SCHOOL OF PUBLIC HEALTH

COLLEGE OF HEALTH SCIENCES

UNIVERSITY OF GHANA

ASSESSMENT OF NUTRITIONAL STATUS AND ASSOCIATED FACTORS IN CHILDREN UNDER-FIVE YEARS AT PRINCESS MARIE LOUISE CHILDREN'S HOSPITAL IN ACCRA, GHANA

BY

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A DISSERTATION SUBMITTED TO THE UNIVERSITY OF GHANA, LEGON IN PARTIAL FULFILMENT OF THE REQUIREMENT FOR THE AWARD OF MASTER OF PUBLIC HEALTH DEGREE

OCTOBER, 2019

DECLARATION

I declare that this study is my original work and is intended for academic purposes. There is no conflict of interest. This dissertation has been written under the academic supervision of Dr. Francis Anto of the Department of Epidemiology and Disease Control and that, apart from the literature review duly acknowledged, this dissertation has not been presented either in whole or in part to any institution or school for the award of any degree.

I also reaffirm that all sources of materials used and consulted in the course of this study have been duly acknowledged.

SIGNED …… DATE ……

Akua Adutwumwaa Boamah Addy

(STUDENT)

SIGNED …… DATE ……

Dr. Francis Anto

(SUPERVISOR)

DEDICATION

This work is dedicated to my loving family who have stood with me through difficult times and for enduring my long absence from home.

ACKNOWLEDGEMENT

I am grateful to the Almighty God, my Creator for the continuous gift of life and strength.

Thanks to my entire family, who have remained steadfast in prayer and support throughout the course of this program.

I also wish to acknowledge the immense guidance and contribution of my supervisor Dr. Francis Anto.

Lastly, to all my friends and post graduate students who made this course bearable, I say thanks to all of them.

LIST OF ABBREVIATIONS

BMI - Body Mass Index

CI – Confidence Interval

FAO – Food and Agriculture Organization of the United Nations

FP - Family Planning

GDHS – Ghana Demographic and Health Survey

GHS - Ghana Health Service

GSS – Ghana Statistical Service

HAZ – Height for Age Z-score

MDG - Millennium Development Goal

MUAC - Mid-Upper Arm Circumference

PML - Princess Marie Louise

RCH - Reproductive and Child Health

SRS - Simple Random Sampling

SSA - Sub-Saharan Africa

UN – United Nations

UNICEF – United Nations International Children's Emergency Fund

WAZ – Weight for Age Z-score

WHO – World Health Organization

WHZ – Weight for Height Z-score

DEFINITIONS

MALNUTRITION – The cellular imbalance between the supply of nutrients and energy and the body's demand for them to ensure growth, maintenance, and specific functions. It includes both undernutrition and overnutrition.

STUNTING – This refers to height less than two standard deviations below the median height for age of the standard reference population.

UNDERWEIGHT – This refers to weight less than two standard deviations below the median weight for age of the standard reference population.

WASTING – This refers to weight for height less than two standard deviations below the WHO child growth standards mean weight for height.

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ABSTRACT

Introduction: Malnutrition remains the main public health problem in most less developed countries. Children are mostly exposed to malnutrition because they are still developing. Sufficient nutrition, during childhood, will ensure correct organ development, adequate growth, neurological and cognitive development, as well as an improved immune system. If the nutritional needs of a child are not met in the early years, it has an enduring effect on the child.

Objective: The main aim of the study was to assess the nutritional status and associated factors in children under five years attending the Princess Marie Louise Children's Hospital, in Accra.

Methods: An analytic cross-sectional study involving children under-five years paired with their parents or guardian was carried out at the Princess Marie Louise Children's Hospital, in Accra. A simple random sampling (SRS) technique was used to randomly select parents or guardians of the children under-five years. Questionnaires were administered to these parents or guardians and data on factors associated with undernutrition in children below five years were collected. Chi-square test and multivariate logistic regression were the two statistical tools used in determining the relationship between the outcome variable and various independent variables.

Results: The prevalence of underweight was 26.9%, stunting 34.5% and wasting 19.3% among the study participants. The age of the child, vaccination status, mother's age at birth of child, educational level of the mother were all found to have a positive relationship with undernutrition. Time period of start of breastfeeding, breastfeeding exclusively and bottle feeding were also found to have a positive relationship with

stunting, wasting and underweight of these infants. Poor sanitation and an unprotected source of drinking water also contributed to undernutrition.

Conclusion: Most of the factors found to have a relationship with undernutrition among these infants are factors that can be prevented. As such measures need to be put in place to curb them so as to reduce the high prevalence of undernutrition.

CHAPTER ONE

1.0 INTRODUCTION

1.1 Background of the Study

Undernutrition persists as a public health concern in most developing countries. According to de Onis, Blössner, Borghi, Morris, and Frongillo (2004), children need adequate nutrition to ensure adequate organ development, healthy growth, neurological and cognitive development, and a strong immune system (Darsene, Geleto, Gebeyehu, & Meseret, 2017). The lack of this leads to malnutrition in these children. If the nutritional needs of a child are not met in these early years of their lives, it has enduring effects on them. This is because, the severely malnourished child has dysfunction of the immune system that may increase the incidence of infectious diseases resulting in increased morbidity and death (Suleiman, Salih, Karrar, Mohammed, & Helsing, 2011). Malnutrition results if the nutrient and energy supply does not meet the body's demand for them resulting in poorer health. It may be brought about by a number of factors within the environment of these individuals (Asfaw, Wondaferash, Taha, & Dube, 2015).

Malnutrition results from dietary deficiencies or excesses of proteins, energy or micronutrients such that it causes health problems (Woldermariam & Genebo, 2002). According to WHO (2017), globally, the number of infants aged five years and below who were stunted, underweight and wasted were 159 million, 95 million and 50 million respectively. Undernutrition is most prevalent in South-East Asia and Africa. In the African region, the prevalence of stunting is 39.4%, while that of wasting is 24.9% and underweight, 10.3% in children under five years (WHO, 2010). Globally, one third of children who are undernourished, are from Sub-Saharan Africa (SSA) according to the Millennium Development Goal (MDG) report, 2015. This demonstrates that,

malnutrition remains a major concern for the child population in the Africa region**.** Urgent intervention, therefore, needs to be put in place (UN, 2015). In Africa, the prevalence of wasting in 2014, was 4.0% in Kenya, 7.9% in Nigeria, 8.7% in Ethiopia, 4.5% in Benin, and 5.2% in Cameroon among children under five years (WHO, 2017). Also, in 2014, the prevalence of stunting was 26.0% in Kenya, 40.1% in Zambia, 40.4% in Ethiopia, 27.5% in Togo, and 39.9% in Chad among children five years and below (Akombi, Agho, Merom, Renzaho, & Hall, 2017). The prevalence of underweight in 2014 was 11.0% in Kenya, 1.5% in Zambia, 25.2% in Ethiopia, 16.0% in Togo, and 28.8% in Chad among children under five years (Akombi *et al.*, 2017). Ghana is categorized as a country with high severity of malnutrition according to the Food and Agriculture Organization of the United Nations (FAO) (2017). Child malnutrition and health continue to be the main challenge and therefore has become an issue of major concern to the country (Ministry of Health, 2017).

According to GSS (2017), the prevalence of stunting and wasting was 28 % and 9% respectively among children under 5 years. The same report also highlighted that this incidence of stunting in Greater Accra region was between 31.5 to 37.4 %. Food insecurity issues, poor child and maternal care, and inadequate nutrition can be said to contribute to this (Chilton, 2007). People residing in the capital city of countries are identified to be of greater risk of malnutrition (FAO, 2017). This is because, they are characterized by poverty and food insecurity due to the serious problems they face such as migration of populations, rapid population growth and lack of alternate sources of income (FOA, 2014).

One vital stage in resolving this issue of malnutrition is by discovering places with high rates and the factors related to it (Nikoi, 2011). The right method to employ for this purpose is nutrition surveys. These are conducted to find those within the population

that are at risk of malnutrition and the factors that influence it (Wasantwisut *et al.*, 2007).

This study was to evaluate the nutritional status of children in Princess Marie Louise Children's Hospital in Accra, to serve as baseline data for projects to be implemented in Accra, the capital city of Ghana. Additionally, some predictors of undernutrition in children aged five and below in Greater Accra region of Ghana was also determined.

1.2 Problem Statement

Malnutrition is one of the major factors influencing health in children aged 5 years and below in developing countries (Chowdhury *et al.*, 2016), with a resultant stunting (Said-Mohamed, Micklesfield, Pettifor, & Norris, 2015). Ghana has made tremendous efforts in ensuring that, malnutrition is significantly reduced among children under five years (Ghana Health Service, 2008). The Multiple Indicator Cluster Survey (MICS4) conducted in Ghana, indicates that the proportion of stunting, moderate or severe underweight and wasting are 23%, 13% and 6% respectively (Ghana Statistical Service, 2011). Children who are malnourished, tend to have lower immunity to diseases, thus, affected by childhood diseases that are common. Some of these disease are respiratory tract infections and diarrhea (Hien & Kam, 2008). These diseases eventually affect their overall health creating problems such as impaired growth, reduced learning ability and frequent sickness (Pal, Pari, Sinha, & Dhara, 2017).

The highest under 5 mortality rate occurs in Sub-Saharan African (SSA) countries (WHO, 2017), with approximately 35% of the mortality attributable to nutrition related factors and 4.4% of the deaths resulting from acute malnutrition (Black *et al.*, 2013). According to Demissie (2013), biological, social and environmental factors are the main factors contributing to undernutrition in developing countries, but Hien and Kam

(2008) believes that ill-health and poverty arising from inadequate resources contribute to ill- health in these countries. Statistical data from Princess Marie Louise Children's Hospital indicated that malnutrition was not part of the top ten causes of out-patient attendance for 2017, but severe malnutrition accounted for the highest cause of mortality (see appendix 5). It is in this light that the research seeks to assess the nutritional status and characteristics related to malnutrition in children under the age of five years at Princess Marie Louise Children's Hospital in Accra, Ghana.

1.3 Objectives of the Study

1.3.1 General Objective

To assess the nutritional status and associated factors (maternal, family, individual) in children under five years at the Princess Marie Louise Children's hospital in Accra, Ghana.

