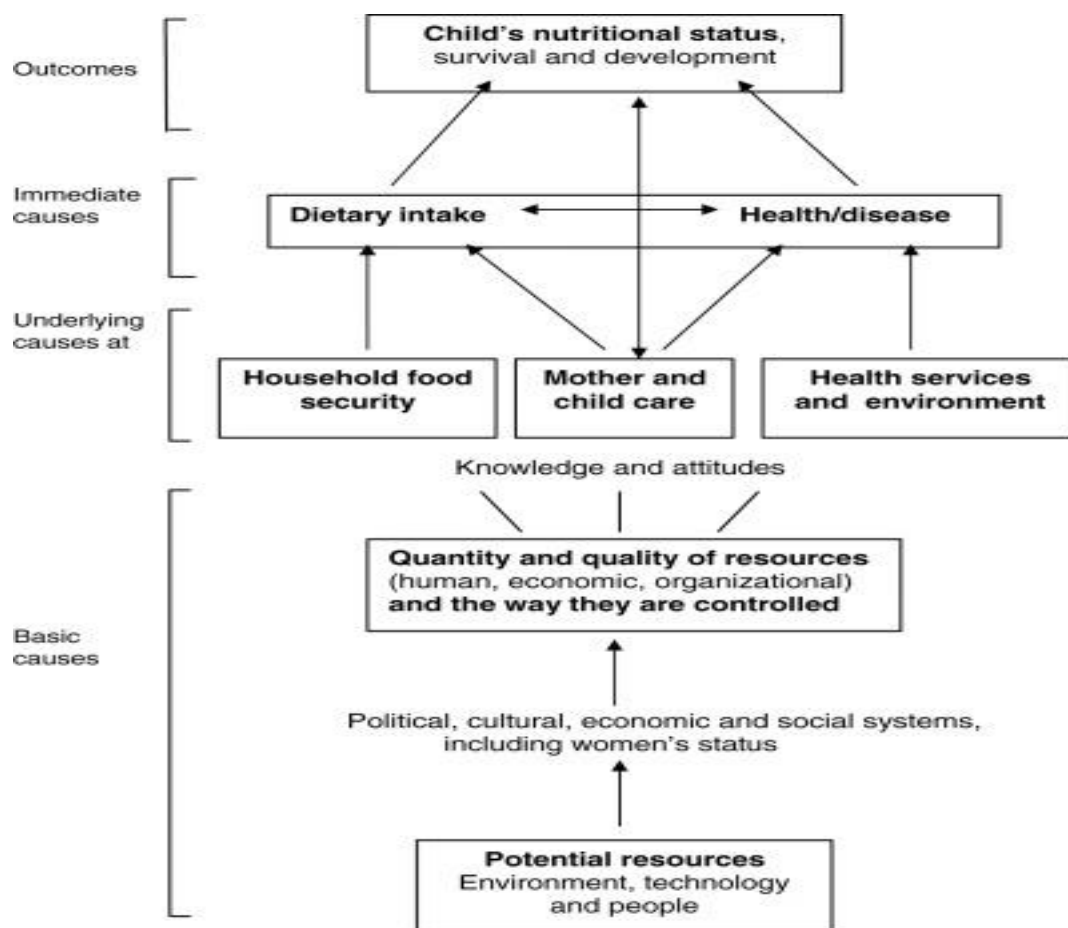
However, this model has one major shortfall. Though, the microeconomic model tends to show related factors which influences child nutritional status, it failed to show the magnitude of impact of each variable. For instance, at the child level factors as postulated by the model, one is not sure which factors are immediate or proximate. This point of confusion is the drive for more approaches or models which simplify this ambiguity.

2.5.2 The UNICEF Approach to Malnutrition

Understanding the causes of childhood malnutrition can be complex (Smith & Haddad, 2000). In other words, providing an explanation for the multitude of factors that are observed in reviewed literature to be associated with child under nutrition can be daunting. Some studies (Smith & Haddad, 2000) have associated childhood malnutrition to biological, social and environmental factors while other authors notably Pelletier, (1994) has attributed malnutrition in children to economic factors.

To understand and handle these complex hierarchical inter-relationships of factors associated with childhood malnutrition, the current study is motivated by UNICEF framework of malnutrition.

Figure 2.5.1: UNICEF Conceptual Framework of Child Nutritional Status



Source: UNICEF, 1998

The framework indicates that, the causes of childhood malnutrition are various and multi-sectoral, involving food, health and caring practices. The UNICEF model above, categorized the causal factors of childhood malnutrition or child nutritional status into three; immediate, underlying and basic causes. Basic factors affecting child nutritional status are attributed to different social-organizational levels, political, economic and cultural and are largely related to the community and the nation. The immediate causes according to the model, is an interplay of two significant factor-inadequate dietary intake and illness which affects the individuals nutritional status. The underlying causes are basically three nested factors which eventually leads to the immediate level

factors. Underlying causes include; “inadequate access to food in a household, insufficient health services and unhealthy environment, and inadequate care for children and women” (UNICEF, 1998).

The framework serves as a useful guide in assessing and analyzing the causes of malnutrition and provides a clearer understanding to the concept of malnutrition. The framework identifies poverty as the number one cause of malnutrition while inadequate dietary intake and unsatisfactory health are immediate causes (UNICEF, 2013). In this view, the levels of malnutrition in any given country tend to reflect the poverty levels or otherwise economic development of that country. Malnutrition among children is an indication of poor health which can lead to morbidity and death. Therefore, understanding child nutritional status associated factors provides a good foundation for measuring children access to food and health care. Nutritional experiences at childhood influences nutritional habits at adulthood and as identified by the UNICEF framework, nutritional status outcome is a product of food intake and health status.

. This present study focused on the association of child dietary patterns and nutritional status and hence adopted the UNICEF theoretical concept of child malnutrition. The UNICEF concept is widely accepted and used because it provides a clear understanding of the causes of childhood malnutrition.

2.6 Studies on Dietary Patterns and Nutritional Status

This section examined studies on dietary patterns and nutritional status of women, adolescents and children at the global, continental and local level. Rapid globalization, urbanization and economic progress have brought about increase transfers of lifestyle, food culture, dietary pattern and dietary habits among populations and countries. For instance, McDonaldatazation of fast food and its

aspect of packaging, cooking, serving and nutrient quality have gained global phenomenon leading to increase demand for and consumption of already prepared foods (Ritzer, 1983) which have high fats and sugar.

Socio-economic progress of developing countries have also given rise to the consumption of meats, oils, cheap processed food with poor nutrients and decreased consumptions of vegetables and fruits. The situation has led to an increase prevalence of diet related diseases such diabetes, cancers, NCDs in adult as a result of inadequate calorie consumption and inadequate micronutrients (Popkin & Wen Ng, 2006).

In the global context, issues of childhood malnutrition and food insecurity are usually on top priority. For instance, the first objective of the millennium development goals was to eradicate poverty and hunger which was also captured as goal one in the SDGS (United Nations, 2016). Yet while some progress has been achieved in these efforts to combat childhood malnutrition in the world, the proportion of undernourished children in the world is increasing as has been observed by the United Nation System Standing Committee on Nutrition (2006).

In their sixth report of the progress in nutrition, the UNSCN reported that the proportion of malnourished children less than five years of age in the world was 26% in 2006 (UNSCN, 2006:6). However, in 2014, the figure dropped from 26% to 24% for the world and 36% for sub-Saharan Africa (United Nations, 2016:15). While there is evidence of declining level of childhood malnutrition in the world in terms of percentages, the absolute figures of children as well infant who dies as result of malnutrition are still high.

In India, Vinod et al., (2011) conducted a study among 434 children below five years of age to assess their nutritional status and dietary pattern and found that 52.23 % were suffering from

various forms of malnutrition. A study of 382 adolescents conducted in the United States by Wang et al. (2010) to determine dietary intake pattern of low income urban African American adolescents, revealed a high energy intake among participants with most participants consuming calorie dense foods as well as foods that are low in nutrient such as snacks, fried foods and sweetened beverage. In sub Saharan Africa, under nutrition and over nutrition are major contributing factors to child morbidity and mortality. Underweight which is a composite measure of nutritional status is also prevalent in developing countries meanwhile underweight children are at higher risk of infectious diseases.

In Prague-Czech Republic, Kudlová & Schneidrová, (2012) noted that, age, sex, place of residence and maternal education were major determinants of children dietary pattern. For instance as the age of the child increased, milk and milk products, fruit, vegetable and poultry frequency tends to decrease. On the other hand, the consumption of meat and grain groups, smoked meat and meat products, sweets and fried food tends to increase (Kudlova & Schneidrova, 2012). Abdelaziz et al., (2015) found in Beni-Suef Governorate, Egypt that nutritional statuses of students aged (5-19years) were 10% and 20% for underweight and stunting respectively. Baranwal et al., (2012) conducted a study to examine the impact of dietary pattern on nutritional profile of under five children in urban-slum community of Varanasi using cross-sectional study of 400 children of under-five age group (1-5years). They found that protein energy malnutrition (PEM) was more prevalent among “children, who were vegetarian by dietary habits, received satisfactory weaning, but the differences were not significant”.

In Ethiopia, a community-based cross-sectional survey conducted by Ma’alin et al., (2016) among 694 participants in Shinile Woreda, showed a prevalence rate of stunting, underweight and wasting as 33.4 %, 24.5 % and 20 %, respectively. Ma’alin et al also noted that, family size, child’s sex,

income of households and immunization statuses were variables associated with one or more forms of malnutrition in Ethiopia.

Awel et al., (2016) conducted a similar study among 655 primary school adolescents in Somali region-Ethiopia using multistage random sampling. Awel et al., (2016) reported higher stunting in “agro-pastoral (14.5%; 95%CI: 10.7 18.3%) than pastoral (8.3%; 95%CI: 5.3-11.3%) communities”. Similarly variables such as place of residence, sex, age, family size, source of drinking water, wealth status, child food insecurity and diarrheal illness were found to have significant association to stunting and underweight.

In South-Western Nigeria, Amosu et al., (2011) studied nutritional status of under-5 children of low-income earners and asserted that poor socioeconomic status, poverty and poor educational background of parents predisposes children to malnutrition-a global burden of diseases. It is obvious from their findings that children from rural areas were more likely to be severely malnourished compared to children in the urban areas in Nigeria.

Amosu et al., (2011) documented a high prevalence of underweight (82.13%) of the under-5 children while 33.52% and 85.15% were stunted and wasted respectively. Also, both males and females children had low intakes of protein, iron, calcium and vitamin A.

In Ghana, the statistics are not so different. In assessing the effects of dietary patterns on the nutritional status of upper primary school children in the Tamale Metropolis, Abiba et al., (2012) found a relatively low prevalence of underweight (10%) among participants whilst 4% were overweight. Abiba et al noted that local staples foods were mostly consumed, 73% of participants did not consume eggs, 37% snack twice a day and most meals were eaten at home. Based on their

finding, they concluded that nutritional status of children is more likely to be influenced by snacking and low consumption of animal protein could put children at risk of pernicious anemia.

Similar study was conducted by Nti et al., (2008) using cross-sectional study among 400 mothers in the Manya Krobo district of Ghana to examine the effects of household dietary practices on family nutritional status. Nti et al., (2008) found that a greater percentage “of the women were nutritionally at risk of being either underweight (12%), overweight (17%) or obese (5%)”. Food items such starchy staples, maize, fish, pepper, onion, tomato and palm fruits were found to be consumed frequently by the women.

Many of the nutrition studies (Abiba et al., 2012; Abubakari & Jahn, 2016; Amugsi et al., 2013, 2014; Nti, 2008) reviewed have admonished the role of dietary patterns in the geographic distribution of malnutrition in a population and consistently pointed out that children who reside in rural areas have higher rates of stunting and underweight than those in urban areas. The Ghana Demographic and Health Survey report (2015) have shown a significant declining in child malnutrition at the national level yet worsening levels of some forms of malnutrition such as underweight and stunting are still high in rural Ghana (Amugsi et al., 2013; Nti, 2008). By inference, it is arguably true that extensive literature may exist in Ghana on the relationship between dietary patterns and nutritional status.