1.3.2 Research Questions

The research questions for this study are:

1. What is the prevalence of malnutrition in children under 5 years attending Princess Marie Louise Children's Hospital?
2. What is the relationship between maternal factors and nutritional status of children under 5 years?
3. What is the relationship between child's characteristics and nutritional status of children under 5 years?
4. What is the relationship between family factors and nutritional status of children under 5 years?
5. What is the relationship between feeding practices and nutritional status of children under 5 years?

1.3.3 Specific Objectives

1. To determine the prevalence of malnutrition in children under 5 years attending Princess Marie Louise Children's Hospital.
2. To determine the relationship between maternal factors and nutritional status of children under 5 years.
3. To determine the relationship between child's characteristics and nutritional status of children under 5 years.
4. To determine the relationship between family related factors and nutritional status of the children under 5 years.
5. To assess the relationship between feeding practices and nutritional status of children under five years.

1.4 Conceptual Framework

The conceptual framework (Figure 1) comprises of independent variables (family, child, maternal and feeding practices) and dependent variable (nutritional status). These independent variables originate from review of related studies where nutritional status (wasting, underweight, stunting) is affected by children's related factors, family related factors, and maternal factors.

Age of the child, sex, birth weight, child's birth order and vaccination status were the child related factors. The maternal factors also included, education status, age at birth of child and occupation.

Family factors highlighted include household size, kind of latrine, source of drinking water, number of children, structure of house, per capita family income and ethnic group. As highlighted by Nguyeng and Kam (2008), maternal factors and family factors have a significant effect on malnutrition. An example is the positive relationship between household size and nutritional status. Mambolo *et al.* (2005) identified that a

household size which was large, was protective against children under five years becoming malnourished. Feeding practices highlighted include time period between child birth and initial breastfeeding, bottle feeding, total duration of exclusive breastfeeding, type of nourishment provided and total duration of breastfeeding.

The conceptual framework therefore shows how the above-mentioned factors (child, family maternal and feeding practices) influence nutritional status of children aged 5 years and below in Princess Marie Louise Hospital.

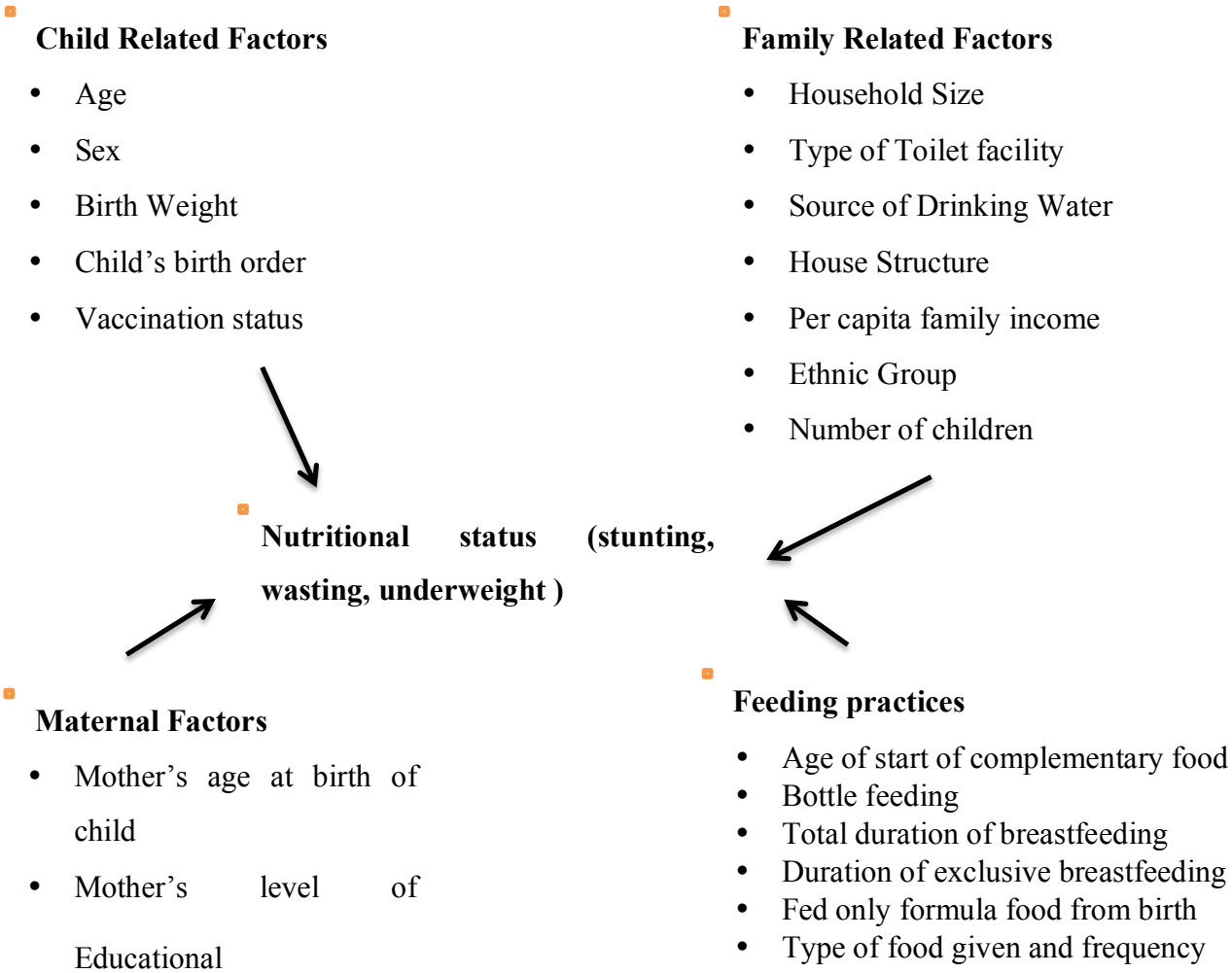

Figure 1: Conceptual Framework of child related factors, family related factors and maternal factors and its relationship with the nutritional status of children below 5 years

CHAPTER TWO

LITERATURE REVIEW

2.1The concept of Child Malnutrition

Pileggi *et al.* (2016) defined child malnutrition as an imbalance between nutrients required by a child and intake of essential nutrients. This disequilibrium extends into lack of energy accumulation, protein and micronutrient, which may result in poor growth and development leading to other consequences (Joosten & Hulst, 2011). In addition, Abdirizak *et al.* (2018) defined malnutrition as the consequence of inadequate essential nutrients which results in poorer health. Several factors which are political, socio-demographic, institutional, environmental, reproductive, regional, and cultural influence malnutrition. Malnutrition also results from the intake of diets, which contains nutrients that are insufficient as such resulting in health problems (Suleiman *et al.*, 2011).

Malnutrition, has long been perceived to have a relationship with mortality among children (Trowell, 1948; Gomez *et al.*, 1956). It was found to enhance the effects of infectious disease on child mortality, by a study conducted in the 1990s, at the population level (Pelletier, Frongillo & Habicht, 1993). They also observed more deaths related to mild-to-moderate malnutrition than severe malnutrition. This is because the former population was in the majority. Their findings also revealed that about 50% of deaths in children from developing countries were caused by malnutrition.

Anthropometric, clinical, dietary and biochemical indicators such as, a reduction in serum albumin levels, are used to fully assess the nutritional status of children.

2.2 Classification of Child Malnutrition

Child Malnutrition is grouped as over and undernutrition. Undernutrition occurs, when the nutrients needed for growth and development is deficient in the diet of the child. Overnutrition, on the other hand, occurs when the nutrient requirements are taken excessively or in copious amounts. For instance, consuming too much food calories leads to obesity while copious vitamins intake specifically vitamin A and D leads to hypervitaminosis. This leads to toxicity and illnesses such as hypercalcemia. Malnutrition leads to reduced productivity, mental potential, and higher cost on health, thus causing needless human suffering. The cost, should therefore not be measured only in terms of morbidity and mortality rates. Evaluation of the nutritional standing of infants is based on standard measurements developed by WHO (2007).

2.2.1 Undernutrition

Undernutrition is defined by De Haen and Thompson (2003) as the lack of either micronutrient or macronutrient or both. Food insecurity, inadequate resources distribution, inadequate knowledge and poverty results in the lack of micronutrient (Nagati, Mansour & Alouane, 2003). Olusanya (2000) stated that, there is undernutrition when a child consumes inadequate amounts of either micronutrients or macronutrients. That is, the effect of inadequate consumption of iron and protein is anaemia and kwashiorkor respectively. Undernutrition is further grouped into wasting, underweight, and stunting (Klugman 2002; Kurz & Johnson-Welch 2001; WHO 2001). In infants and children younger than five years, stunting is a greater problem than underweight and wasting, and it is usually an indicator of nutritional deficiencies or illness that occurred during times of growth and development (Shetty, 2002; UNICEF, 2009).

2.2.2 Underweight

A z- score of -2SD below the median for weight-for-age, is defined as moderately underweight, while severely underweight, is a z-score below the median by -3SD (UNICEF 2009; WHO 2007). WHO (2007) classified malnutrition in children, using weight-for-age, as underweight. Underweight defines acute malnutrition. According to the WHO, 23 percent of children globally, are moderately underweight (WHO, 2014). A child who weighs 15% to 20% below that normal for their age group is considered underweight. The child is underweight though they may have relatively normal body proportions, weight-to-height ratios (Golden & Golden, 2000; Wittenberg, 2004). When a diet is insufficient in protein and/or energy, there will be a slowing down of linear height as well as weight loss, and this is seen when the child is exposed to an acute food shortage. In Ghana, the proportion of underweight is 3% (GDHS, 2014).

2.2.3 Stunting

Stunting is a z-score of -2SD below the median for height-for-age whereas, severely stunted is -3SD below the median (WHO, 2014). Stunting defines chronic malnutrition, although it could also occur due to genetics and endocrine factors. When there is prolonged inadequate nutrient intake coupled with recurrent infections, its results in restriction of linear growth. Stunting, when it occurs early, can result in poor cognitive and motor development. One-third of children, globally, are stunted (UNICEF 2007; WHO 2004).

Stunting, often commences in the uterus as a result of maternal malnutrition, from consuming foods that lack quality, as well as, regular occurrence of common infections. According to Piercecchi Marti *et al.* (2006), the initial clinical sign of malnutrition is stunting and it affects about 195 million children in developing countries and one-third of African children below five years. UNICEF and WHO (2013), have reported that,

stunting was estimated to be about 25% globally, with 70% of these children aged five years and below residing in Africa and Asia. In Ghana, the incidence of stunted children is 19% (GDHS, 2014).

2.2.4 Wasting

Wasting denotes a reduced growth rate, whereby the z-score for weight-for-age is -2SD below the median of the WHO growth charts (WHO, 2014). When the weight-for-height is below the median by -3SD, a child is said to be severely wasted (UNICEF 2009; WHO 2007). Wasting usually occurs when food intake is reduced drastically or child suffers a severe illness (UNICEF 2007a; WHO 2004). Wasting represents an acute undernutrition and increases risk of mortality in these children (Williams, 2005). Global statistics in 2011 show that over 50 million children under five years, were wasted as well as 1 out of every 10 children in Africa (Liu *et al.*, 2012). In Ghana, the prevalence of wasting is 11% (GDHS, 2014).

2.3 Assessment of Nutritional Status

Shetty (2002) stated that assessing nutritional status gives information on child nutrition and health and an idea of the standard of living of a population. The methods used to examine the child's nutritional status are anthropometric, clinical, dietary and biochemical indicators. According to Torún (2006), the clinical and biochemical standards are effective and efficient to use for classification if the illness is advanced. The anthropometric method is preferred because of its sensitivity over the full scale of malnutrition. The clinical and biochemical standards are also more effective when a child is at least moderately malnourished. This study uses anthropometry to evaluate and analyze the nutritional standing of the children.

2.3.1 Use of Body Measurements (Anthropometry)

Anthropometric measurement of a child is done so as to compare with the expected average for a child in that age group. A substantial difference below the expected level for a child about that age will imply a risk of undernutrition (Müller & Krawinkel, 2005). Mid-upper arm circumference (MUAC) measurements are taken using a strip with several colours along it. According to Mother and Child Nutrition (2009), if the arm strip falls on the orange division, it indicates a child experiencing moderate acute malnutrition while an arm strip falling on the red division indicates a child experiencing severe acute malnutrition.

2.4 Child Related Factors and Malnutrition Status

Child related elements such as sex, age, birth weight and birth interval of the child, time of start of breastfeeding, and vaccination have been identified to have an association with malnutrition of children under 5 years (Frempong & Annim, 2017; Darsene *et al.*, 2017).

2.4.1 Child Sex and Nutritional Status

Frempong & Annim (2017) sampled 7550 children under-five years from 11,925 households from MICS 4 and analysis of the data collected using bivariate and multivariate regression, showed that compared to girls, more boys are underweight, wasted and stunted. This is as a result of differences in how children are cared for, their biological components and preference of girls (Fuse, 2010).

Furthermore, Darsene *et al.* (2017) confirmed a greater chance of stunting occurring in boys compared to their female counterparts. This could be due to influence from environmental factors such as diet. There is also a higher tendency of experiencing under-nutrition in environments filled with activities such as exposure to toxins,

repeated infections and air pollutants which are unavoidable to boys (Hien et al, 2009; Olack et al., 2011).

Similarly, Juma *et al.* (2016) examined children under-five from the Bagamoyo District Hospital and three rural health facilities in Tanzania using the Chi-square test. The findings revealed that the significance of all malnutrition incidences (stunting, underweight, wasting) was higher in males than females. This conforms to a number of researches conducted in Dollo Ado District, Somali Region, Ethiopia (Solomon & Amare, 2013), in Chandigarh India (Bhatia et al*.,* 2007), in Kwara State, Nigeria (Raphael et al*.,* 2011), in Eastern Uganda (Ingunn et al., 2006), in Botswana (Mahgoub et al., 2006) and in Ethiopia (Teshome et al, 2009; Deribew et al, 2010; Hien et al, 2009) which reinforces the statistic of increased under-nutrition in boys than girls.

From these studies, the differences could be closely linked with culture or traditional norms as well as gender issues. This, they reported might reflect preferential treatment, provision of better-quality food and health facilities for the female sex.

In contrast though, Joseph *et al.*, *(*2002) showed that female children had a higher tendency of being underweight than males. This conformed to the findings of some researches done in India (Benjamin & Zachariah, 1993; Dwivedi *et al.,* 1992).

2.4.2 Child Age and Malnutrition Status

The risk of malnutrition is proportional to age, according to Nguyen and Kam (2008). Their study found that stunting, underweight and wasting was lesser in the youngest age group (0-11) months compared to the older age group. Studies, also done by Frempong and Annim (2016), revealed a statistically significant difference among the undernutrition incidences over the various age groups. From the results, they found an indirect correlation between the age and nutritional standing of child. The ratio of underfed children by age increased to 35 months and then dropped. Juma *et al.* (2016)

also found children between the ages of 24–59 months to be more underweight compared to those within 6–23 months. They also noted that for stunting and wasting incidences, the disparity between the age groups, was statistically insignificant. Darsene *et al.* (2017) also identified in their study that, as age increases, the incidence of undernutrition increases. Thus, the incidence of undernutrition in children aged 1 year and below was lower than that of children aged between 36–47 months. These findings were consistent with some studies carried out in Ethiopia (Kar *et al.*, 2008; Asres et al, 2011), Congo (Lesiapeto *et al.*, 2010) and South Africa (Ngianga *et al.*, 2011) where there was a relationship between underweight and age less than 12 months. An increase in the nutritional desires of children for growth and development until they get to age three can be a reason why there is a higher risk of underweight at younger ages. This could be as a result of insufficient meal frequency, inadequate dietary diversity and lack of appropriate diet (Babatunde *et al.*, 2011).

2.4.3 Childbirth Interval and Malnutrition Status

Darsene *et al.* (2017) stated that there is an independent relationship between birth interval and wasting. They revealed that wasting in children occurred more frequently in birth intervals lower than 24 months compared to birth intervals greater than 24 months.

2.4.4 Child Birth Weight and Malnutrition Status

Brhane and Regassa (2014) stated that, one of the main demographic factors that influence stunting in children under 5 years, is the birth weight of the child. They found an indirect statistical relationship between stunting and the birth weight of the child. That is, as birth weight increases, stunting decreases and vice versa. This is consistent with that of Ramakrishnan *et al.* (1999), who identified an inverse relationship between

birth weight of children and stunting. Also, further analysis indicated the risk of stunting, underweight and wasting was higher in low birth weight babies (Hien & Kam, 2008). According to Hien and Kam (2008), this negative relationship is due to the lack of certain essential nutrients during childbirth needed for future development. They also suggested that the cause of the negative relationship is due to the need for longer duration in obtaining the normal weight for these children. Whitney and Rolfes (2008) stated that, low birth weight babies, have increased risk of stunting and this can lead to intergenerational effect because they tend to gain a smaller body size as adults.

2.4.5 Vaccination and Malnutrition Status

Immunizations, are one of the public health prevention tools needed to help reduce infectious diseases in developing countries. With effective immunization, the morbidity and deaths connected to infectious diseases such as diarrhea, measles, etc. are significantly reduced (Aaby *et al.*, 2003). A study by Gwatkin *et al.* (2000), revealed a little over half of the children had their vaccination up to date. The study revealed that, due to the tremendous benefits of vaccination, there is the need to put into action public health programmes, targeted at children under five years in areas where they are prone to the highest risk of infection.

2.5 Maternal Factors and Nutritional Status

Maternal factors like age, occupation, educational status of the mother, number of children and BMI have been identified to have an association with malnutrition of children aged 5 years and below (Abdirizak *et al.*, 2018; Darsene *et al.*, 2017).

2.5.1 Maternal Age and Nutritional Status

Darsene *et al.* (2017) state that, maternal age has a significant relationship with undernutrition of children. They identified that, children delivered to mothers who are

35 years and above, had a higher tendency of stunting than children delivered to mothers who are below 35 years. This finding supports that of Nure-Alam *et al. (*2011) and Latham (1997) who reported that, maternal age has a significant relationship with malnutrition.

2.5.2 Mother's Education and Nutritional Status

Abdirizak *et al.* (2018) sampled 385 participants from six different IDP's at Bosaso district in Somalia and analyzed the data using binary logistic regression. They identified that the educational status of mothers has a significant association with malnutrition. That is, children with uneducated mothers stood a higher chance of being malnourished in comparison to the offspring of mothers that had formal education. They concluded that education is the utmost significant resource, which empowers women to care for their children appropriately. A study also carried out by Nguyen and Kam (2008) stated that, the degree of literacy of mothers can influence the nutrition and general health of the child. In their study, mothers with their education up to the level of junior high school were found to have a significant association with wasting and underweight. They further attributed this finding to unemployed mothers, with low education (primary school or less), assuming the role of housewives to nurture their children. Those who had finished junior high school, had higher chances of employment and are unable to have time to adequately care for their children.

The findings of Nguyen and Kam (2008) is contrary to the findings in Ethiopia by Brhane and Regassa (2014) and Darsene *et al.* (2017), in the Democratic Republic of Congo by Ngianga *et al.* (2011) and in Pakistan by Islam *et al.* (2013), who found that, children born to mothers whose educational level is higher than junior high have a higher chance of not being malnourished. Brhane and Regassa (2014) identified that, stunting was more prone in children born to uneducated mothers than children born to

literate mothers. Darsene *et al.* (2017) reported that the children of uneducated mothers tend to be underweight as compared to infants of literate mothers. Ajieroh (2009) stated that education equips the mother with the necessary skills for childcare, increases their awareness of nutritional needs for children, modern health facilities preference, alters traditional beliefs with respect to disease causation and ensures utilization of family planning. Gudina *et al.* (2014) attributed these findings to better childcare and health care practices used by educated mothers as compared to those utilized by uneducated mothers.

2.5.3 Mother's Occupation and Nutritional Status

Brhane and Regassa (2014) stated that one major risk factor for stunting is maternal unemployment. They stated that employed mothers have a higher potential of earning more income which enables them to cater for their child's nutrition and health needs. The unemployed woman, however, may be lacking in this regard. Thus, to boost the child's nutritional status, the mother's participation in income generating activities, is vital. This finding corroborates the studies of Charmarbagwala *et al.* (2005) and Ajieroh (2009) that identified a negative association between employment and stunting.