However, as stated earlier in this study, some of the studies reviewed such as nutritional status of upper school children (Danquah, 2013), influences of child care practices on nutritional status (Amugsi et al., 2014), socio demographic patterns in child malnutrition (Amugsi et al., 2013), maternal nutritional knowledge and child nutritional status (Appoh & Krekling, 2005), maternal dietary patterns and practices and birth weight (Abubakari & Jahn, 2016) are limited by geographic

scope. Need therefore arise to also focus on a holistic study to unmask the relationship between dietary pattern and nutritional status particularly among infants and young children under five years who need micronutrient for physical and mental growth.

2.6.1 Nutrition Profile of Ghana

Ghana is predominantly an agricultural country with about 51% of the population living in urban areas. The level of urbanization varies from region to region which is reflected in the higher proportion of the population concentrated in the urban areas that have many industries and high commercial activities (GSS, 2012).

According to Ghana Statistical Service (2012), agricultural remains the dominant sector which employs a high proportion of the economically active population. Studies (Brhane & Regassa, 2014; Yalew, 2014) have linked occupations to nutrition outcome. Ramesh & Sumoni, (2010) have opined that occupation and dietary characteristics are likely to shape both under nutrition and over nutrition among the population. Occupation is a determinant of household income and socio-economic status. Socio-economic status (SES) is viewed widely in literature to have a central role in a range of things that happen in our lives including access to health, access to material resources, access to food, social networks, education and many others.

Ghana is a middle income country and thus, incomes of households are likely to determine their food consumption pattern. Bhuiya, (1986) and Popkin & Wen Ng, (2006) have documented a strong link between socio-economic status and nutrition outcome. Therefore, it is accurate to hypothesised that, households from higher wealth quintile are more likely to have access to food and able to have food choices compared to households from lower wealth quintile. Food security

which entails three aspects (access, utilization and availability) is critical in ensuring that nutrition plays its optimum in human health.

Yet studies for instance, in Nigeria (Robinson, 2014), Ghana (Agbale et al., 2009) and Cameroon (Gouado, 2014) have asserted that food insecurity and poverty are two main contributing factors of under nutrition in these countries and in developing countries in general. Taruvinga et al., (2013) have asserted that, households who own live-stocks are more likely to have high dietary diversity compared to non-lives-stock household.

Therefore, agricultural activities such as cultivation of food crops and rearing of live-stocks predominant in Ghana have implication for the dietary pattern, health and nutrition profile of the population. Agbale et al, (2009) have documented that, diets in Ghana are largely starchy roots (cassava, yams), fruit (oranges, pineapples, mangoes) and cereals (maize, rice), meat and fish which provides almost three quarters of the dietary energy of the population.

Over the years, there is considerable decrease in the levels of some forms of malnutrition in Ghana (Ghana Statistical Service et al., 2015). For instance, the prevalence of anaemia among children has decreased from 78% to 66% in 2008 and 2014 respectively (GSS et al., 2015). Notwithstanding the decrease in anaemia prevalence, other forms of malnutrition persist. GSS et al., (2015) in classifying children under 5 years as malnourished based on the three anthropometric indices of nutritional status, have documented that 19% of children were stunted while 5% and 11% were wasted and underweight respectively.

2.7 Conceptual Framework

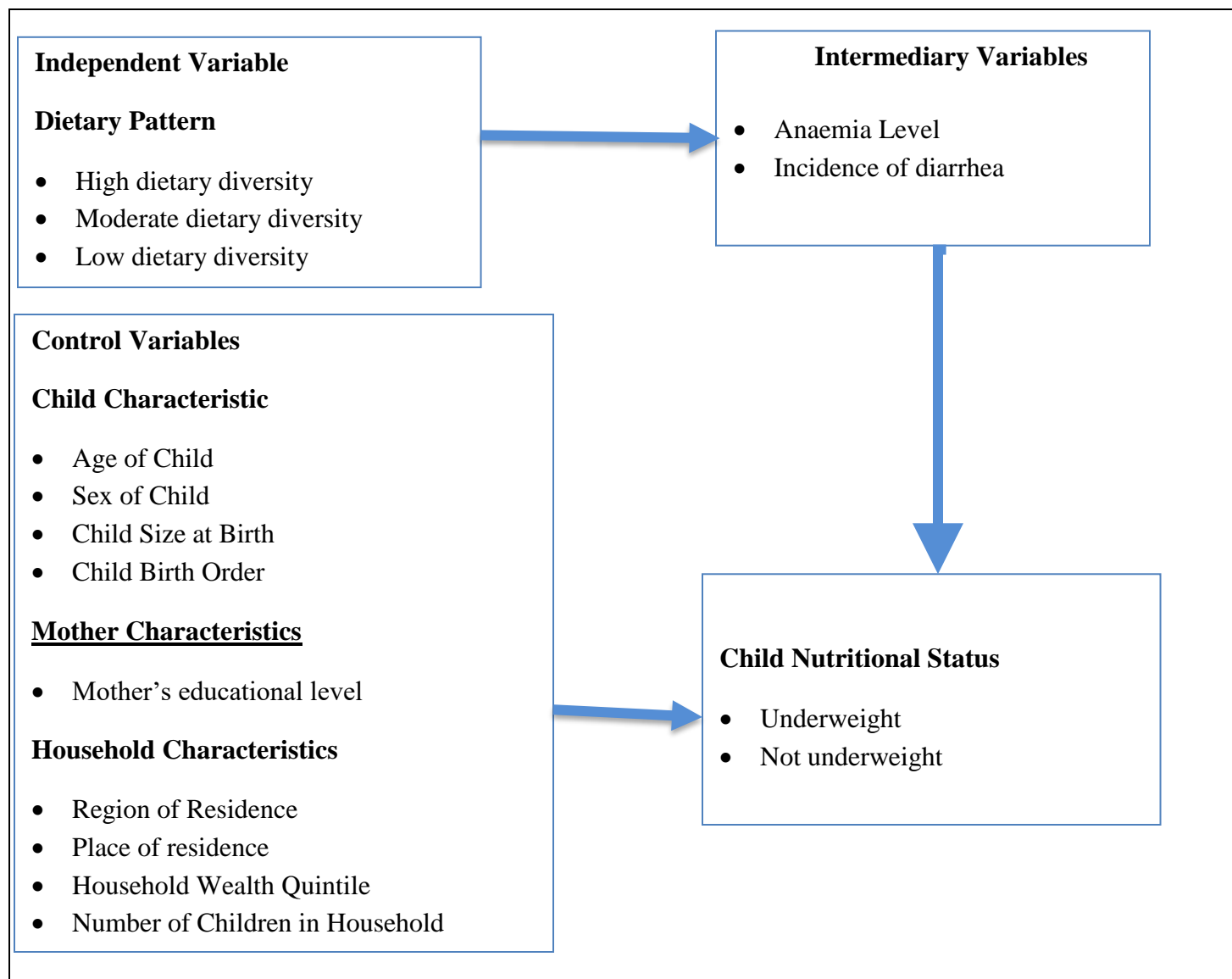
This section discusses the framework that is used to explain the interrelationship between child nutritional status and the factors that affect it. A conceptual framework, as defined by Miles &

Huberman (1994), is a visual or written product that “explains, either graphically or in narrative form, the main things to be studied—the key factors, concepts, or variables—and the presumed relationships among them”.

In the present study, the framework adapted from UNICEF’s framework (1998) offers a better understanding of the interrelationships of the variables which help to shape the nutritional status of children. The framework demonstrates the relationship between the independent variable which is dietary intake and the dependent variable (child nutritional status). The child dietary intake is seen to have a direct influence on the child nutritional status while some variables are thought of to have a possible influence on dietary intake too as indicated in the framework.

However, according to some literature (Amosu et al., 2011; KOet al., 2010; Nti, 2008; Taruvinga et al., 2013; Ukwuani & Suchindran, 2003) reviewed, there are several other factors that could potentially influence child nutritional status, but which are not the subject of interest in the present study. As a result, these variables have been controlled for. They include region of residence, place of residence (rural/urban), number of children in the household, mother’s educational level, household wealth status, sex and age of the child. The others are child had diarrhea, anaemia level, child birth size and child birth order. Below is the conceptual framework for the study.

Figure 2.7.1: Conceptual Framework for Dietary pattern and Child nutritional status in Ghana



Source: Author's Construct, 2017.

2.8 Hypotheses

1. Children with high dietary patterns are less likely to be underweight compared to children with low dietary patterns.
2. Children from households in the poorest wealth quintile are more likely to be underweight compared to children from households in the richest wealth quintile.

3. Children living in rural areas are more likely to be underweight compared to children living in urban areas.

CHAPTER THREE

METHODOLOGY

3.1 Introduction

This chapter basically presents the approaches, procedures and techniques used in the study to achieve the research objectives. The section highlighted key issues such as data source, study area, data analysis method as well as brief descriptions of the four categories of the variables in the study.

3.2 Study Area

The study was conducted in Ghana which is located on the West African coast with a total land area of 238,537 square kilometers. Administratively, Ghana currently has ten administrative regions; Western, Central, Greater Accra, Volta, Eastern, Ashanti, Brong Ahafo, Northern, Upper East and Upper West which are subdivided into 216 districts. Economically, Ghana is a middle income country with an estimated real GDP of Gh¢ 38,344.1 million in 2017 (Ofori-atta, 2017). According to the GSS (2013), 45% of the economically active population in Ghana engaged in Agriculture while 41% provides service.

Demographically, Ghana's population in 2017 is estimated at 28.7 million according to the Population Division of United Nations Department of Economic and Social Affairs (United Nations Department of Economic and Social Affairs: Population Division, 2017) while the 2010 population and housing census recorded a total population of 24.7 million. While the Country conducts its population censuses in every ten years with the 2010 PHC been the latest, it also relies on sample surveys for important demographic information. The GDHS is one of such sample surveys of which the 2014 GHDS is the latest.

3.3 Data Source

The 2014 Ghana Demographic and Health Survey data set is the main data source of this study. The DHS is nationally representative sample surveys that collect demographic and health data in developing countries. In Ghana, the survey has been conducted every five years since 1988 and the 2014 Ghana demographic and health survey is the sixth round of GDHS. The GDHS collects data on demographic, socio-economic and health information on men and women in their reproductive ages and on children under the age of five years. The survey also gathers data on household characteristics, education, maternal and child health, nutrition, family planning, knowledge, behaviour and attitudes towards HIV/AIDS.

3.4 Sample Size and Design

The 2014 GDHS was a nationally representative household-based survey of 11, 835 households selected nationwide. From these numbers of households, 9,396 women age 15-49 and 4,388 men age were interviewed to generate information on fertility, family planning, infant and child mortality, maternal and child health and nutrition. Information on malaria treatment, prevention and prevalence among children age 0-59 months were also collected.

Anthropometric measurement for height, weight, nutritional status and age data were collected for 3,118 children under age five years who were present in the 2014 GDHS sample households at the time of the survey. According to Ghana Statistical Service et al., (2015) report, 97% of the 3,118 children had complete and credible anthropometric and age data which was used to evaluate the nutritional status of young children.

However, the food frequency questionnaire was administered specifically to only the last child between ages 0 and 23 months. Though the unit of analysis for this study is any child less than five

years (0-59 months), the main focus is on the last child whom complete data was obtained for dietary practices, food frequency as well as the weight-for-age index scores. Children 0-5 months were not considered in this study sample in order to eliminate bias emanating from the combination of exclusively breastfeeding children.

In obtaining the desire sample, the women sampled weight was applied to the data and dietary variables (food items) computed into one composite variable. Secondly, the weight/age standard deviation variable was divided by 100 kg units to obtain the weight-for-age index which is a composite measure of nutritional status. Values less than minus two (-2) standard deviation were classified as underweight in reference to the WHO median cut off. Values more than plus two (+2) and +3 standard deviation representing overweight and obese respectively were not considered by the study due to the few number of cases in those categories.

Thirdly, all desirable cases included in the study were sorted by the weight-for-age variable and excluded missing cases. Based on this, a total of 1195 children were included in the study. This procedure helped to limit if not eliminate, the number of missing systems and other incomplete information inherent in the data set

3.5 Measurement and Definition of Variables

This sub section provides some explanations on how each of the variables in the study was measured or defined. A complete description of all variables in the study is presented in the table below.

Table 3.5.1: Child's Nutritional Status Model: Description of Variables

Variable Type	Variable	Description (how variables are measured)
Independent Variable	Dietary pattern	Food frequency questionnaire was used to describe food consumption patterns and total dietary diversity score was used to derive child feeding index. This was categorized as high, moderate and low dietary diversity.
	Region of residence	Region of residence are categorized into the ten regions in Ghana: Greater Accra, Western, Eastern, Central, Volta, Ashanti, Brong Ahafo, Northern, Upper East and Upper West Regions
Control Variables	Place of Residence	Rural versus urban
	Mother's education	Level of education of mother of child categorised as No education, Primary, Secondary, Higher
	Age of child	Age in months categorized as 6-11, 12-17, 18-23, 24-35, 36-47 and 48-59
	Sex of child	Male or female child
	Household Wealth Status	Wealth quintile categorized as poorest, poor, middle, rich and richest.
	Child birth Size	Measured as Small, Average and Large
	Number of children in the household 5 years and Under	Continuous
	Child Birth order	Continuous
Intermediate Variables	Child had diarrhea recently	Yes or No
	Anaemia	Moderate, Mild and Not anaemic
Dependent Variable	Child Nutritional Status	Weight-for-age index for underweight. Categorized into two-Underweight and not underweight.

Source: Author's Construct, July 2017

3.5.1 Dependent Variable

Child nutritional status is the main dependent variable of interest of this study. Nutritional status is measured by a child's growth in height and weight (ICF Macro, 2010a). The GDHS uses anthropometric measures of child nutritional status based on the measurement of the child's height, weight and age.

The 2014 GDHS collected data on three main indices: height-for age, weight-for-height and weight-for-age which "provides information about children growth and their body composition" that can be used to assess nutritional status. Children's growth retardation is indicated by the height-for-age index while current nutritional status is measured by weight-for-height index. Children with height-for-age Z-score below minus two standard deviations (-2 SD) from the median of the reference population are considered chronically malnourished or short for their age (Stunted). While severely stunted children are those below minus three standard deviations (-3 SD). The weight-for-height index measures the body mass in relation to the body height. This index describes the current nutritional status unlike the height-for-age index which measures the long term effects of malnutrition.

On the other hand, using the weight-for-age index, children whose weight-for-age Z-scores are below -2 SD from the median reference population is considered to be acutely malnourished (wasted) while children with Z-scores below -3 SD are severely wasted. Wasting may be as result of weight loss due to illness and onset of malnutrition.

Thus, this study focused on the Weight-for-age index which serves as a composite index of height-for-age and weight-for-height. This measure considers both acute and chronic malnutrition hence the best method for analyzing nutritional status. Children with weight-for-age Z-score below -2

SD from the median of the reference population are considered underweight whilst those below - 3 SD are severely underweight. Children whose weight-for-age Z-scores were above +2 SD indicating overweight were very few cases (about 1.3%) hence were dropped from the sample. Therefore, the dependent variable is categorized as underweight and not underweight because the children whom the dietary patterns questions were administered and had weight-for-age Z score above +2 (i.e overweight for their age) were very few hence were excluded from this study.

3.5.2 Independent Variable

The independent variable of interest in this study is dietary pattern. Dietary patterns are important tools used in nutrition literature to explore the relationship between dietary intake and health outcome. In the 2014 GDHS, questions were asked about liquids and foods that a child has taken during the night prior to the interview. Respondents were asked to indicate “1.Yes”, if food item had been taken by the child and “2. No” if not. There was also a third option “8. I don’t know”. However, in the data set the three responses were coded as “0” for No, “1” for Yes and “8” for I don’t know. Reported responses were re-coded by this study. The “No” and “I don’t know” responses were combined and re-coded as 0 for No and 1 as Yes.

About 21 food items were collected for children under five years and presented in 2014 GDHS data set. These twenty-one food items questions include the following; Juice, Tinned Powdered or fresh milk, Baby formula, Baby fortified foods (cerelac, etc), Soup or clear broth, Bread, noodles, other made from grains, Potatoes, cassava and other tubers, Egg, Meat (beef, pork, lamb, chicken etc) and Pumpkin, carrot. The rest are squash (yellow or orange), Any dark green vegetables, Mangoe, papaya, other vitamin A fruits, Any other fruits, Liver, heart, other organs, Fish or shell fish and Food from beans, peas, lentils, nuts. Others are Cheese, yogurt, other milk products, Solid or semisolid food, Yoghurt and Food from beans & nuts

Based on this, dietary pattern was derived in this study using total dietary diversity scores (Taruvunga et al., 2013), food frequency questionnaire (Nti, 2008) and child feeding composite index (Arimond & Ruel, 2002). Nti (2008) for instance, used the food frequency questionnaire to describe the food consumption patterns of women in Manya Krobo district in Ghana.

Using Nti's approach, this study classified the food items into five major food groups namely; animal and food protein (egg, meat, beans, milk etc), Vitamins and Mineral, Fat foods, Fruits and vegetables (juice, baby formula, carrot) and Carbohydrates (cassava, yoghurt, and fortified baby food).

The food items in each food group were then computed into one food variable. In scoring each food group, this study allocated scores of 0 to 1 based on the summed of the number of food items in the group. A score of 0 is awarded to respondent who have not taken any of the food items and 1 for one or more food items/group.

The five food group variables are then computed into a composite dietary diversity score or composite index by summing the five variables i.e Animal and food source protein + Vitamins and minerals + Fruits and vegetables + Carbohydrates foods + Fats food.

This method is similar to Arimond & Ruel, (2002) study that computed a composite Child Feeding Index (CFI) using five main components; breastfeeding, drank from bottle, dietary diversity (past 24 hours), frequency of feeding and food frequency (past 7 days).

However, this study uses the five main food group classification as components for the composite child feeding index or child dietary diversity score. Scores were assigned to each component variable based on respondent response. The Infant and Young Children Feeding practices proposed by WHO in 2008 recommends that three food groups be considered as appropriate

minimum number of food groups for children under five years (WHO, 2008; WHO, 2010; Arimond and Ruel, 2004).

On the bases of this recommendation, the composite variable was categorized into three namely; high, moderate and low dietary diversity. Respondents’ dietary pattern are classified as high dietary diversity when their dietary diversity score is equal to four (4) or more food groups in the composite scale and low dietary diversity pattern is when respondent dietary diversity score is equal to 0-2 food groups in the composite dietary pattern variable scale. Moderate dietary diversity on the other hand refers to children whose dietary diversity score is equal to three (3) food groups. The table below shows how the dietary diversity variable was derived and measured.

Table 3.5.2: Variables scoring used to create child feeding index

Variable	Scoring Criteria
Animal and Food Protein	None of the food groups = 0, One or more food items =1
Vitamins and Minerals	None of the food groups = 0, One or more food items =1
Fruits and Vegetables	None of the food groups = 0, One or more food items =1
Carbonhydrates foods	None of the food groups = 0, One or more food items =1
Fats	None of the food groups = 0, One or more food items =1
Composite feeding index	Less than three food/groups = 0, Three or more food/group =1

Source: Author’s construct July, 2017

3.5.3 Intermediate Variables

The mediating variables in this study include anaemia level and diarrheal disease. With respect to incidence of diarrhea, it is measured as “Yes” if child had diarrhea recently before the survey or otherwise “No”. Dietary intake of children is said to have a strong link with their health status and Awel et al., (2016) have documented evidence of the mediating role of diarrheal disease in health

outcomes. Evidence suggest that, irrespective of children food intake, diarrheal disease tends to have a dare consequence on their nutritional status and health outcome.

Also, levels of anaemia has a determination in the overall nutritional status of children. Anaemia condition leads to a reduction in the volume of red blood cells and decreases the haemoglobin concentration in the blood (GSS, 2015) . Prevalence of anaemia are based on haemoglobin (Hb) levels. Haemoglobin is measured in grams per deciliter (g/dl). Anaemia level was recoded and categorized in this study as not anaemic, moderate and mild anaemia. Children are classified as having moderate anaemia when their haemoglobin levels measured between 7.0 to 9.9 g/dl. Mild anaemia on the other hand refers to haemoglobin levels between 10.0 to 10.9g/dl. However, children with haemoglobin levels equal to 11.0 g/dl or more were classified as not anaemic.

3.5.4 Control Variables

Studies (Pollak, 2002; Popkin & Wen Ng, 2006) have associated nutritional status to be influenced by variables such as age and sex of the child, maternal education, place of residence, region of residence, education, wealth status etc. Therefore, these variables are controlled for in this study to avoid them becoming confounders and affecting the analysis of the study. Place of residence was categorized as rural and urban. Child birth order and number of children 5 years and under in the household were measured as count variables. Age of child was categorized as 6-11, 12-17 and 18-23 months.

Region of residence are categorized into the ten administrative regions of Ghana (Western, Central, Eastern, Ashanti, Brong Ahafo, Greater Accra, Volta, Northern, Upper East and Upper West

regions). Wealth quintile is been categorized in the GDHS as poorest, poorer, middle, richer, richest is used as a proxy for the socio-economic status of mothers of the children.

Child birth size variable was recoded into three categories namely; Small, Average and Large. Children with reported birth weight less than 2.5 kilograms are classified as having Small birth size. Average birth size refers to children with reported birth weight equal to 2.5 kg. However, children who were reported to have birth weights more than 2.5 are classified as large.

3.6 Data Validation

Age is one important variable in demographic analysis, however obtaining data on age in sub-Saharan African is not without difficulties with regards to accuracy and reliability (Randall & Coast, 2016). In data collection process, respondents may misreport their age either intentionally or due to lack of information about their accurate date of birth.

According to Randall and Coast, (2016:144), the problem of age misreporting are particularly pervasive in sub-Saharan African which can be attributed to high illiteracy and increase social irrelevance of knowing one' s date of birth or age. In view of this, the Myers and Bachi indexes were used as data validation and evaluation techniques to gain fair knowledge about the amount of errors or otherwise associated with the age reporting in the data set.

The table below shows that the Myers and Bachi indices are 22.45 and 11.23 respectively. This means that about 22% of the population misreported their ages. However, the Bachi index indicates that 11% of the population actually reported their ages with incorrect terminal digit.

However, since this study subjects are children whose ages are reported by respondents, it is believed that the errors of age misreporting would be minimal coupled with the used of children birth records during the 2014 GDHS data collection process. Also, the Bachi index indicates that

those who incorrectly reported their ages are not many. Therefore, the data is reliable and this study finding is accurate and depicts the nutritional status of children under five years in Ghana. Again, cases for the study were sorted by the weight-for-age variable so as to exclude missing systems and incomplete errors and the sample weight was used to weight the data.

Table 3.6.1: Myers and Bachi Index of Age Validation

Digit Preference	Ages 10-89			Ages 20-89			Blended Population	Proportion of Blended Population	Deviation from 10
	Sum	Weight	Product	Sum	Weight	Product			
0	885	1	885	885	9	7965	8850	15.10	5.10
1	414	2	828	414	8	3312	4140	7.06	-2.94
2	706	3	2118	706	7	4942	7060	12.05	2.05
3	482	4	1928	482	6	2892	4820	8.22	-1.78
4	517	5	2585	517	5	2585	5170	8.82	-1.18
5	825	6	4950	825	4	3300	8250	14.08	4.08
6	446	7	3122	445	3	1335	4457	7.61	-2.39
7	499	8	3992	497	2	994	4986	8.51	-1.49
8	569	9	5121	561	1	561	5682	9.70	-0.30
9	519	10	5190	504	0	0	5190	8.86	-1.14
Total							58605	100.00	22.45/2 = 11.23

Source: Author computation from the 2014 GDHS

3.7 Methods of Data Analysis

Data was analyzed at three levels: univariate, bivariate and multivariate. At the univariate level, frequencies and percentages in the form tables and graphs were used to present data. Prevalence of underweight was observed by using weight-for-age Z-scores (WHZ) and adopting a cut-off point equal to or less than -2 Z-score.

Based on the defined cut-off point for underweight, children whose weight were greater than -2 Z-score of the WHZ index were classified as not underweight. Z-scores were calculated relative to WHO 2006 reference data. At the bivariate level, the study hypotheses were examined using the chi-square independent test to assess the relationship between each independent variable and child nutritional status. The significance level was set at alpha value 0.05 while the Phi and Cramer's V test were used to measure the strength of relationship between each variable and nutritional status.

At the multivariate level, binary logistic regression model was fitted to examine the factors associated with child nutritional status. The choice of binary logistic model is because the dependent variable is dichotomous which takes on the values of "0" and "1". This study measured child nutritional status using underweight as a proxy.