2.5.4 Number of Children and Malnutrition Status

According to Asfaw *et al.* (2015), there was a greater risk of being underweight in a child born to a mother with more than four children than one with less than four. The report was consistent with the study carried out in Vietnam by Amsalu and Tigabu (2008) and in Bangladesh by Islam *et al.* (2013) who found an indirect association between malnutrition and the number of children. This, they stated could be due to the economic pull on apportioning of resources and the food consumption effect on families with more children, hence resulting in the likelihood of poor nutritional status in

children. Families who cannot make ends meet, cannot satisfy the nutritional demands of their wards. Families, with higher number of children, will barely devote time and resources to cater and care for the children (Fentaw *et al.* 2013).

2.5.5 Mother's Body Mass Index and Malnutrition Status

Brhane and Regassa (2014) found that BMI of mothers affects stunting. They observed there was a reduced stunting risk in the children of mothers with normal BMI compared with children of mothers with low BMI.

2.6 Family Related Factors and Malnutrition Status

Family related factors such as household size, type of latrine, source of drinking water and per capita family income, have been identified to have an association with malnutrition of children under 5 years (Brhane & Regassa, 2014; Darsene *et al.*, 2017).

2.6.1 Household Size and Malnutrition Status

Darsene *et al.* (2017) stated that, the risk of underweight is higher in children coming from a household size of greater than four than a household size of less than four. This finding is at par with studies carried out in Ethiopia by Teshome *et al.* (2009) who found that larger family size increases underweight in children. This purports that, families with higher household size, experience great economic pull on their resources, hence unable to adequately feed their children.

The findings of Brhane and Regassa (2014) show that, having a high household size could negatively impact the nutritional standing of the child. This implies that, an increase in the household size, increases the risk of underweight. On the contrary, Nguyen and Kam (2008) found that, large household size has a positive association

with malnutrition. The large household size comprised members of the extended family. The findings revealed that, children who found themselves in such families were better cared for, thus, helping to prevent malnutrition.

2.6.2 Type of Latrine and Malnutrition Status

Form the Ghana Multiple Indicator Cluster Survey conducted in 2011, Frempong and Annim (2016) sampled 11,925 households of which 10,627 were women aged between 15 to 49 year and 7550 children below five years. After analysis of the data collected, results showed that the type of toilet facility used was closely linked to the health of the child in Ghana. Per the study, stunting was more likely in children living with families where the bush or bucket is used as toilet facility as compared to households with flush toilets. Similarly, wasting was less frequent in children found in households with flush toilets as compared to their counterparts living in households with neither flush toilet nor pit latrine**.**

2.6.3 Per Capita Family Income and Malnutrition Status

Frempong and Annim (2016) also found that children born to wealthier households had improved nutritional status (less stunting and underweight) than those born into poorer households. Abdirizak *et al.* (2018) after sampling 385 participants from six different IDP's at Bosaso district in Somalia and analyzing the data using binary logistic regression found that family monthly wages had an inversely proportional relationship with malnutrition. Children, belonging to families which earn less than $100 as monthly income, had a higher tendency of being malnourished. The following studies done in Nigeria (Odunayo & Oyewole, 2006), Sudan (Coulter *et al.,* 1988), Zimbabwe (Radebe *et al.,* 1996), India (Jeyaseelan & Lakshman, 1997), Bangladesh (Islam *et al.,* 1994)

and Ethiopia (Haidar *et al.,* 2005; Solomon *et al.,* 2008; Melkie, 2007; Alive & Thrive, 2010), also found low family income as a risk factor for undernutrition.

2.6.4 Source of Drinking Water and Nutritional Status

Safe drinking water lessens the incidence of malnutrition. The incidence of underweight in children who use an unprotected source of drinking water is greater than those with access to safe drinking water. Good sanitation and improved water supply, enhances the health of the children by reducing infections and malnutrition (Cuesta, 2007). This result is consistent with the finding of Frempong and Annim (2016) that, the source of drinking water is significantly associated with malnutrition in Ghana.

2.7 Feeding practices and nutritional status

Appropriate feeding practices has been found to contribute to healthy development of infants.

Recommendations by World Health Organization stipulates that, children should be breastfed within the first hour of life, breastfed exclusively for the first six months, after which the right complementary feeds should be added (WHO, 2018). A study carried out by Amsalu & Tigabu (2006), revealed that starting complementary feeds after twelve months, not breastfeeding exclusively in the first six months and using bottle for feeding, contributed to undernutrition in infants. This is in consistent with results from a research by Tette et al. (2016) which stated that not breastfeeding exclusively for the first six months was associated with stunting. Brhane and Regassa (2014) used multivariate analysis and found that delays in the practice of early and prompt breastfeeding immediately after delivery was crucial in stunting of children. That is, children who were immediately breastfed after delivery had a reduced chance of stunting versus those who were breastfed hours after delivery. This is attributed to the

early manufacture of colostrum in the breast milk, which offers natural resistance to illness which otherwise, can increase prevalence for stunting. Bottle and formula fed infants are more prone to diseases mainly from contamination of the bottles by disease causing organisms thereby exposing them to undernutrition (Baghianimoghadam et al, 2009).

CHAPTER THREE

METHODOLOGY

3.1 Study Design

The study employed an analytic cross-sectional design. Nutritional status of children under 5years attending the out patients department of the Princess Marie Louise Hospital was assessed using measurements of weight and length or height. Structured questionnaires were used to gather information on the child, maternal, family related factors and feeding practices in the study participants. Quantitative method of data collection and analysis was employed.

3.2 Study Area

This study was carried out in Princess Marie Louise (PML) children's hospital in Accra, Ghana. PML Children's Hospital is the first ever children's hospital in Ghana. It was built in 1926 and it is situated in Accra's commercial centre with a 74- bed capacity. It is located within the Ashiedu Keteke sub-metro of the Greater Accra region. PML, offers primary care, specialised paediatric services, engages in disease control, offers reproductive and child health, family planning and nutrition facilities.

3.3 Study Population

The target populace for this research was children under-five years along with their parents or guardian at PML hospital in Accra, Ghana. The total number of out- patient attendance for 2017 was 56, 109 with 44, 918 being children under 5 years; 20, 124 females and 24, 794 males (PML, 2017).

3.4 Variables in the Study

Nutritional status was the outcome variable for this study. This was indicated by stunting, wasting and underweight. Stunting (height-for-age) is an indicator of chronic

undernutrition in children. Wasting (weight-for-height) measures body mass in relation to height and usually depicts acute malnutrition. Underweight (weight-for-age) is a combined indicator of height-for-age and weight-for-height (Akombi *et al.*, 2017). The independent variables were child and maternal characteristics, family related factors and feeding practices (Amare, 2013; Nguyeng & Kam, 2008). A summary of the outcome and independent variables that was used in the study can be found in table 3.1.

Table 3.1: Summary of Variables used in the Study

Variable Type	Name of Variable	Scale of Measurement
Dependent variable	Nutritional Status (Underweight, stunting, wasting)	Binary
Independent Variable	**Child related factors**	
	Age	Continuous
	Sex	Binary
	Child's weight at birth	Continuous
	Child's birth order	Nominal
	Vaccination status	Binary
	Maternal Factors	
	Mother's age at birth of child	Continuous
	Educational level of mother	Nominal
	Mother's occupation	Nominal
	Household size	Discrete
	Number of children	Discrete
	Type of latrine	Nominal
	Source of water	Nominal
	House structure	Nominal
	Ethnic group	Nominal
	Per capita monthly income	Continuous
	Feeding Practices	
	Child ever been breastfed	Binary
	Time of Initiation of Breastfeeding	Continuous
	Age of start of complementary food	Continuous
	Bottle feeding	Binary
	Total duration of breastfeeding	Continuous
	Duration of exclusive breastfeeding	Continuous
	Fed only formula food from birth	Binary
	Type of food given	Binary

3.5 Sampling Method

The simple random sampling (SRS) technique was the method employed to select children under-five years at the out- patient department. Cards with inscriptions bearing yes or no were placed in a box. Parents or guardian of these children were made to select a card each and those who picked yes were included in the study after consent had been given.

3.6 Sample Size Determination

Cochran (1977) formula for population proportions in a cross-sectional survey was employed in calculating the sample size for this study. According to the last Multiple Indicator Cluster Survey (MICS4), the prevalence of stunting, wasting, underweight and overweight is 19%, 5%, 11% and 3% respectively (Ghana Statistical Service (GSS), 2015). The prevalence of stunting was used as the estimated proportion since it had the highest prevalence of malnutrition.

The sample size was calculated as;

$$= \frac{Z^2\frac{\alpha}{2} \times P \times (1 - P)}{e^2}$$

Where n= the minimum sample size

α = significance level = 0.05

Z = z-score for population distribution =1.96

e = margin of error or precision = 5%

P = prevalence of malnutrition (estimated proportion) = 19.0%. Hence, p will be assumed to 0.19.

Sample size computation using Cochran (1977) is given as;

$$n = \frac{1.96^2 \times 0.19 \times (1 - 0.19)}{0.05^2} = 236.49 \approx 236$$

Accounting for 10% non-response rate, the total number of participants was calculated as follows: $236 + (0.10 \times 236) = 259.64 \approx 260$. Therefore, the required minimum sample size needed for the study was 260. However, 290 children under-five years were recruited for the study.

3.7 Eligibility Criteria

3.7.1 Inclusive Criteria

The study considered children under 5 years of age whose parent or legal guardian signed an informed written consent to be part of the study and did not meet any of the exclusion criteria.

3.7.2 Exclusion Criteria

This study did not include children under five years whose parents or guardians did not give permission for their wards to be part of the study. Disabled children who showed difficulty during anthropometric measurements were also omitted from the study. Children diagnosed of malnutrition as a result of some chronic diseases such as renal failure, liver disease, congenital heart disease, or sickle cell disease were also omitted from the study. Finally, children already in the nutritional rehabilitation programme during data collection were also excluded.

3.8 Source of Data and Data Collection

Anthropometric data was collated through measurement of weight and length or height of all study participants. Weighing of children less than 24months of age was performed using a children's scale with precision of 0.1kg. The caregivers of these children were asked to take off their shoes and any clothing, leaving only their nappies before their

weights were taken. This was performed twice and the mean weight was recorded as the weight of the participant. Children aged between 24months and 59months who could stand were weighed barefooted using the digital scale, with the precision of 0.1kg. Children unable to stand were weighed together with their caregiver, then the weight of the caregiver alone also taken. The difference between the two measurements was then recorded as the child's weight.

A stadiometer was used to measure the height of the children between 24months and 59months, in a standing position with their heels together and eyes straight forward to the nearest 0.1cm. An infantometer was used to measure the length of the children less than 24months or those who were too ill to stand. Recumbent length was measured to nearest 0.1cm. The child was made to lie parallel to the long axis of the board and the crown of the head placed against the fixed board. The WHO anthro software version 3.2.2 was used to convert the anthropometric measures; weight, height and age values into z-scores of the indices; height for- age (HAZ), weight-for-height (WHZ) and weight-for-age (WAZ) taking sex into consideration. The scores classify the nutritional status of children aged between 0-60months. A height-for-age z-score, weight-for-height z-score and a weight-for age z-score below -2SD of the reference population indicated stunting, wasting, and underweight respectively (WHO, 2011).

The study also utilized primary data collected from parents or guardians of the study participants through the administration of questionnaires. Pretesting of the questionnaires for the study was done at the Greater Accra Regional Hospital. The goal for conducting a pilot testing survey was to evaluate the reliability of the questionnaires planned to be administered to the intended participants. The questionnaires were used to solicit for information on demographic background, family, maternal, feeding practices and the characteristics of children under-five years of age at PML. Literature

proves that an indirect relationship exists between these variables and the nutritional status of children below 5 years.

3.9 Data Collection Tool

After review of other questionnaires from previous studies, (Fentaw *et al.* 2013; Frempong and Annim, 2016; Tette et al. 2016; Darsene *et al.* 2017) the questionnaire was developed. It was validated through pretesting and reliability was estimated with Cronbach's alpha score of 0.8. The questionnaire consisted of four sections: child related factors, maternal factors, family factors and feeding practices. The structured questionnaire was written in English and the respondents were expected to complete these at an estimated time of 10 minutes as determined during the pre-testing.

3.10 Data Analysis

Data gathered from the study were coded and entered into a Microsoft excel 2015 spreadsheet and analyzed using STATA version 15. Frequency distribution tables and percentages were used to present the results. A bivariate analysis and multivariate logistic regression were the two statistical tools used to determine the association between the outcome variable and the independent variables. Both bivariate and multivariable logistic regression analysis were used to evaluate predictors of nutritional status. All variables identified to be related to the nutritional status in bivariate analysis at significant level of ≤ 0.05 were taken to multivariable regression analysis in order to control for confounders. Adjusted Odds Ratio with 95% CI was used to assess the degree of relationship between explanatory variables and nutritional status of the participants. Statistical relationship between dependent and independent variables was declared significant at p-value of ≤ 0.05.

3.11 Quality Control Measure

Pre- testing was done at the outpatient department of the Accra Regional Hospital among 50 children under five years to enhance the validity of the questionnaire. Training was held for three data collectors a month prior to data collection. Data collection was done between May and June 2019. The data collectors comprised of a nurse at the Princess Marie Louise hospital, an intern with the nutritional department and a medical officer at the facility. The training comprised details of the background of the study, explanation of the questions in the questionnaire as well as the need to conform to the ethical guidelines of the study.

3.12 Ethical Clearance

Ethical clearance was sought from the Ghana Health Service (GHS) ethical review committee before the commencement of this study as GHS protocol demands. Permission was also sought from the administration of PML for the study to be carried out in the facility.

3.13 Consenting Process

Consent was sought from PML hospital. The parents or caregivers of the study participants gave their consent by signing an informed consent form. The consent form contained information on possible risk or discomfort, benefits, data storage and management, contact person for additional information, voluntary participation and the right to pull out from the study with no penalty attached.

3.14 Privacy and Confidentiality

The information shared by participants during the study was confidential to the principal investigator of the study. In view of this, participants were given codes for identification instead of using their names. Under no circumstance was information

received, shared with others. The names of participants were not disclosed to any other person before, during and after the study.

3.15 Dissemination of Findings

The results of this research were submitted to the School of Public Health in partial fulfillment of the requirements for the award of a Master of Public Health Degree. The findings will also be written for publication in a reputable journal.

CHAPTER FOUR

RESULTS

4.1 Child and maternal characteristics that influence nutritional status of children under five years

A total of 290 children under 5 years were recruited and their caregivers completed all the questionnaires making a response rate of 100%. They were all included in the analysis. Table 4.1 shows the child characteristics that influence nutritional status of these children. The average age of the children was 7.1 (SD± 6.6) months, with 174 (60%) between the age 1-5 months. One hundred and eighty-three (63.1%) of the children were males, with 152 (52.4%) of them being first born**.** The number of children who completed their vaccination was 196 (67.6%). The mean weight and height of the study participants was 6.4 (SD± 3.6) kg and 64.3 (SD± 7.5) cm respectively.

One hundred and fifty-nine (54.8%) of the mothers were aged less than 30years at birth of their children under five years. The mothers mean age was, 22.5 (SD± 5.8) years. Ninety-nine (34.1%) of these mothers had no formal education, with 2.8% attaining education up to the tertiary level. The mothers that had less than five children were 273 (94.1%), with 112 (38.6%) of these mothers, with no occupation.

Table 4.1: Child and Maternal Characteristics that influence Nutritional Status of children under five years

Child Characteristics	N (%)	Maternal Characteristics	N (%)
Age of Child - months		**Mother's Age at birth- years**	
Mean(±SD)	7.1(±6.6)	Mean(±SD)	22.5 (± 5.8)
1-5	174(60.0)	<30	159(54.8)
6-9	49 (16.9)	31-40	95 (32.8)
10-11	28 (9.7)	>40	36 (12.4)
12-23	29 (10.0)		
24-59	10 (3.5)		
Child's sex		**Educational Level of mother**	
Male	183 (63.1)	No Formal Education	99 (34.1)
Female	107 (36.9)	Primary	112(38.6)
		JHS/ Middle School	27 (9.3)
		Secondary (SHS/ Technical/ Vocational)	44 (15.2)
		Tertiary (Undergraduate/ Postgraduate)	8 (2.8)
Birth Order		**Number of Children**	
First Born	152 (52.4)	< 5	273 (94.1)
Second Born	98 (33.8)	≥ 5	17 (5.9)
Third Born	24 (8.3)		
Above Third Born	16 (5.5)		
Vaccination Status		**Occupation**	
Not completed	94 (32.4)	No occupation	112 (38.6)
Completed	196 (67.6)	Trader	102 (35.2)
		Civil Servant	42 (14.5)
		Others	34 (11.7)
Child's weight during Survey, kg			
Mean (± SD)	6.4 (± 3.6)		
<5	83 (28.6)		
≥5	207 (71.4)		
Child's height during survey, cm			
Mean (± SD)	64.3 (± 7.5)		
<60	112 (38.6)		
≥60	178 (61.4)		

4.1 Family factors and Feeding Practices that influence nutritional status of the study participants

Two hundred and eleven (72.8%) of the study participants belonged to a family with household size less than five, with 61% of these families using water closet and 155 (53.4%) with their source of drinking water being pipe-borne, as shown in Table 4.2. One hundred and nineteen (41.0%) of the study participants lived with their families in attached houses with 148 (51.0%) belonging to the Ga/Dangme ethnic group. One hundred and seventy-four (174) of these families had a per capita family income of less than Ghc200.

One hundred and thirty-nine (47.9%) of the study participants had been breastfed, with 192 (66.2%) of them having complementary feeds started at less than 6months of age. Two hundred and thirty-three (80.3%) of the study participants had breastfeeding initiated within an hour after delivery with 77.2% of the study participants, exclusively breastfed for six months or less, as shown in Table 4.2.

For the type of feeding practiced by participants, as shown in Table 4.3, 116 (40.0%), 39 (13.4%), 140 (48.3%), 27 (9.3%), 103 (35.5%) and 178 (61.4%) were given legumes, fruits, proteins, vegetables, carbohydrates and fats and oil every day, respectively, as shown in table 4.3.

Table 4.2: Family factors and Feeding Practices that influence nutritional status

Family factors	N (%)	Feeding Practices	N (%)
Household size		**Child ever been breastfed**	
Median(IQR)	7.1(6.6)	Never Breastfed	151 (52.1)
< 5	211 (72.8)	Ever Breastfed	139 (47.9)
≥ 5	79 (27.2)		
Type of Latrine		**Time of Initiation of Breastfeeding**	
Water closet	177 (61.0)		
Private pit latrine	83 (28.6)	Mean (± SD)	1.2(± 0.6)
Public pit latrine	30 (10.4)	< 1 hour	233 (80.3)
		≥ 1 hour	57 (19.7)
Source of drinking water		**Age of addition of complementary food**	
Not Pipe-Borne	135 (46.6)	Mean (± SD)	6.5 (± 2.1)
Pipe-Borne	155 (53.4)	< 6 months	192 (66.2)
		≥ 6 months	98 (33.8)
House Structure		**Bottle Feeding**	
Attached	119 (41.0)	Never	227 (78)
Semi- Detached	118 (40.7)	Ever	63 (21.7)
Detached	53 (18.3)		
Ethnic Group		**Total breastfeeding time**	
Akan	78 (26		
Ga/Dangme	148 (51.0)	Mean (± SD)	7.2 (± 2.8)
Ewe	34 (11.7)	≤ 6 months	117 (40.3)
Guan	17 (5.9)	> 6 months	173 (59.7)
Mole-Dagbani/Grusi	13 (4.5)		
Average family Income - Ghc		**Time period of exclusive breastfeeding**	
Mean (± SD)	33.5 (±8.1)	Mean (± SD)	5.2(± 1.8)
< 200	174 (60.0)	≤ 6 months	224 (77.2)
200- 499.99	64 (22.0)	> 6 months	66 (22.8)
500- 999.99	24 (8.3)		
≥1000	28 (9.7)		
		Fed only formula food from birth	
		Not Every day	139 (47.9)
		Every day	151 (52.1)

Table 4.3: Feeding Practices of study participants (Type of food given)

Characteristics	N (%)
Legumes (beans, peas)	
Not Every day	174 (60.0)
Every day	116 (40.0)
Protein (Meat, Eggs, Fish, milk)	
Not Every day	150 (51.7)
Every day	140 (48.3)
Vegetables (Kontomire, carrot, cabbage, tomatoes, onions, green pepper, etc.)	
Not Every day	263 (90.7)
Every day	27 (9.3)
Carbohydrates (Yam, Rice, Cocoyam, Plantain, etc.)	
Not Every day	187 (64.5)
Every day	103 (35.5)
Fruits (orange, banana, mango, pawpaw, watermelon etc.)	
Not Every day	251 (86.6)
Every day	39 (13.4)
Fats and Oil (margarine, cheese etc)	
Not Every day	112 (38.6)
Every day	178 (61.4)

4.3 Prevalence of Nutritional Status of Children under 5 years

The prevalence of underweight, stunting and wasting among children under 5 years at the Princess Marie Louise Hospital is shown in Figure 2. Out of 290 participants, 26.9% were underweight, 34.5% were stunted and 19.3% were wasted.