In measuring the nutritional status of the children, the child is either underweight which takes a value of "1" or not underweight with a value of "0". The Logistic regression analysis were carried out at three levels. At the first level, the independent variable (dietary patterns) was regressed with child nutritional status to determine its influence on the latter. At the second level, the independent variable, together with the proximate variables of anaemia level and diarrheal disease were put into the regression model with child nutritional status to examine the effects of the intermediate variables on child nutritional outcome. At the final level, all the independent variables in this study were entered into the model to assess the effect of the independent variables on child nutritional status.

Of the variables included in the models, one category is selected as a reference category and the odd ratio is used to interpret for instance, the possibility of a child with high, moderate or low dietary diversity having good nutritional status in relation to the reference category.

An odds ratio equal to one is set for the reference category to indicate the absence of underweight. Odd ratios that are more than one shows higher odds while odd ratios less than one shows lower odds of underweight for a category than the reference category. A p-value < 0.05 is used as a measure of the significance of a predictor variable in predicting child nutritional status. All data were analysis using the Statistical Package for Social Sciences (SPSS) software (SPSS vr 20.0).

3.8 Limitation of the Study

Many of the food items in the survey food questionnaire did not reflect the local Ghanaian dishes hence there were so many children left out. This study only focused on the children of whom the dietary information was obtained by the survey. The dietary diversity is limited because it measured only respondents' food consumptions from previous night.

CHAPTER FOUR

BACKGROUND CHARACTERISTICS, DIETARY PATTERNS AND CHILD NUTRITIONAL STATUS

4.1 Introduction

This chapter provided descriptive statistics of all the variables presented in the conceptual framework. These variables were analyzed using appropriate graphs. Using Pearson chi-square independent test, bivariate analyses were done to examine the independent relationship between each of the variables and child nutritional status while the phi and Cramer's V coefficients were used to assess the strength of any association. At the bivariate level, almost all variables in the conceptual framework were found to be statistically significant to child nutritional status except dietary pattern, incidence of diarrhea, anaemia level and child birth order.

4.2 Univariate Analysis

Information on each of the variables in the study is presented in this section using descriptive statistics. The section also provided appropriate charts and tables for categorical variables namely: Child nutritional status, dietary patterns, sex of child, age of child, household wealth status, mother's educational level, region of residence, place of residence, anaemia level, diarrheal disease and continuous variables – child birth order and number of children in a household.

4.2.1 Child Nutritional Status

The dependent variable in this study is nutritional status of children under five years. However, underweight-a composite measure of child nutritional status is used in the study as a proxy for nutritional status. The weight-for-age (WAZ), one of three anthropometric indexes of nutritional outcomes was used. This method was obtained by computing for the weight and age standard

deviations. Using the WHO new growth standard reference median as a cutoff, poor nutritional status or underweight were those with WAZ < -2. In other words, children whose WAZ score is less than -2 standard deviation were classified as underweight or poor nutritional status. Table 4.2.1 below shows that 17.2% of the children aged 6-23 months in the study sample were underweight. This means about 17% of the children in the study sample have poor nutritional status.

Table 4.2.1: Percentage Distribution of Children’s Dietary Pattern and Nutritional Status

Variable	Percentage	Number
Nutritional status		
Underweight	17.2	205
Not underweight	82.8	990
Dietary Pattern		
High dietary diversity	27.3.	327
Moderate dietary diversity	27.6	330
Low dietary diversity	45.0	538
Total	100.0	1195

Source: Computed from GDHS (2014) data, July 2017

4.2.2 Child’s Dietary Pattern

Dietary pattern is the independent variable of interest of this study. This is a composite variable derived from a number of different questions asked about child dietary intake. These different diets were classified into five food groups and computed into a composite variable called dietary pattern score. Dietary pattern scores were grouped into three namely; high, moderate and low dietary diversity. This was done in reference to the World Health Organization’s recommendation that children age 6-23 months should receive three food groups as the appropriate minimum food

groups (Arimond & Ruel, 2002; GSS et al., 2015). From the data presented in table 4.2.1 above, 538 children of the study sample representing 45.0% did not meet the feeding requirement as proposed by WHO.

4.2.3 Age of Child

Yalew in 2013 reported that, “appropriate child feeding practices and patterns are age-specific, and they are also defined within very narrow age ranges” (Yalew, 2013:3). This study has controlled for age of the child to examine its relationship on child nutritional status.

The age of child in months, sex of child, place of residence and child birth size are presented in table 4.2.2 below. The table revealed that, 36.3% of the study children are between the ages of 12-17 months, 35.0% are aged 6-11 months while 28.7% of the children were between the ages of 18-23 months. This age structure where there are higher numbers of children in the younger age group than the older age group, could have some implications on health care service facilities and the socio-economic development of the country.

On the other hand, a low percentage of children in older age group could be associated with high infant and child mortality. Yet malnutrition according to the United Nations nutrition progress 5th report, is said to be the number one cause of infant and child mortality in sub-Saharan Africa (UNSCN, 2004).

Table 4.2.2: Child Background Characteristics

Variable	Percentage	Number
Age (Months)		
6-11	35.0	418
12-17	36.3	434
18-23	28.7	343
Sex of child		
Male	50.7	606
Female	47.5	589
Birth size		
Small	14.9	178
Average	47.8	572
Large	37.2	445
Residence		
Urban	45.1	539
Rural	54.9	656
Total	100	1195

Source: Author's computation from 2014 GDHS

4.2.4 Sex of Child and Child Size at Birth

Table 4.2.2 above indicates the percentage distribution of sample participants by sex. The table shows that, males constituted 50.7% of the children under five years while 49.3% were females. The higher proportion of males within the ages of 6-23 months in the sample and by extension in Ghana can be associated to the sex ratio differentials at birth which is normally 103 and 105 for females and males respectively.

Also, table 4.2.2 above shows that, children whose weight at birth was small (weight less than 2.5 kilograms) constituted 14.9% of the children sampled while children whose size at birth was large (more 2.5 kg) are 37.2%. Majority 572 (47.8%) of the children under five year birth weights were average (equal to 2.5 kg). Children's birth weight or size indicate their vulnerability to the risk of childhood diseases and chance of survival (GSS et al, 2015).

4.2.5 Place of Residence

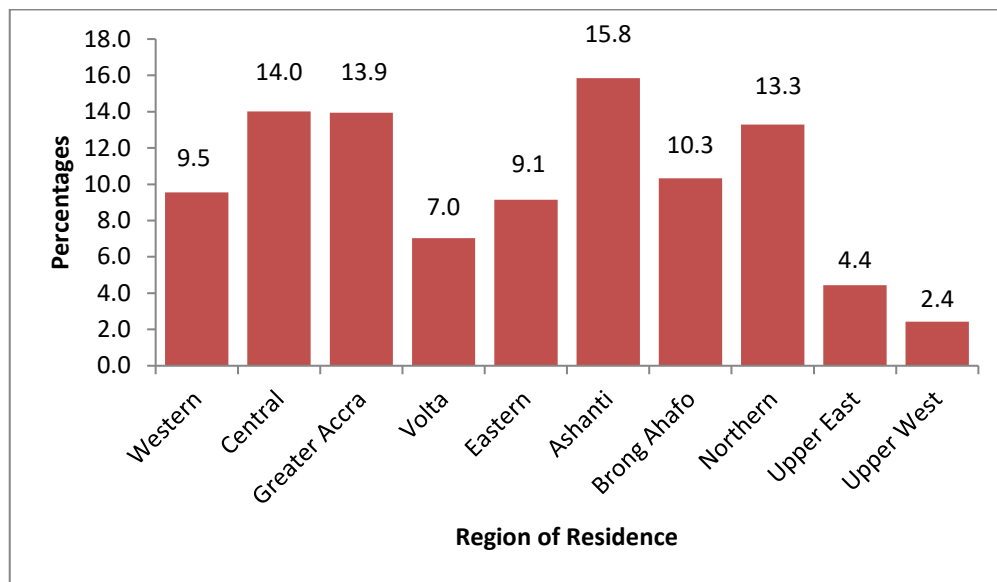
As observed in literature (Ukwuani & Suchindran, 2003), residential status plays a key role in nutritional status outcome. Therefore, rural and urban residential difference of the children sampled was controlled for by this study. Table 4.2.2 above presented the distribution of the children under five years in the study and by extension Ghana according to residential status. The table shows that, children with rural residential status are 539 representing 45.1%. On the other hand, 54.9% of the children sampled are from urban residential place.

4.2.6 Region of Residence

The DHS was carried out in all the ten administrative regions in Ghana. The geographic region of residence has been observed by Ukwuani & Suchindran, (2003) to have an implication for a child's nutritional outcome. Yet the ten administrative regions are unevenly developed. Owing to this point, variation in food access and utilization as well as dietary patterns may exist.

The regional distributions of the children aged 6-23 months sampled are presented in figure 4.2.1. The figure shows that, children from Ashanti region constituted the highest proportion 15.8% (189) of the sample population while Upper West region had the least representation 29(2.4%) in the sample. Greater Accra and Central regions almost had same proportion of children (14.0% and 13.9% respectively).

Figure 4.2.1: Region of Residence



Source: Author's compilation from 2014 GDHS dataset

4.2.7 Maternal Educational Level

Maternal level of education is categorized into four namely; no education, primary, secondary and higher. The distribution of the study children according to maternal educational level is presented in table 4.2.3 below. The table shows that substantial number of 350 representing 29.3% of the children's mothers had no education. Most, 574 representing almost (48.0%) of the children's mothers had secondary education while those who had primary education are 230(19.2%). Only few proportions of the children's mothers in the sample had higher education 41(3.5%).

Table 4.2.3: Percentage Distribution of Children’s Mother's Educational Level and Household Wealth Status

Mother's Educational level	Percentage	Number
No education	29.3	350
Primary	19.2	230
Secondary	48.0	574
Higher	3.5	41
Wealth Status		
Poorest	24.3	291
Poorer	21.5	257
Middle	19.4	231
Richer	17.8	213
Richest	17.0	203
Total	100	1195

Source: Computed from GDHS (2014) data, July 2017

4.2.8 Household Wealth Status

Household wealth status is categorized into five namely; poorest, poor, middle, rich and richest as presented in table 4.2.3 above. The table disclosed that, greater proportions (24.3%) of the children sampled were from the poorest income families in Ghana while poor income families constituted 21.5%. This implies that, about 46% of the households belonged to low income group.

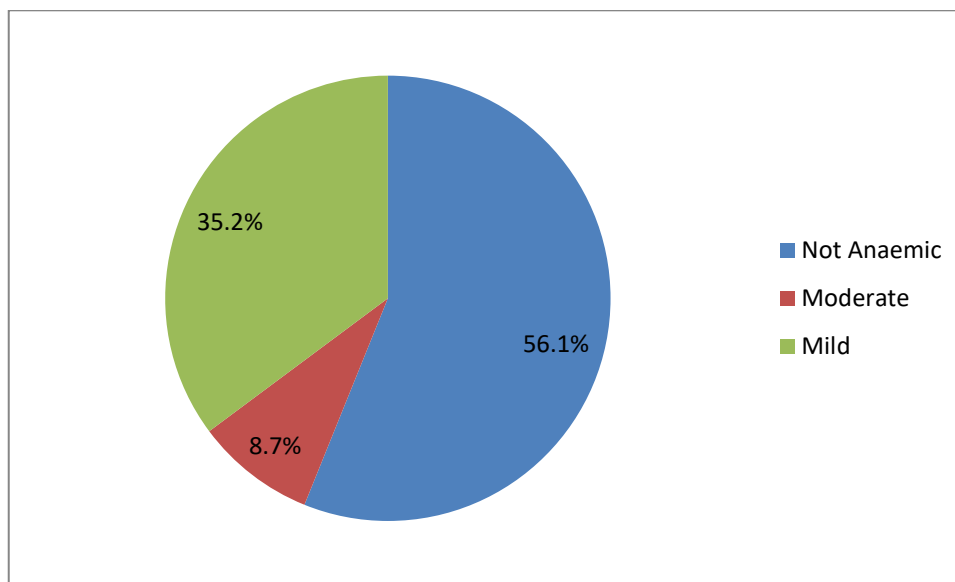
On the other hand, 213(17.8%) and 203(17.0%) of the children aged 6-23 months sampled belonged to richer and richest income families respectively. This indicates that about 35% of households were in the high income bracket while almost (19%) are in the middle income status.