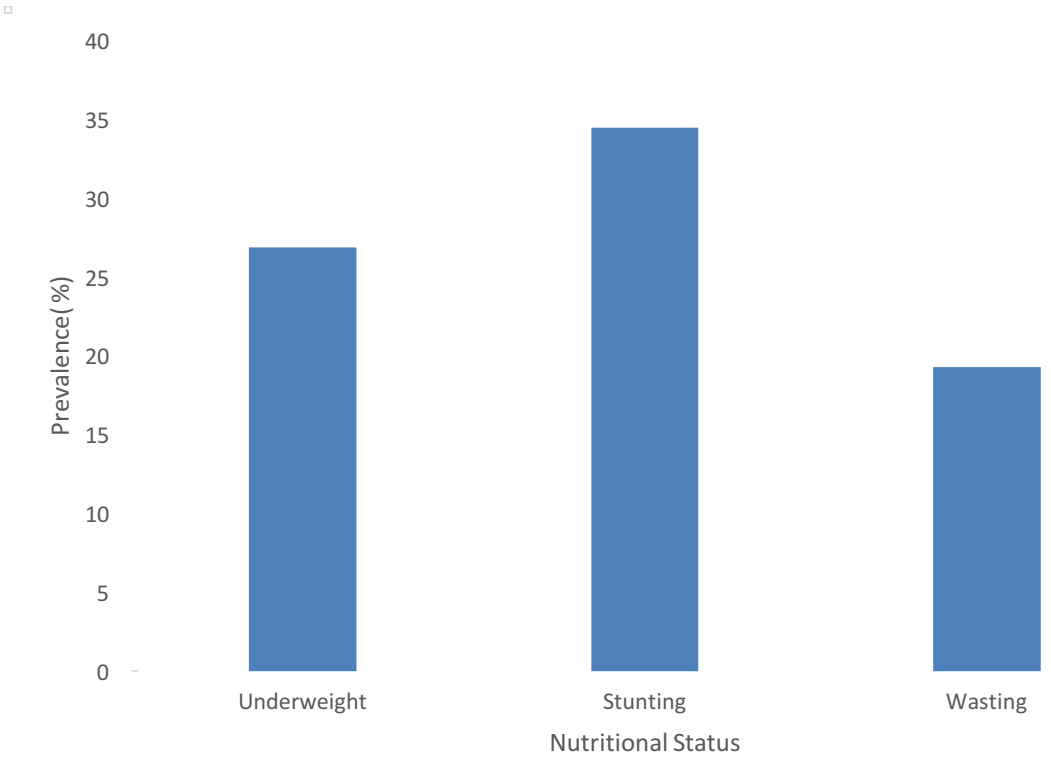

Figure 2: Prevalence of nutritional status of children below 5 years

4.4 Prevalence of nutritional status by age groups of children under 5 years

Percentage of stunting was 49%, 29% and 8% in the 1-5months, 6-9months and 10-11months age groups respectively as shown in figure 3, 12.5% of the participants in the age group 12-23 months were wasted, while 7.7% of the participants in the age group 23-59 months were underweight, as displayed in figure 3.

Figure 3: Prevalence of nutritional status by age groups of children under 5 years

4.5 Relationship between child and maternal characteristics and nutritional status of the study participants.

Age of the participants was significantly related to underweight (p=0.038). Fifty one percent (51%) of the study participants between the ages 1-5 months were underweight compared with 7.7% between the ages 24-59 months, as shown in Table 4.5. The proportion of stunting among the 1- 5months age group was 49.0% compared to 5.0% among the 24-59 months age group. This relationship was statistically significant (p=0.001).

Birth order of participants was significant with regard to stunting (p=0.044). First and second born children had the same proportion of stunting (41.0%) compared to 11.0% among the third born participants.

The proportion of underweight among those who had completed their vaccination was 79.5% compared to 20.5% among those with incomplete vaccination. This association

was statistically significant (p=0.009). Similarly, vaccination status was significant with stunting (p=0.026), with 76% of those with complete vaccination being stunted as displayed in table 4.5.

The proportion of stunting among infants born to mothers aged <20years at birth, was 38% compared to 16% among those aged between 31-40 years. This relationship was statistically significant (p=0.000). Furthermore, the prevalence of wasting among infants born to mothers aged <20years at birth, as displayed in table 4.6 was 41.1% compared to 25% among those aged between 31-40 years at birth of their children. This association was statistically significant (p=0.004), as displayed in table 4.6.

Mother's educational status was statistically significant with underweight (p=0.010). The proportion of underweight among children whose mothers had no formal education was 24.4% compared to 6.4% among those who completed tertiary education, as shown in Table 4.6. The stunting percentage in infants whose mothers had attained tertiary education was 6.0% with 33.0% among those who had no formal education. This association was statistically significant (p=0.030).

Table 4.5: Bivariate Analysis of child characteristic and nutritional status

	No. of Children	Underweight %	Stunting %	Wasting %
Child Characteristics				
Age				
1-5months	174	55.1	49	44.6
6-9months	49	23.1	29	25
10-11months	28	6.4	8	10.7
12-23months	29	7.7	9	12.5
24-59months	10	7.7	5	7.1
Chi square		**10.17 (p=0.038**)**	**17.9628 (p=0.001**)**	8.6868 (p=0.069)
Sex				
Male	183	69.2	65	67.9
Female	107	30.8	35	32.1
Chi square		1.7205 (p=0.190)	0.2358 (p=0.627)	0.6736 (p=0.412)
Child Birth Order				
First	152	48.7	41	44.6
Second	98	34.6	41	37.5
Third	24	11.5	11	7.2
Above Third	16	5.3	7	10.7
Chi square		1.701 (p=0.637)	**8.1164 (p=0.044**)**	4.5870 (p=0.205)
Vaccination Status				
Not completed	94	20.5	24	19.6
Completed	196	79.5	76	80.4
Chi square		**6.8982 (p=0.009**)**	**4.9322 (p=0.026**)**	5.1669 (p=0.123)

p<0.05**

Table 4.6: Bivariate Analysis of maternal characteristics and nutritional status

Maternal Characteristics	No. of Children	Underweight %	Stunting %	Wasting %
Mother's Age at birth				
< 20 years	159	55.1	38	54.8
21-30 years	95	37.2	46	32.8
31-40 years	36	7.7	16	12.4
Chi square		2.5544 (p=0.279)	**17.6335(p=0.000**)**	**11.2807(p=0.004***
Educational status				
No Formal Education	99	24.4	33	28.6
Primary	112	34.6	31	37.5
Middle/JHS/JSS	44	20.5	17	19.6
Secondary/SHS/SSS	27	14.1	13	8.9
Tertiary	8	6.4	6	5.4
Chi square		**13.2271(p=0.010**)**	**10.7340(p=0.030**)**	3.2763 (p=0.513)
Occupation				
No Occupation	112	32.1	39	30.4
Trader	102	29.5	27	37.5
Civil Servant	42	19.2	17	21.4
Others	34	19.2	17	10.7
Chi square		8.9619 (p=0.130)	7.1955 (p=0.066)	3.7063 (p=0.295)

p<0.05**

4.6: Relationship between family factors and nutritional status of study participants.

Household size was statistically significant with underweight (p=0.031). The proportion of underweight among children born into families with a household size of five or less was 82.1% compared to 17.1% among those in families with household size of more than 5, as shown in Table 4.7. The proportion of stunting in infants born into families with a household size of five or less was 90.0% compared to 10% among those in families with household size of more than 5.

Type of latrine was significantly related to stunting (p=0.000). The proportion of stunting among participants who lived in a house with water closets was 73% compared with 12% among those in houses with private pit latrine.

The proportion of wasting among children who use pipe-borne water as source of drinking was 67.9% compared to 32.1% who do not use pipe-borne water. This association was statistically significant (p=0.016), as displayed in table 4.7.

The prevalence of underweight among children who lived in attached houses was 26.9% compared to 46.2% among those who lived in semi-detached houses. This association was statistically significant (p=0.006). The percentage of stunting among children who lived in attached houses was 10% compared to 66% among those who lived in semi-detached houses. This association was statistically significant (p=0.000).

The prevalence of wasting in households with five or less children was 85.7% compared to 14.3% in households with more than five children. This association was statistically significant (p=0.003**) as shown in table 4.7.