4.2.9 Anaemia Level

The figure below shows the anaemia level of the children sampled. This variable, was categorized into three namely; not anaemic, moderate and mild anaemia as presented in figure 4.2.2. The data presented in the figure reveals that majority 670(56.1%) of the children under five which were

included in the sample were not anaemic while a lower (8.7%) proportions had moderate anaemia. The data also discloses that 35.2% of the sampled children were mild anaemic.

Figure 4.2.2: Percentage Distribution of Children by Anaemia Level

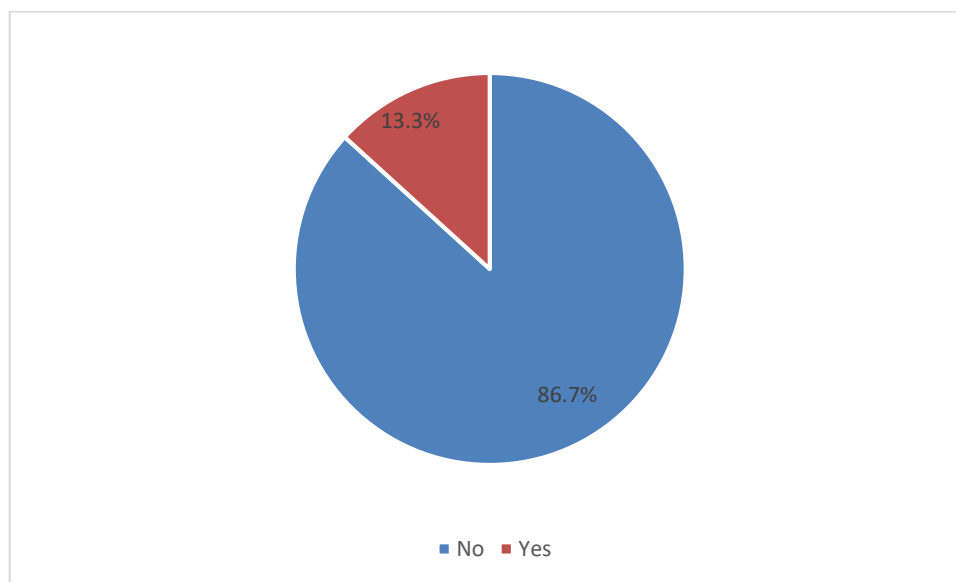


Source: Computed from GDHS (2014) data, July 2017

4.2.10 Incidence of Diarrhea

The figure below shows the percentage of children under 5 with or without diarrhea in the past two weeks preceding the 2014 GDHS. Figure 4.2.3 revealed that 1,037 of the children within the ages of 6-23 months representing about 87% of the children sampled answered no to the question on child had diarrhea recently. The figure disclosed that, 158 representing 13.3% of the children sampled had diarrhea two weeks to the survey.

Figure 4.2.3: Percentage Distribution of Children by Diarrheal Disease



Source: Computed from GDHS (2014) data, July 2017

4.2.11 Child Birth Order and Number of Children in Household

The number of children in the household and the child birth order are presented as continuous variables as shown in the table below.

Table 4.2.4: Childbirth Order and Number of Children in Household

Variable	Mean	Std Deviation	Minimum	Maximum
Birth order	3	1.74	1	13
Number of children 5 and under in Houshold	2	0.81	1	6

Source: Computed from GDHS (2014) data, July 2017.

The number of children in household represents the total number of children age 5 and under in each of the sampled households. From table 4.2.4 above, the mean number of children less than five years in each household in the sample was 2 with a minimum of 1 child in a household and a maximum of 6 children.

Also, the highest birth order of a child within the sampled children is 13 and minimum of 1. The mean birth order of a child in the samples households was 3 with 1.74 standard deviations.

4.3 Bivariate Analyses-Relationship between Dependent and Independent Variables

This section examines the relationship between the independent variables and the dependent variable using crosstabs. Independent variables include dietary pattern, age of child, sex of a child, child birth size, maternal educational level, household wealth status, region and place of residence. Other variables include child anaemia level, diarrhoeal disease and child birth order.

In measuring the relationships between participants,' background characteristics or independent variables and nutritional status, the Pearson independent chi-square statistics with an alpha of 0.05 significance level or 95% confidence interval was used. Based on this criterion, a chi-square test asymptotic significance value greater than 0.05 indicates a no significant relationship exist between the two variables.

The chi-square independent test was used to explore the relationship if any between the independent variables and child nutritional status. While the chi-square provided the test of association, the Phi and Cramer's v coefficient were used to determine the magnitude of any relationship among the test variables. Results indicate that age of child, sex of child, child size at birth, place of residence, region, maternal education, household wealth status and number of children in household are all statistically significant to child nutritional status. However, child dietary diversity, anaemia level, incidence of diarrhea and child's birth order were found to be insignificant with child nutritional status.

4.3.1 Dietary Pattern and Child's Nutritional Status

Table 4.3.1 below indicates that, higher proportions (85.6 %) of children with high dietary diversity are not underweight and about 17% of underweight children had low dietary diversity. Of the 1195 children studied, 205 (17.2%) were found to have poor nutritional status (to be underweight). Least proportion (14.4%) of children who have high dietary diversity are underweight.

The asymptotic chi-square test of independence value ($p = 0.128$) shown an insignificant relationship between children dietary diversity and nutritional status. Also, a Phi value ($\phi = 0.059$) obtained indicates that, there is a weak relationship between dietary pattern and nutritional status. This findings are contrary to the works of (Bhandari et al., 2016; Kudlova & Schneidrova, 2012) that, found dietary pattern to have significant relationship in the health outcomes of children especially their nutritional status.

However, this findings may be consistent with the findings of (Brhane & Regassa, 2014) which did not establish any relationship between child's feeding pattern and nutritional outcome. According to Brhane & Regassa, (2014) in their study of nutritional status of children under five years of age in Shire Indalassie, factors that had strong relationship with children nutritional status are child's age, maternal education, maternal employment status as well as child's weight at birth.

Nyankovskyy et al., (2014) have acknowledged a crucial role of diet especially balance diet in the physical and mental development of children. However, this current study did not find any significant relationship between dietary pattern and child nutritional status. This line of departure between the current study and the work of Bhandari et al., (2016); Kudlova & Schneidrova, (2012) may be as a result of variation in sampling size and geographical context.

Table 4.3.1: Percentage Distribution of Children Dietary Pattern by Child Nutritional Status

Variable		Child nutritional status		
		Underweight	Not underweight	Total
Dietary Pattern	High dietary diversity	47 (14.4 %)	280 (85.6%)	327
	Moderate dietary diversity	67 (20.3%)	263 (79.7%)	330
	Low dietary diversity	91 (16.9%)	447 (83.1%)	538
Total		205 (17.2%)	990 (82.8%)	1195

$$\chi^2 = 4.10 \quad \rho = 0.128$$

$$df = 2$$

$$\alpha = 0.05$$

Source: Computed from GDHS (2014) data, July 2017

4.3.2 Age of Child and Child's Nutritional Status

Table 4.3.2 below shows the percentage distribution of socio-demographic characteristics of children by nutritional status. The Phi value and p-value of 0.103 and 0.001 respectively indicates strong association and statistical significance of child's age and nutritional status. Consistent with the findings of the 2014 GDHS, this study found peak level of underweight to occur among children age 18-23 months (23.3%) while the least underweight children are between ages 6-11 months (13.9%). Children who are underweight is an indication of poor nutritional status whereas children who are not underweight is a mark of good nutrition and good health.

Higher proportion (86.1%) of children who are not underweight were between the ages of 6-11 months while a least proportion (76.7%) of children between 18-23 months were not underweight. According to Yalew (2013:3) "appropriate child feeding practices and patterns are age-specific, and they are also defined within very narrow age ranges". This implies children of different age group are likely to have varied feeding practices and dietary patterns and by implication nutritional outcome.

This study has found a strong relationship between children's age and their nutritional status. Several studies (Brhane & Regassa, 2014; Yalew, 2013) have documented this relationship and admonished the role age plays in the nutritional status of children. For instance, the (GSS et al., 2015:157) has found that, while the prevalence of underweight among children under five years in Ghana was 11.0%, the peak level of underweight was found among children 18-23 months (15%). This exemplified the impact or influence of age on nutritional status.

In their study of nutritional status of children under three years in Ukraine, Nyankovskyy et al., (2014) investigated the important role of age in determining children feeding habits and its consequence on nutritional status and have documented significant association between age of a child and child's nutritional status. The findings of this study is also consistent with Amugsi et al., (2014) who have found child's and mother age to have a significant association with a child nutritional status. Awel et al., (2016) also found a significant connection between age, place of residence and sex on underweight in their study of nutritional status and associated factors among primary school adolescents.

However, the findings of the current study is slightly in contrast with Ray et al., (2000) who found higher prevalence of malnutrition among children between age group 6-11 months. Therefore, it must be noted that, the role of age cannot be ignored in nutrition analyses especially in studying children between 0-5 years whose nutritional status is a key indicator of health, economic and social development.

Table 4.3.2: Percentage Distribution of Children Nutritional Status by Age

Age in Months	Child nutritional status		
	Underweight	Not underweight	Total
6-11	57 (13.9%)	361 (86.1%)	418
12-17	68 (15.5%)	366 (84.5%)	434
18-23	80 (23.3%)	263 (76.7%)	343
Total	205 (17.2%)	990 (82.8%)	1195

$\chi^2 = 13.20$ $p = 0.001$ $df = 2$ $\alpha = 0.05$

Source: Computed from GDHS (2014) data, July 2017

4.3.3 Sex of Child and Child’s Nutritional Status

In table 4.3.3 below, the prevalence of underweight is high among female (19.9%) children than their male counterparts 14.7%. Sex is recognized as an important factor that has major impact on population components such as fertility, migration, mortality as well as health outcome (Randall & Coast, 2016).

An analysis of the data presented in table 4.3.3 revealed, there is a statistical significant relationship between sex of a child and child’s nutritional status. The chi-square value of 5.67 and p-value of 0.017 indicates a strong relationship between sex of child and child nutritional status.

This result is consistent with the findings of (Ma’alin et al., 2016a; Yalew, 2014) who found sex as a significant predictor of child nutritional status. Yalew’s study has also documented evidence of the sex differential in malnutrition prevalence and argued that, “male children are 1.5 times more likely to be stunted than female children”(Yalew, 2014:3). Yet the analysis carried out here has disclosed that, more female children in the study are underweight compared to the male children.

Table 4.3.3: Percentage Distribution of Children Nutritional Status by Background Characteristics

Background characteristics		Child nutritional status		
		Underweight	Not underweight	Total
Sex of child	Male	88 (14.7%)	518 (85.3%)	606
	Female	117 (19.9%)	472 (80.1%)	589
$\chi^2 = 5.67$	$\rho = 0.017$	df = 1		$\alpha = 0.05$
Child size at birth	Small	58 (32.6%)	120 (67.4%)	178
	Average	57 (10.0%)	515 (90.0%)	572
	Large	90 (20.2%)	355 (79.8%)	445
$\chi^2 = 53.57$	$\rho = 0.000$	df = 2		$\alpha = 0.05$
Place of Residence	Urban	70 (13.0%)	470 (87.0%)	539
	Rural	135 (20.7%)	520 (79.3%)	656
Total		205(17.2%)	990 (82.8%)	1195
$\chi^2 = 12.54$	$\rho = 0.000$	df = 1		$\alpha = 0.05$

Source: Computed from GDHS (2014) data, July 2017

4.3.4 Child Size at Birth and Child's Nutritional Status

The result of the bivariate relationship between child's birth weight and child nutritional status presented in table 4.3.3 shows that child birth size is significantly associated (p-value = 0.000) with child nutritional status. This means controlling for other factors, a child born with average size have lower probability of being underweight than those born with small size. The table indicates that, 10% of the children who were born with average size are underweight while about 33% of the children whose size at birth was small are underweight.

This findings corroborated Ukwuani & Suchindran, (2003) study which found birth weight to be highly significant with child nutritional status. This study found that, children who were born small are 3 times likely to be malnourished compared to children with average size at births. The asymptotic chi-square independence test result p-value (0.000) and a phi value (0.212) indicate a strong association between a child's birth size and nutritional outcome.