Table 4.7: Bivariate Analysis of family factors and nutritional status

Family Factors	Total	Underweight %	Stunting %	Wasting %
Household size				
≤5	211	82.1	90	73.2
>5	79	17.9	10	26.8
Chi square		**4.6486 (p=0.031**)**	**22.8915 (p=0.000**)**	0.0073 (p=0.932)
Type of latrine				
Water closet	177	67.9	73	64.3
Private pit latrine	83	17.9	12	30.4
Public pit latrine	30	14.2	15	5.3
Chi square		6.5380 (p=0.138)	**21.5098 (p=0.000**)**	1.8623 (p=0.394)
Source of drinking water				
Not pipe-borne	135	50	40	32.1
Pipe-borne	155	50	60	67.9
Chi square		0.5099 (p=0.475)	2.6332 (p=0.105)	**5.7911 (p=0.016***
House structure				
Attached	119	26.9	10	30.4
Semi-detached	118	46.2	66	46.4
Detached	53	26.9	24	23.2
Chi square		**10.3262 (p=0.006**)**	**62.5915 (p=0.000**)**	3.4161 (p=0.181)
Ethnic Group				
Akan	78	15.4	19	17.9
Ga/Dangme	148	61.5	56	53.6
Ewe	34	11.5	13	14.3
Guan	17	5.1	7	7.1
Mole-Dagbani/Grusi	13	6.4	5	7.1
Chi square		8.5494 (p=0.073)	4.9161 (p=0.296)	3.8741 (p=0.423)
Per capita family income				
<200	174	64.1	52	55.4
200-499.99	64	17.9	29	25
500-999.99	24	6.4	10	14.3
≥1000	28	11.5	9	5.3
Chi square		1.9608 (p=0.581)	5.5666 (p=0.135)	4.8763 (p=0.181)
Number of children				
≤ 5	273	96.1	92	85.7
>5	17	3.9	8	14.3
Chi square		0.7858 (p=0.375)	1.2642 (p=0.261)	**8.9239 (p=0.003***

p<0.05**

4.7: The relationship between feeding practices and nutritional status

The proportion of stunting was 25% among children who had breastfeeding started within an hour after delivery and this relationship was significant statistically (p=0.007**) as shown in table 4.8.

There was a 50% prevalence of stunting among those who had complementary feeds started at less than 6months and this relationship was statistically significant (p<0.001**).

Bottle feeding was significantly associated with stunting and wasting (p=0.029, p=0.000 respectively). The proportion of stunting among children who were bottle-fed was 29% compared to 71% in those who were bottle-fed. The proportion of wasting was 17.9% among those who were not bottle fed compared to those who were.

As displayed in table 4.8, the total duration of breastfeeding and exclusive breastfeeding was significantly associated with underweight, stunting and wasting. The prevalence of underweight was ≤ 26.9% among those who were exclusively breastfed for 6months when matched to those who were exclusively breastfed for more than 6 months (p=0.000). Similarly, stunting was 45% and wasting 84.1% among those who were exclusively breastfed 6 months or less.

The proportion of underweight was 25.4% among children who were fed only formula feed, 65.4% among those who were fed protein every day and 44.9% among those who were fed carbohydrates every day, as shown in Table 4.9. That of wasting was 57% among those who were fed protein every day and 17.9% among those who were fed vegetables every day.

Table 4.8: Bivariate Analysis of feeding practices and nutritional status

Feeding practices	Total	Underweight %	Stunting %	Wasting %
Time of initiation of breastfeeding				
< 1 hour	233	79.5	75	21.4
≥ 1 hour	57	20.5	25	78.6
Chi square		0.0497 (p=0.824)	**2.7611 (p=0.007**)**	152.5477 (p=0.110)
Age of addition of complementary feeds				
< 6 months	192	62.8	50	66.1
≥ 6 months	98	37.2	50	33.9
Chi square		0.5469 (p=0.460)	**17.9190 (p=0.000**)**	0.0006 (p=0.981)
Bottle feeding				
Never	227	80.8	71	17.9
Ever	63	19.2	29	82.1
Chi square		0.3901 (p=0.532)	**4.7516 (p=0.029**)**	**148.9851(p=0.000**)**
Duration of breast feeding				
≤ 6 months	117	29.5	32	23.2
> 6months	173	70.5	68	76.8
Chi square		**5.2263 (p=0.022**)**	**4.4161 (p=0.036**)**	**8.4621 (p=0.004**)**
Duration of exclusive breastfeeding				
≤ 6 months	224	26.9	45	84.1
> 6 months	66	73.1	55	17.9
Chi square		**153.6784 (p=0.000**)**	**90.2559 (p=0.000**)**	**0.949 (p=0.030**)**
Fed only formula feed from birth				
No	139	74.4	91	42.9
Yes	151	25.6	9	57.1
Chi square		**29.8598 (p=0.000**)**	**113.443 (p=0.000**)**	0.716 (p=0.391)

p<0.05**

Table 4.9: Bivariate Analysis of feeding practices (frequency of feeds) and nutritional status

Feeding practices	Total	Underweight %	Stunting %	Wasting %
Frequency of child's feed				
Legumes				
Not Everyday	174	57.7	57	62.5
Everyday	116	42.3	43	37.5
Chi square		0.2368 (p=0.627)	0.5724 (p=0.449)	0.1807 (p=0.671)
Fruits				
Not Everyday	251	87.2	85	80.4
Everyday	39	12.8	15	19.6
Chi square		0.0361 (p=0.849)	0.3157 (p=0.574)	2.2880 (p=0.130)
Protein				
Not Everyday	150	34.6	43	60.7
Everyday	140	65.4	57	39.3
Chi square		**12.5075 (p=0.000**)**	**4.6523 (p=0.031**)**	2.2464 (p=0.134)
Vegetables				
Not Everyday	263	91	89	82.1
Every day	27	9	11	17.9
Chi square		0.0143 (p=0.905)	0.5161 (p=0.473)	**6.0042 (p=0.014****
Carbohydrates				
Not Everyday	187	55.1	53	53.6
Everyday	103	44.9	47	46.4
Chi square		**4.0768 (p=0.043**)**	**8.7873 (p=0.003**)**	3.6078 (p=0.058)
Fats and oil				
Not Everyday	112	34.6	34	32.1
Every day	178	65.4	66	67.9
Chi square		0.7221 (p=0.395)	1.3747 (p=0.241)	1.2285 (p=0.268)

p<0.05**

4.8 Multivariate Logistic Regression Analysis of Factors Influencing Nutritional Status

The multivariate logistic regression model was used to test the strength of the association between the outcome variables (underweight, stunting, wasting) and independent variables. This model was also used to control for confounders and included all variables that were statistically significant at $p<0.05$ during the chi-square test.

The Wald Chi-squared value was 234.04 with P-value of 0.000 for height for age (stunting), 191.50 with P-value of 0.000 for weight for age (underweight), and 139.12 with a P-value of 0.0000 for weight for height (wasting). This showed the overall significance of the logistic regression model that was used to explain the factors that influence nutritional status (stunting, underweight and wasting). The multivariate analysis showed that age of participant, vaccination status, mother's educational level, house structure, duration of exclusive breastfeeding, child fed with only formula food and carbohydrates everyday had a statistically significant association with weight for age (underweight).

As displayed in table 4.10, participants who belonged to the age group 6-9 months had 90% (AOR = 0.066, 95% CI = 0.050, 0.933, P<0.05) reduced odds of being underweight compared to those in the 1- 5 months age group than participants who belonged to the age group less than 5 months. Children, who belonged to the age group 10-11 months also had 0.027 (AOR = 0.027, 95% CI = 0.013, 0.551, P<0.05) odds of being underweight compared to the 1-5months reference age group.

The odds of underweight among the children who had completed their vaccination was 0.413 times (AOR = 0.413, 95% CI = 0.247, 1.78, P-value<0.05) compared to those who had not completed their vaccination. The odds of underweight among study

participants, whose mothers had attained secondary education was 1.409 times (AOR= 1.409, 95% CI = 1.090, 3.491, P-value <0.05) those who had no formal education. There was also 3.502 (AOR= 3.502, 95% CI = 2.790, 5.124, P-value <0.05) odds of stunting among participants who had attained tertiary education compared to participants whose mothers had no formal education.

As displayed in table 4.11, families who lived in a semi-detached structured house had 0.202 (AOR = 0.202, 95% CI =0.055, 0.745, P-value<0.05) odds of underweight among their children compared to those who lived in an attached house. However, the odds of stunting 1.472 (AOR = 1.472, 95% CI =0.561, 4.76, P-value<0.05) among children who lived with their families in semi- detached houses was increased. There was increased odds of underweight by 4.217 (AOR= 4.217, 95% CI = 2.851, 6.265, P-value <0.05) and stunting by 3.084 (AOR= 3.084, 95% CI = 2.974, 5.371, P-value <0.05) among the children who were exclusively breastfed for more than 6 months compared to those exclusively breastfed for 6months or less.

Participants who were fed formula food from birth had 1.048 (AOR = 1.048, 95% CI = 0.386, 2.847, P-value<0.05) higher odds of being underweight compared to those who were not fed formula food from birth. However, the odds of stunting among those who were fed formula feed from birth was reduced by 0.024 (AOR = 0.024, 95% CI = 0.007, 0.086, P-value<0.05). The odds of underweight was 2.150 (AOR=2.150, 95% CI=1.906, 3.150, P-value<0.05) higher among those who were given carbohydrates everyday compared to those who were not.

The odds of stunting among participants whose household use private pit latrine was 5.107 (AOR= 5.107, 95% CI = 0.292, 8.320, P-value <0.05) higher compared to participants whose household use water closet. Participants who were bottle-fed had

4.841 (AOR = 4.841, 95% CI = 1.443, 6.214, P-value<0.05) higher odds of being stunted compared to those who were not bottle-fed.

The odds of participants being stunted was 1.671 (AOR=1.671, 95% CI=0.256, 2.915, P-value<0.05) higher among those who were given carbohydrates everyday compared to those who were not.

The odds of wasting among participants whose mothers belonged to the age group above 30 years was 6.232 (AOR= 6.232, 95% CI = 1.406, 7.626, P-value <0.05) higher compared to participants whose mothers belonged to the age group less than 30 years. Participants whose mothers had more than five children had 0.641 (AOR = 0.641, 95% CI =0.103, 1.006, P-value<0.05) reduced odds of wasting compared to those whose mothers had five children or less.

Participants, whose source of drinking was pipe-borne had 0.721 (AOR = 0.721, 95% CI = 0.801, 5.100, P-value<0.05) lower odds of being wasted compared to those whose source of drinking water was not pipe-borne. Participants who were bottle-fed had 3.552 (AOR = 3.552, 95% CI = 2.481, 4.105, P-value<0.05) higher odds of being wasted compared to those who were not bottle-fed as displayed in table 4.11.