Similar statistics for underweight prevalence were found by the 2014 GDHS among children born with very small weight (29.4%) (GSS et al., 2015:156). According to the 6th report of United Nation System Standing Committee on Nutrition (UN-SCN), low birth weight is identified as one significant factor associated with poor nutrition in the world especially in sub-Saharan African countries (United Nations System-Standing Committee on Nutrition, 2006). The same report has attributed low birth weight to maternal age child's birth specifically children born to younger mothers.

This close link between maternal age at child's birth and child's underweight was investigated and found in their study (Ukwuani & Suchindran, 2003) to examine the implication of women's work and child nutritional status in sub-Saharan African with Nigeria as the study area. Guided by this strong relationship, the rate of low birth weight and malnutrition could be high in Ghana where it is found that, "about one fifth of women age 25-49 (22%) tend to give birth before reaching age 18 (GSS, 2015:69).

4.3.5 Place of Residence and Child's Nutritional Status

The bivariate analysis conducted to explore the relationship between nutritional status and children residential status was found to be highly significant with p-value of 0.000. This indicates a strong relationship; the chi-square test shows that, residential status account for about 13% of a child having poor nutritional status or good nutritional status.

Out of the 539 from the urban area as shown in table 4.3.3 above, lower proportions (13.0%) were found to be underweight. Underweight prevalence was found to be high (20.7%) among children with rural residential status while a higher proportion 470(87.0%) of the urban children were found to be not underweight.

According to Popkin et al., (1999:1905) in their article on urbanization, lifestyle changes and the nutrition transition, lower income countries are experiencing rapid changes “in the structure of diet, physical activity patterns, and obesity patterns in their urban areas”. They opined that residents in “urban areas consume diets distinctly different from those of their rural counterparts and the general shifts in their diets enhance energy and fat density and lead to great potential for chronic disease-related health problems” (Popkin et al., 1999:1908).

4.3.6 Maternal Educational Level and Child’s Nutritional Status

Education is a major determinant in a wide range of things in human life. For instance, education plays a crucial role in transferring knowledge and values in society from one generation to another or within certain sub groups of the population. An individual higher level of education is expected to have positive effects on many things such knowledge on nutritional status, adequate proportion of dietary requirement, food hygiene, balance diets and good child feeding practices.

According to table 4.3.4 below, maternal education is highly significant (p -value < 0.05) with child nutritional status at 95% confidence level. The chi-square test of independence association revealed that, maternal educational level accounts for about 20% of the variation in the nutritional status of a child. This study findings confirmed Popkin & Wen Ng, (2006) who have associated education and income as factors influencing dietary behavior and pattern and nutrition outcome in both developed and developing countries. Zero proportion of children whose mothers had higher education were found to be underweight while a greater proportion (23.1%) of malnourished children were found among children whose mothers had no education.

Observation from the table below indicates a trend in the levels of child under nutrition and that of maternal education. Higher levels of maternal education turn to decrease the levels of underweight and improve child nutritional outcome.

The study results concurred Yalew’s findings that “Children of highly educated mothers were less likely to be stunted or malnourished 14 (1.7%) than children whose mothers had a primary education 104 (12.3%) and those mothers with no education 215 (25.5%)” (Yalew, 2013:8).

Table 4.3.4: Maternal Educational Level and Child’s Nutritional Status

Background characteristics		Child nutritional status		
		Underweight	Not underweight	Total
Highest educational level	No education	81 (23.1%)	269 (76.9%)	350
	Primary	40 (17.4%)	190 (82.6%)	230
	Secondary	84 (14.6%)	490 (85.4)	574
	Higher	0 (0.0%)	41 (100%)	41
$\chi^2= 19.90$	$\rho = 0.000$	df = 3		$\alpha =0.05$
Household Wealth Status	Poorest	71 (24.5%)	219 (75.5%)	290
	Poorer	52 (20.3%)	204 (79.7%)	256
	Middle	25 (11.2%)	207 (88.8%)	232
	Richer	44 (20.7%)	169 (79.3%)	213
	Richest	13 (6.4%)	191 (93.6%)	204
Total		205 (17.2%)	990 (82.8%)	1195
$\chi^2= 36.91$	$\rho = 0.000$	df = 4		$\alpha =0.05$

Source: Computed from GDHS (2014) data, July 2017

4.3.7 Household Wealth Status and Child’s Nutritional Status

This study hypothesized that, “children from households in the poorest wealth quintile are more likely to be underweight compared to children from households in the richest wealth quintile”. The prediction is that, households with high wealth status are more likely to have improved access to food and thereby would enhance the feeding pattern and nutritional status of children.

An analysis of the data shown in table 4.3.4 above disclosed that, greater proportion (24.5%) of children age 6-23 months in the study sample who are underweight are from the poorest households while a least proportion 13(6.4%) of the children sampled are from the richest households. Of the 232 children from the middle wealth status households, 11.2% are found to have poor nutritional status (to be underweight).

It can be concluded that, the prevalence of poor nutritional status was found to be high (44.8%) among children born to low household wealth status mothers. On the other hand, children from households with higher wealth status were found to have an elevated probability (93.6%) of having good nutrition than their counterparts born to households with low income status.

At the 95% confidence level, this study found a significant (p-value <0.05) association between household wealth status and child nutritional status among children under five years in Ghana.

The significance of the household wealth status in child nutritional outcome as revealed by the study is to be expected. This is because, wealth or household income is an important factor in determining the lack of or access of food and food utilization (Popkin & Wen Ng, 2006; Yalew, 2013). And as identified by UNICEF, (2015:9), inadequate dietary intake and disease are some underlying causes of under nutrition.

Yet inadequate dietary intake, inadequate care and feeding practices for children may occur due to household food insecurity (lack of availability of, access to, and/or utilization of a diverse diet) which consequentially is linked to household wealth. Low wealth status has been observed to have an influence in a child's feeding practice, access to food and adequate health care which all have an overall effect on the child's nutritional status.

This explains why, at the global level, low and middle-income countries have been observed to be the victims facing the “triple burden of malnutrition – undernutrition, micronutrient deficiencies and overweight and obesity”(UNICEF, 2015).

Also, at the household and individual level, low wealth status manifest itself in the form of poverty which is the underlying cause of malnutrition or poor nutrition (Popkin & Wen Ng, 2006). The culminating effect of poverty is that; it lowers poor person’s propensity to purchase nutritious foods thereby exposing them to under nutrition.

This findings confirms Popkin et al, (1999) observations that high socio- economic status and affluence improves households access to food and health care.

The results of this study is consistent with the findings of Ukwuani & Suchindran, (2003) who found that, children from families with higher wealth status were more likely to have improve nutrition than those from low income families.

4.3.8 Region of Residence and Child’s Nutritional Status

Table 4.3.5 below shows the region of residence and child’s nutritional status. Literature has proved that the geographic region of residence of a child has significant influence on child nutritional status. While environmental differences may exist between these regions, there is likelihood of uneven development across the ten administrative regions in Ghana.

Owing to this point, variation in food access and utilization as well as dietary patterns may exist. The test results showed that the overall region of residence category was found to be significantly associated with child nutritional status in Ghana at the 95% confidence level. The chi-square value is 36.10 with 9 degrees of freedom and p-value of 0.000. The phi coefficient ($\phi = 0.174$) indicates a strong relationship between the region of residence and child nutritional status.

The results presented in the table indicate that most children under five years in Ghana from Northern and Upper West region are underweight with both regions having same proportion of about 28%. This means that 28% of the children in these two regions have poor nutritional status. This is followed by Upper east (21%) and Central (22.8%) regions. Eastern region come bottom on the nutritional status record for children under five years in Ghana with 13.7%. These findings are similar to the 2014 GDHS which found Northern region with the highest prevalence of underweight among children under five years (GSS, 2015:156). Higher proportion (92.1%) of not underweight children are from Ashanti region.

Table 4.3.5: Region of Residence and Child’s Nutritional Status

Variable		Child Nutritional status		
		Underweight	Not Underweight	Total
Region	Western	13 (12.2%)	101 (87.8%)	114
	Central	37 (22.8%)	130 (77.2%)	167
	Greater Accra	24 (14.4%)	143 (85.6%)	167
	Volta	17 (20.2%)	67 (79.8%)	84
	Eastern	17 (15.5%)	92 (84.5%)	109
	Ashanti	15 (7.9%)	174 (92.1%)	189
	Brong Ahafo	17 (13.7%)	107 (86.3%)	124
	Northern	44 (27.7%)	115 (72.3%)	159
	Upper East	13 (24.5%)	40 (75.5%)	53
	Upper West	8 (27.6%)	21 (72.4%)	29
Total		205 (17.2%)	990 (82.8%)	1195

$\chi^2 = 36.10$ $\rho = 0.000$ $\alpha = 0.05$ $df = 9$

Source: Computed from GDHS (2014) data, July 2017

4.3.9 Diarrheal Disease, Anaemia Level and Child’s Nutritional Status

Table 4.3.6 below shows the relationship between the incidence of diarrhea in children and their nutritional status. While studies (Cordero et al, 2017; Rah et al., 2010) have documented significant relationship between diarrhea in children and child’s nutritional status, this study has

found a contrary relationship. Diarrheal disease has been found to be not statistically significant to child nutritional status with a chi-square value of 1.60 and ρ -value of 0.205.

Despite the non-significant relationship between diarrhea disease and child's nutritional status, greater proportion (20.8%) of the children in the study who had history of diarrhea in two weeks preceding the 2014 GDHS were found to be malnourished. The results of this study is contrary to the work of Ukwuani & Suchindran, (2003) who found significant association between child diarrhea and child's nutritional status among children 0-59 months in Nigeria.

Table 4.3.6: Diarrheal Disease, Anaemia Level and Child's Nutritional Status

Variable		Child nutritional status		
		Underweight	Not underweight	Total
Diarrheal Disease	No	173 (16.7%)	864 (83.3%)	1037
	Yes	32 (20.8%)	126 (79.2%)	158
$\chi^2 = 1.60$	$\rho = 0.205$	$\alpha = 0.05$		df =1
Anaemia Level	Not Anaemic	106 (15.8%)	564 (84.2%)	670
	Moderate	23 (23.1%)	80 (76.9%)	103
	Mild	76 (18.1%)	346 (81.9%)	422
Total		205 (17.2%)	990 (82.8)	1195

$X^2 = 3.62$ $\rho = 0.163$ df =1 $\alpha = 0.05$

Source: Computed from GDHS (2014) data, July 2017

Similarly, table 4.3.6 has disclosed that, the relationship between child's anaemia level and child's nutritional status is not statistically significant at the 95% confidence level. However, it is worth noting that, a lower proportion (15.8%) of the children sampled who were found to have poor nutritional status (underweight) is not anaemic.

4.3.10 Child Birth Order and Number of Children in Household

The number of children in the household as well as the birth order of a child is measure as count variables. Therefore, at the bivariate level, the Pearson product moment correlation was carried

out to examine the relationship between these two variables and child’s nutritional status. The result showed that, there is no significant ($r = 0.045$, p (one-tailed) = 0.061) relationship between a child’s birth order and child nutritional status. The analysis has revealed that birth order of a child has no tendency to affect the child nutritional status.

However, from the table above, child nutritional status and the number of children in a household are statistically associated. The detail results are shown in table 4.3.7 below;

Table 4.3.7: Child Birth Order, Number of Children in Household

Descriptive	Statistics
Birth Order	
Mean	3
Covariance	0.029
St. Deviation	1.74
Pearson Correlation	0.045
p(One-tailed)	0.061
Number of Children	
Mean	2
Covariance	0.017
St. Deviation	0.81
Pearson Correlation	0.055
p(One-tailed)	0.029

Source: Author’s Computation, July 2017.

CHAPTER FIVE

FACTORS INFLUENCING CHILD NUTRITIONAL STATUS

5.1 Introduction

The main objective sought to examine the relationship between dietary pattern and nutritional status of children under five years in Ghana. Overall, both bivariate and multivariate level analysis has not established any significant relationship between dietary pattern and child's nutritional status.

5.2 Multivariate Analysis: Determinants of Child Nutritional Status

Binary logistic regression was carried out to predict the factors associated with child nutritional status at three levels. The first level involved an assessment of the relationship between the independent variable (dietary patterns) and the dependent variable (child nutritional status). At the second level, dietary patterns (the independent variable), together with the intermediate variables of anaemia level and diarrheal disease are put into the regression model with the child nutritional status to examine the influences of the intermediate variables of the child nutritional status. At the third level, all the independent variables and intermediate variables are considered in the model as predictors of child nutritional status.

For categorical variables, one category is used as reference category and all others are interpreted in reference to that category. The possibility that a child will be underweight are interpreted with the help of odd ratios. Odd ratios greater than one shows a positive relationship of the variable with child nutritional status. A category with odd ratio greater than one increases the odds of being underweight compared to the reference category of that variable while odd ratios less than one

decreases the odds of being underweight. Significant predictors were measured to be able to predict child nutritional status outcome using the p-value at an alpha level of 0.05.

5.2.1 Model 1: Estimation of Child Nutritional Status Using Dietary Patterns

Model 1 presented in the table below is a regression analysis of the dietary patterns variable against a constant only model which was found to be statistically significant ($X^2 = 4.23$, $p = 0.000$ with $df = 2$).

The result shows the model has distinguished correctly between children who are underweight and those who are not. The Nagelkerke's R^2 value of means that the model explains approximately 0.6% of the variations in child nutritional status. This indicate a weak relationship between dietary patterns and child's nutritional status. The overall group classification prediction success was 82.80%. The Hosmer and Lemeshow (H-L) goodness of-fit test of 0.307 is not statistically significant and that implies the model estimates fit the data at acceptable level and thus the model is a good fit.

The results in model 1 indicate that dietary diversity has no significant influence on children's nutritional status, with a p-value of 0.121. However, children with moderate dietary diversity has a significant influence on their nutritional status, with a p-value of 0.042.

Table 5.2.1: Estimation of Child Nutritional Status Using Dietary Patterns

Variables	OR 95% C.I	Sig. (P-value)
Dietary diversity score		0.121
<i>High dietary diversity (RC)</i>	1.00	
Moderate dietary diversity	1.53 [1.01, 2.30]	0.042
Low dietary diversity	1.21 [0.83, 1.77]	0.327
<i>Constant</i>	0.168	
<i>Correct % Prediction</i>	82.80%	
<i>Hosmer and Lemeshow Test</i>	30.70%	
<i>Nagelkerke R²</i>	0.60%	
<i>Model Chi-square (df)</i>	4.23(2)	

5.2.2 Model 2: Estimation of Child Nutritional Status Using Dietary Patterns and Mediating Variables

Model 2 involved an assessment of the relationship between the main independent variable together with the intermediate variable against a constant only model. The influence of dietary patterns on child nutritional status is been observed to mediated by some variables such as anaemia level and the onset of diarrhea. Model two (2) seeks to establish how the presence of these intermediate variables could affect the influence of nutritional status of children under five years. The model results in table 5.2.2 show that, the model is statistically significant ($X^2 = 8.67$, $p = 0.000$ with $df = 5$). This indicates that the predictors in this model have reliably distinguished between children who are underweight and those who are not. The model explains approximately 1.20% (*Nagelkerke R²*) of this variation in the dependent variable. However, this indicates a weak relationship between the predictors and child nutritional status, with an overall prediction of success rate of 82.80%. The Hosmer and Lemeshow goodness-of-fit test value of 0.307 which is greater than the confidence level of 0.05 means that the model is a good fit.

The results revealed no relationship between dietary diversity as having direct influence on nutritional status of children when model with the mediating variables. This means the

intermediate variables have no much influence on the association between child’s dietary diversity and child’s nutritional status. However, incidence of diarrhea has been found to have positive association with child’s underweight or nutritional status. The results revealed that, children who had diarrhea were 0.28 times more likely to be underweight as compared to children who do not have diarrhea.

Anaemia level, though not significantly related to child’s underweight, children who are moderately anaemic are 57% more likely to be underweight as compared to children who are not anaemic.

Table 5.2.2: Binary Logistic Regression of Child Nutritional Status Using Dietary Patterns and Mediating Variables

Variables	OR 95% C.I	Sig. (P-value)
Dietary Diversity Score		0.125
<i>High dietary diversity (RC)</i>	1.00	
Moderate dietary diversity	1.52 [1.01, 2.29]	0.045
Low dietary diversity	1.20 [0.82, 1.77]	0.344
Had Diarrheal		
<i>No (RC)</i>	1.00	
Yes	1.28 [0.84, 1.95]	0.252
Anaemia Level		0.194
<i>Not Anaemic (RC)</i>	1.00	
Moderate	1.57 [0.95, 2.60]	0.080
Mild	1.16 [0.84, 1.61]	0.359
<i>Constant</i>		0.148
<i>Correct % Prediction</i>		82.80%
<i>Hosmer and Lemeshow Test</i>		30.70%
<i>Nagelkerke R²</i>		1.20%
<i>Model Chi-square (df)</i>		8.67 (5)

5.2.3 Model 3: Estimation of Factors Associated with Child's Nutritional Status

A further binary logistic analysis of the factors associated with nutritional status showed that age of child, child birth size and household wealth status are strong significant (p-value <0.005) predictors of child nutritional status.

The result showed that the overall model is significant with a chi-square value of 139.28 with 29 degrees of freedom. The inclusion of all the explanatory variables yields a better fit and the model predicts 83.10% of the correct categorization of children nutritional status with a *Nagelkerke's R-squared* value 18.20%. This means that the model explains 18.10% of the variation of child nutritional status. Detail results of the overall effect of the independent variables on child nutritional status is presented in table 5.2.3 below.

Table 5.2.3: Binary Logistic Regression Model Depicting Factors Associated Which Child Nutritional Status

Variables	OR 95% C.I	Sig. (p-value)
Dietary diversity score		0.943
<i>High dietary diversity (RC)</i>	1.00	
Moderate dietary diversity	1.07 [0.67, 1.70]	0.777
Low dietary diversity	1.01 [0.63, 1.61]	0.973
Age of Child in Months*		0.001
6-11 (RC)	1.00	
12-17	1.28 [0.83, 1.96]	0.264
18-23*	2.28 [1.47, 3.55]	0.000
Sex of Child		
Male (RC)	1.00	
Female	1.23 [0.88, 1.70]	0.225
Child Birth Size*		0.000
Small (RC)	1.00	
Average*	0.20 [0.13, 0.32]	0.000
Large*	0.49 [0.32, 0.75]	0.001
Number of Children under 5 in Household	1.06 [0.86, 1.31]	0.572

Variables	OR 95% C.I	Sig. (p-value)
Region		0.067
<i>Western (RC)</i>	<i>1.00</i>	
Central*	2.33 [1.13, 4.79]	0.022
Greater Accra	1.55 [0.67, 3.56]	0.303
Volta	1.48 [0.63, 3.45]	0.367
Eastern	1.33 [0.58, 3.03]	0.503
Ashanti	0.92 [0.40, 2.10]	0.834
Brong Ahafo	0.98 [0.42, 2.29]	0.966
Northern*	2.43 [1.05, 5.60]	0.038
Upper East	1.44 [0.53, 3.90]	0.471
Upper West	1.97 [0.64, 6.07]	0.238
Place of Residence		
<i>Urban (RC)</i>	<i>1.00</i>	
Rural	1.17 [0.73, 1.89]	0.519
Maternal Educational Level		0.399
<i>No Education (RC)</i>	<i>1.00</i>	
Primary	0.88 [0.52, 1.49]	0.645
Secondary	0.95 [0.58, 1.58]	0.847
Higher	0.06 [0.00, 1.65]	0.096
Household Wealth Status*		0.017
<i>Poorest (RC)</i>	<i>1.00</i>	
Poor	0.98 [0.56, 1.70]	0.928
Middle	0.55 [0.28, 1.10]	0.089
Rich	1.11 [0.53, 2.30]	0.788
Richest	0.39 [0.15, 1.05]	0.061
Had Diarrheal		
<i>No (RC)</i>	<i>1.00</i>	
Yes	1.33 [0.84, 2.11]	0.218
Anaemia_Level		0.899
<i>Not Anaemic (RC)</i>	<i>1.00</i>	
Moderate	1.08 [0.62, 1.88]	0.781
Mild	1.08 [0.76, 1.54]	0.667
Child Birth Order	0.98 [0.90, 1.07]	0.682
<i>Constant</i>	<i>0.223</i>	
<i>Correct % Prediction</i>	<i>83.10%</i>	
<i>Hosmer and Lemeshow Test</i>	<i>2.20%</i>	
<i>Nagelkerke R²</i>	<i>18.30%</i>	
<i>Model Chi-square (df)</i>	<i>139.28 (29)</i>	

Note: RC-Reference Category

Results from table 5.2.3 above indicates that, sex of child, child's dietary pattern, maternal educational level; region and place of residence are not significant predictors of child nutritional status. The model also revealed that anaemia level and incidence of diarrhea does not have any significant influences on nutritional status.

The results from the model above indicates that, age of a child has significant influence on child's nutritional status, with a p-value of 0.001. Children ages 18-23 months are significant predictors of nutritional status. When compared to children age 6-11, children age 18-23 [with OR: 2.28, 95% [1.47, 3.55] are 1.28 times as less likely to be underweight. Children between ages 12-17 months are 0.28 times less likely to be underweight compared to children aged 6-11 months in Ghana.

With respect to child size at birth, there is a strong relationship between child birth size and child nutritional status with p-value of 0.000. The results reveal that children born with average size are 80% less likely to be underweight as compared to those with small birth size. Children whose size at birth was large are 59% less likely to be underweight as compared to those with small birth size.

Overall, region of residence was found to be not statistically significant (p-value < 0.05) predictor of child nutritional status. Being a resident of any of the individual region such as Greater Accra, Volta, Eastern, Ashanti, Brong Ahafo, Upper East and Upper West region was not also found to be significantly related to child nutritional status. By comparison, children age 6-23 months from Central region are 1.33 times as likely to be underweight when compared to their counterparts from Western region. Children born in Northern region are 1.43 times as likely to be underweight as compared to their counterparts from Western region.

Similarly, maternal educational level was found to be insignificant predictor of child nutritional status, with a p-value of 0.399. Children whose mothers have higher education are 60% less likely to be underweight as compared to their counterparts whose mothers have no education. A consistent trend of declining prevalence of underweight among children as mother's education improved was observed.

As stated earlier, sex of child and number of children in a household was found to be insignificant predictors of child nutritional status. With regard to residential status, children from rural area are 0.17 times more likely to be underweight when compared to their counterparts in the urban areas.

On the other hand, the results reveal that household wealth status has a strong association with child's nutritional status. Household wealth status was found to be significantly associated (p-value = 0.017 with child nutritional status. However, being a member of either poor, rich or richest households is not identified by the model to be predictors of child's nutritional status in Ghana.

Children born to poor households are found to be 0.02 times less likely to be underweight as compared to their counterparts from poorest households. Richest households' category was found to be insignificant (p-value = 0.061) predictor of child nutritional status. Children from richest households are found to be 0.61 times less likely to be underweight compared to their counterparts from poorest households.

5.3 Discussions of Findings

This section provides a brief discussion of key findings while comparing findings with previous works. Discussions are centre on the main objective of the study, the study hypothesis and comparisons made to other research work on child's nutritional status.

5.3.1 Relationship between Dietary Pattern and Child's Nutritional Status

The first objective of this study was to examine relationship between dietary pattern and nutritional status of children under five years in Ghana using underweight as proxy. Guided by this, the study hypothesized that, “children with high dietary patterns are less likely to be underweight compared to children with low dietary patterns”. Therefore, the chi-square independent test was used to assess the association between dietary pattern and nutritional status whiles the phi and Cramer's v was used to examine the strength of relationship.

An analysis at the bivariate level showed a chi-square value of 4.104 with p-value of 0.128 which means that, dietary pattern is not significantly associated with child nutritional status. This interesting finding is partly due to the types of food examined in the survey which may not reflect the local Ghanaian dishes or diets consumed by children. On the basis of this finding, it can be said that a type of food taken by a child is less likely to influence the current nutritional status of that child.

Despite the insignificant relationship between dietary pattern and child nutritional status at the bivariate level, the study added it in the final model to examine its influence on child nutritional outcome. The results revealed that, child's dietary pattern did not have significant association with child's nutritional status. Therefore, there is no evidence to accept the first hypothesis of this study.

This study has defined three dietary pattern; high, moderate and low dietary diversity. As the main objective, the study examined the relationship between pattern of diet that a child consumed and how it is associated with the nutritional status of the child.

Results from the study indicate that, there is a no significant [OR: 1.21, 95% CI, 0.83-1.77 with p-value = 0.327] association between low dietary diversity score and child nutritional status. Children who had low dietary score were found to be 0.21 times more likely to be underweight when compared to their counterparts with high dietary diversity. On the contrary, moderate dietary diversity is significantly [OR: 1.53, 95% CI, 1.01-2.30 with p-value = 0.042] associated with child nutritional status.

This finding is contrary to Pelletier, (1994) who found improper food intake and poor child feeding practices as some factors associated with childhood under nutrition in developing countries. The incidence of poor child feeding practices are likely to be dominant in rural communities where knowledge of food hygiene maybe lacking or limited. Urbanization is been observed to be a key player in population dietary practices and choices (Popkin, 1999). By implication the incidence of urbanization in Ghana and the onset of obesogenic environment where there is an increase consumption of already prepared and canned food or fruits could be having nutrition implication on Ghanaian children under five years of age. In short, in this study dietary pattern did not remain as a significant predictor of nutritional status after model testing of associated factors of children under five nutritional statuses was carried out.

5.3.2 Relationship between Household Wealth Status and Child Nutritional Status

The second objective of the study was, to examine the relationship between household wealth and the nutritional status of children under five years in Ghana. Guided by this objective the study postulated that, children from households in the poorest wealth quintile are more likely to be underweight compared to children from households in the richest wealth quintile.

As expected, household wealth status has been found to have an effect on children under five year's nutritional status particularly underweight which the study focused. With respect to

household wealth status, children whose parents are poor were found to be 0.02 times less likely to be underweight as compared to their counterparts whose parents are poorest. This means that, children from poor households are less likely to have poor nutritional status as compared to their counterparts from poorest households. It is worth noting that as household income improves, the household access to food is more likely to improve. There enough evidence to accept the second hypothesis since there is a strong relationship between household quintile and child nutritional status.

5.3.3 Relationship between Maternal Educational Level and Child Nutritional Status

One of the study objective was, to assess the relationship between maternal educational level and the nutritional status of children under five years in Ghana. The expectation are that since maternal education plays a significant role in child health care practice and food access, it could significantly predicts child's likelihood of being underweight. On the contrary, the current study result showed that maternal educational level has no significant influence on child nutritional status. Notwithstanding, it is worthy to note that, children whose mothers have higher education were found to be 0.04 times less likely to be underweight as compared to their counterparts whose mothers have no education.

Previous studies notably Amugsi et al., (2014), Chandran, (2009) and Hong, (2016) have found contrary trends and relationship between maternal education and child nutritional. Consistent to this study findings, Appoh & Krekling, (2005) in their study of maternal nutritional knowledge and child nutritional status in the Volta region of Ghana, did not find any association between maternal education and child nutritional status. Their argument which I agree with is that maternal nutritional practical knowledge is more important to the child health status than her formal education. This conclusion made by Appoh & Krekling support the findings by Ukwuani &

Suchindran, (2003) in Nigeria where improvement of maternal education had a negative effects on child nutritional. In Ukwuani and Suchindran's study, the reason attributed to the inverse relationship between education and child nutritional was the inability of educated mothers to find employment in Nigeria.

5.3.4 Relationship between Socio-Demographic Characteristics and Child's Nutritional Status

Several socio-demographic variables are been observed to have significant association with nutritional status. This study examined these variables to establish their effects on children under five years nutritional status. After controlling for other variables in the final model, age of child and child's birth size were found to have a strong association with child nutritional status.

Consistent with the findings of the 2014 GDHS, this study found peak level of underweight to occur among children age 18-23 months (23.3%) while the least underweight children are between ages 6-11 months (13.9%). Higher proportion (86.1%) of children who were found to be not underweight were between the ages of 6-11 months while a least number proportion (76.7%) of children who were not underweight are between 18-23 months. This implies few children between ages 18-23 have good nutritional status.

The sex of a child was not found to have any association with the child nutritional status. However, higher proportion (19.9%) of female children were found to be underweight as compared to their male (14.7%) counterparts. In other words, more female children were found in the study to have poor nutrition as compared to male children. Similar results has been documented by Ma'alin et al., (2016) in Shinile Woreda, Ethopia where more female participants were found to be underweight. Also, same finding was reported in the 2014 GDHS where almost 12% of female

children between the ages 0-59 months were underweight as compared to their male (11%) counterparts in same age group.

Child birth size was found to be another key significant predictor of child nutritional status. The study found that, greater proportion (47.8%) of Ghanaian children between the ages 6-23 months had average birth size. Children who were born with average size are 80% less likely to be underweight as compared to those with small birth size. Children whose size at birth was large are 0.59 times less likely to be underweight as compared to those with small birth size.

This finding confirms the works of Ma'alin et al., (2016), Pelletier, (1994) and Ukwuani & Suchindran, (2003) who found significant relationship between child birth weight and child nutritional status. The birth size of children is been observed to be associated with the mother's age at child birth and maternal feeding habits during pregnancy which all have implication for the health and nutritional status of the child (Pelletier, 1994; UNSCN, 2006). This study findings also corroborated the 6th report of the United Nations System Standing committee on nutrition which documented significant association between a child's birth size and the probability of him or her being underweight (UNSCN, 2006).

5.3.5 Relationship between Place Residence, Other Characteristics and Child Nutritional Status

The third hypothesis of the study was that; "children living in rural areas are more likely to be underweight compared to children living in urban areas". However, there is not enough evidence to support this claim because in relation to child's place of residence, this study has found no significant association of a child place of residence with the probability of him or her being underweight. This study finding is contrary to the findings of Amugsi et al., (2014) who found significant association between a child's place of residence and child's nutritional status outcome.

However, it's important to note that, poor nutritional status is found to be high (20.7%) among children with rural residential status while a higher proportion (87.0%) of the urban children were found to have good nutritional status (not underweight).

Also, regional variation in nutritional status exists. Region of residence of a child is not statistically significant (p -value < 0.05) predictor of child nutritional status. Children from Central region are 1.33 times as likely to be underweight when compared to their counterparts from Western region while children from Northern region are 1.43 times as likely to be underweight.

In general, the result of the study shows that age of child, child birth size, household wealth status, are significant predictors of the nutritional status of children under five years in Ghana. However, sex of a child, dietary pattern, region, maternal educational level, anaemia level, incidence of diarrhea, child's birth order and place of residence are not significantly associated with the nutritional status of children.

Based on this the third hypothesis of this study; "children living in rural areas are more likely to be underweight compared to children living in urban areas" was not accepted since there is no significant relationship between child's place of residence and child nutritional status.

However, there is enough evidence to accept the second hypothesis of the study that; "children from households in the poorest wealth quintile are more likely to be underweight compared to children from households in the richest wealth quintile".

CHAPTER SIX

SUMMARY, RECOMMENDATIONS AND CONCLUSION

6.1 Introduction

This chapter present a summary of the key findings of the study and makes policy and research recommendations on child nutritional status based on the findings. The chapter is divided into three sub-sections namely; summary, conclusion and recommendation.

6.2 Summary

The main objective of the study sought to examine the relationship between dietary pattern and nutritional status of children under five years in Ghana. The study also sought to examine factors associated with the nutritional status of children under five years in Ghana. Child dietary pattern or feeding composite index was derived after food items were classified into five food groups. Children who scored from 0 to 2 points (food groups) on the composite index are children whose feeding diversity are below the minimum feeding food groups recommended by WHO hence were classified as low dietary diversity. Those whose dietary diversity scored equals three points (food groups) are said to have met the minimum feeding requirements recommended by WHO hence are classified as moderate dietary diversity. However, children whose dietary diversity score are equals to four (4) food groups (points) or more are classified as high dietary diversity.

The three dietary patterns were used to measure the independent association of dietary pattern and nutritional status while controlling for socio demographic variables. The study used the children under five years' file of the 2014 GDHS. The inclusion criterion was based on the last child between ages 0-23 months upon whom data on the aspect of dietary intake was obtained.

With the view of comparing findings with other studies, three analyses; univariate, bivariate and multivariate were carried out. Univariate analyses were done to show the socio economic, demographic and geographic distribution of the study participants. Bivariate analysis through cross tabs was conducted to examine relationship between each of the independent variables and nutritional status. At the multivariate level, binary logistic regression model was done to examine the associated factors of child nutritional status at the 95% confidence interval. The study found that, out of the 1195 children sampled, 657 (57%) feeding practices met the standard minimum feeding requirements recommended by WHO.

Evidence from the study showed that about 17.2% children under five years in Ghana have poor nutritional status. Underweight which was used as indicator for nutritional status was found to be high about (28%) in Northern and Upper West regions. Rural underweight prevalence was higher (20.7%) compared to the urban area. Higher proportion (92.1%) of children who had good nutritional status was found to be in Ashanti region and among children from the richest households (93.6%).

At the bivariate level, socio economic and demographic variables were tested using chi-square independent test. Results from the study showed that, age of child, sex of child, child birth size, child birth order, maternal educational level; household wealth status, region and place of residence are significantly associated with child nutritional status. However, dietary diversity, anaemia level, diarrhea disease and number of children in the household were found not to be significant predictor of child nutritional status.

At the multivariate level, the study further conducted a binary logistic model analysis to identify the most significant predictors of the nutritional status of children under five years. In the model,

dietary pattern was still not found to be a significant [OR: 1.21, 95% CI 0.83-1.77 with p-value = 0.121] predictor of nutritional status of children under five years in Ghana when all other variables were added in the model.

An analysis of the model revealed that, child dietary pattern, region, maternal educational level, number of children in the household, place of residence and sex of child are not significant predictors of children under five years' nutritional statuses in Ghana.

On the other hand, the study found that age of child, child birth size and household wealth status are strong significant predictors of child nutritional status. This means that the significant determinants of child nutritional status are age of child, child birth size and the wealth status of the child household.

The study made three hypotheses. The first hypothesis was that; “children with high dietary patterns are less likely to be underweight compared to children with low dietary patterns”. The result of the study did not confirm this hypothesis hence was rejected. The second hypothesis was that; “children from households in the poorest wealth quintile are more likely to be underweight compared to children from household in the richest wealth quintile”. As expected, this study found an association between household wealth status and child nutritional status. Therefore, the second hypothesis was accepted based on the findings. The third hypothesis was that; “children living in rural areas are more likely to be underweight compared to children living in urban areas”. However, this did not find any relationship between a child's place of residence and his or her probability of becoming underweight. In this regard, the third hypothesis was rejected because there was no evidence to support it.

6.3 Recommendations

The findings of the study have shed more light on the most significant predictors of the nutritional statuses of children under five years in Ghana. These findings have implications both for policy and academic research. Against this backdrop, the following recommendations are made.

It is evident from the study that majority of the children found to have poor nutritional status aged between 18-23 months. It is recommended that, child age specific attention be given to children during feeding as they transitioned from breastfeeding into household foods especially when families have limited food access.

The study also found that low child birth size had a significant effect on child nutritional status. Therefore, it is imperative for Ghana health service to intensify efforts to reduce low birth weight in Ghana through nutrition educational campaigns during pregnancy and postnatal clinical visits of mothers.

Maternal educational level though was not found in this study to be a significant predictor of child nutritional status, a declining trend of poor nutritional status was observed as mother's educational level improves. In view of this, it is recommended that the efforts to improve nutrition, eradicate childhood malnutrition and reduce under five mortalities in the world should be focused on female education. Therefore, initiatives such as Campaign for Female Education (CAMFED) must be adopted and accelerated by Ghana education service. As more girls are educated, they grow into adulthood as mothers with high purchasing power to provide their households especially their children with adequate domestic food needs.

More children from rural areas were found to have poor nutritional status which may be closely linked to lack of nutrition education or information. The Ghana health service through the

Community Health Planning and service (CHPs) model can replicate same in community nutrition intervention programmes to reduce the prevalence of underweight in rural Ghana.

6.4 Conclusion

The nutritional status of children under five years is an important indicator of health and development of any country. The development outcome of every individual at adulthood can be traced to individual childhood nutritional status. For this reason, this study examined the influences of dietary patterns and other variables on children's nutritional status.

However, this study did not find any relationship between dietary pattern and children's nutritional status. Household wealth status, age of a child and child birth size were found as significant predictors of the nutritional status of children under five years in Ghana.

In view of this, an integrated approach targeting at these variables is required by policy makers and health planners to address childhood poor nutrition in rural Ghana.

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