Table 4.10: Multivariate Logistic Regression Analysis of Child and Maternal Characteristics Influencing Nutritional Status

Child characteristics	**WAZ (95% CI)** ***Underweight***	**HAZ (95% CI)** ***Stunting***	**WHZ (95% CI)** ***Wasting***
Age			
1-5	1	1	
6-9 months	0.066(0.050,0.933)*	2.442 (0.351, 3.973)	-
10-11 months	0.027(0.013,0.551)*	0.689 (0.06,1.914)	-
12-23 months	0.070 (0.004, 1.199)	1.616(0.150,2.389)	-
24-59 months	0.168 (0.005, 6.305)	0.023(0.0003,1.515)	-
Child Birth Order			
First Born	-	1	
Second Born	-	0.701 (0.214, 2.295)	-
Third Born	-	0.882 (0.139, 1.610)	-
Above Third Born	-	0.512 (0.060, 1.330)	-
Vaccination Status			
Not completed	1	1	
Completed	0.413 (0.247, 1.78)*	1.434 (0.284, 3.245)	-
Maternal related factors Mother's Age at birth			
< 20 years	-	1	1
20-30 years	-	1.902 (0.234, 5.479)	1.052(0.393,2.816)
>30 years	-	2.533 (0.429, 5.069)	6.232(1.406,7.626)*
Mother's Educational Level			
No Formal Education	1	1	
Primary	2.28 (0.721, 4.229)	0.752 (0.250, 2.257)	-
JHS/Middle School	1.425 (0.323, 2.294)	1.864 (0.357, 3.748)	-
Secondary	1.409(1.090,3.491)*	4.097 (0.642, 6.129)	-
Tertiary	1.714 (0.729, 2.960)	3.502(2.790,5.124)*	-
Number of Children			
< 5	-	-	1
≥ 5	-	-	0.641(0.103,1.006)*

p<0.05**

Table 4.11: Multivariate Logistic Regression Analysis of Family Factors and Feeding Practices Influencing Nutritional Status

	WAZ (95% CI) *Underweight*	HAZ (95% CI) *Stunting*	WHZ (95% CI) *Wasting*
Family related factors			
Household Size			
< 5	1	1	
≥ 5	0.414(0.032,1.306)	0.078(0.0037,1.646)	-
Type of Latrine			
Water closet		1	
Private pit latrine	-	5.107 (0.292, 8.320)*	-
Public pit latrine	-	2.423 (0.551, 3.653)	-
Source of Water			
Not Pipe-Borne			1
Pipe-Borne	-	-	0.721(0.601,5.100)*
House Structure			
Attached House	1	1	
Semi-Detached House	0.202(0.055, 0.745)*	1.472 (0.561, 4.76)*	-
Detached House	0.787 (0.187,3.314)	2.499 (0.504, 3.394)	-
FeedingPractices factors			
Time of Initiation of Breastfeeding			
< 1 hour		1	
≥ 1 hour	-	3.084 (2.971,5.271)*	-
Age of addition of complementary food			
< 6 months		1	-
≥ 6 months	-	0.706 (0.102, 1.890)	-
Child was bottle-fed			
No		1	1
Yes	-	4.841 (1.443,6.214)*	3.552 (2.481, 4.105)*
Total breastfeeding time			
≤ 6 months	1	1	1
> 6 months	0.793 (0.199,3.152)	0.719 (0.165, 3.135)	1.827 (0.345,9.679)
Time period of exclusive breastfeeding			
≤ 6 months	1	1	
> 6 months	4.217(2.851, 6.265)*	3.084 (2.974, 5.371)*	0.855 (0.293, 2.491)*

p<0.05**

Table 4.12: Multivariate Logistic Regression Analysis of Type of feeds Influencing Nutritional Status

	WAZ (95% CI)	HAZ (95% CI)	WHZ (95% CI)
Fed only formula food from birth			
No	1	1	
Yes	1.048(0.386,2.847)*	0.024(0.007,0.086)*	-
Types of Child's Feed			
Protein			
Not Everyday	1	1	
Everyday	0.590 (0.219, 1.642)	0.926 (0.330, 2.601)	-
Vegetables			
Not Everyday			1
Everyday			1.168(0.316,2.323)
Carbohydrates			
Not Everyday	1	1	
Everyday	2.150(1.906, 3.150)*	1.671(0.256, 2.915)*	-

p<0.05**

CHAPTER FIVE

DISCUSSION

5.0 Prevalence of nutritional status

Sufficient nutrition is necessary during childhood for organ development and to help build a strong immune system (Darsene, Geleto, Gebeyehu, & Meseret, 2017). A raised risk of morbidity and death, as a consequence of immune system dysfunction can be attributed to a lack of adequate nutrition (Suleiman et al., 2011). It is therefore necessary to put in preventive measures to help reduce the death associated with malnutrition.

The prevalence of underweight was 26.9% among the 290 study participants. According to Akombi et al. (2017), this is higher than the prevalence in Kenya (11.0%), Ethiopia (16.0%), and Zambia (25.2%), but slightly lower than the prevalence in Chad (28.8%). Globally in 2017, an estimated 95 million children were underweight (WHO, 2017). This prevalence of underweight is also far higher than the prevalence of 3% found during the Ghana Demographic Health Survey (GDHS 4) conducted in Ghana (GDHS, 2014).

The prevalence of stunting in this study was 34.5%. This prevalence is higher than the prevalence in Kenya (26.0.0%) and Togo (27.5%), but lower than the prevalence in Zambia (40.1%), Ethiopia (40.4%), and Chad (39.9%), according to Akombi et al. (2017). Globally in 2017, an estimated 159 million children under five years were stunted (WHO, 2017). This prevalence of stunting, is far higher than the prevalence of 19% found during the Ghana Demographic Health Survey (GDHS 4) conducted in 2014 (GDHS, 2014) and 28% according to Ghana Statistical Service (GSS, 2017). The prevalence of stunting in the Greater Accra region was between 31.5% to 37.4%, according to GSS (2017). This finding is consistent with the prevalence of stunting in this study.

The prevalence of wasting was 19.3% among 290 study participants. This prevalence of wasting is higher than the prevalence in Kenya (4.0%), Nigeria (7.9%), Ethiopia (8.7%), Benin (4.5%), and Cameroon (5.2%), according to WHO (2017). Globally in 2017, an estimated 50 million children under-five years were wasted (WHO, 2017). This prevalence of wasting is far higher than the prevalence of 11% found during the Ghana Demographic Health Survey (GDHS 4) conducted in 2014 in Ghana (GDHS, 2014) and 9% according to Ghana Statistical Service (GSS, 2017) .

According to Nagati et al. (2003), food insecurity, inadequate resources distribution, inadequate knowledge and poverty can result in stunting, wasting, and underweight. This study found that 60% of the families of these children had a per capita family income of less than GHS200, 38.6% of the mothers were not gainfully employed and only 2.8% had education up to the tertiary level. All these factors could have contributed to the high prevalence of undernutrition in this study. Chilton (2007) further reaffirms that poor child care and nutrition negatively influence the nutritional standing of children below 5 years.

5.1 Child and Maternal Characteristics and nutritional Status

This study found that child age, vaccination status and mother's age at birth of child had an association with wasting. Educational status of the mother, also had an association with underweight and stunting.

Children, aged 1-5 months were more likely to be underweight (55.1%) compared to those aged 12-23 months (7.7%). This finding is not consistent with several studies. A study conducted in by Frempong & Annim (2016) in Ghana reported that, increasing age of children under 5 years has an association with underweight.

According to Nguyen and Kam (2008), the risk of malnutrition is increases with age. Their study found that children in the youngest age group (0-11) months had a significantly lower risk being underweight than children in the older age group. This is not consistent with findings in this research.

Juma et al. (2016) also found that, children between the ages of 24–59 months were more underweight compared to those within 6–23 months. Darsene et al. (2017), also identified in their study that, as age increases, the incidence of undernutrition increases. These findings were consistent with some studies carried out in Ethiopia (Kar et al., 2008; Asres et al, 2011), Congo (Lesiapeto et al., 2010), and South Africa (Emina et al., 2011) where there was a relationship between underweight and age less than 12 months. Undernutrition was found to be peaking at 12months than 6months. This might be due to the protective effect of breastfeeding against malnutrition.

Children under 5 years who have completed their vaccination were less likely to be underweight compared to infants who have not completed their vaccination. This finding is strengthened by Darsene et al. (2017) which stated that, children under 5 years who had completed their vaccination were less likely to be underweight. This is because with effective vaccination, the morbidity connected to infectious diseases such as diarrhea, measles etc. is significantly reduced (Aaby et al., 2003).

Furthermore, children under five years, whose mothers have attained secondary education were more likely to be underweight compared to children under five years, whose mothers have no formal education. Also, mothers have attained tertiary education were more likely to have their children stunted compared to mothers have no formal education. Consistent with our findings, Nguyen and Kam (2008) found that children whose mothers have attained junior high education are more prone to be underweight. They stated that, unemployed mothers with low education (primary

school or less) have enough time to nurture their children whereas mothers who had completed junior high school, had higher chances of employment and are unable to cater for their children due to time constraints.

This finding opposes Abdirizak et al. (2018) who identified a significant association between the educational status of mother and stunting. According to Abdirizak et al. (2018), children with illiterate mothers had a higher tendency of being malnourished than children born to mothers that had formal education. They concluded that education is the utmost significant resource, which empowers women to care for their children appropriately. It is also contrary to findings in Ethiopia by Brhane & Regassa (2014) and Darsene et al. (2017), in the Democratic Republic of Congo by Ngianga et al. (2011) and in Pakistan by Islam et al. (2013), who found that, children born to mothers whose educational level is higher than junior high have a higher chance of not being malnourished. Darsene et al. (2017) reported that children born to illiterate mothers were prone to be to be underweight as compared to children of literate mothers.

Ajieroh (2009) stated that, education equips the mother with the necessary skills for childcare, increases their awareness of nutritional needs for children, alters traditional beliefs with respect to disease causation and ensures utilization of family planning. Gudina et al. (2014) attributed these findings to better childcare and health care practices adopted by educated mothers as compared to those adopted by uneducated mothers.

Mothers who were more than 30 years at birth of their children, are more likely to have their children wasted compared to mothers who were less than 20years at birth of their children. This is similar to studies by Darsene et al. (2017) and Nure-Alam *et al. (*2011) who found that maternal age has a significant relationship with undernutrition of children. According to Darsene et al. (2017), children delivered to mothers who are 35

years and above had a higher tendency of stunting than children delivered to mothers who are below 35 years. According to Hien & Kam (2008), mother's age at birth <24 years or >35years is a risk factor for undernutrition. This risk is increased in the younger mothers because they may not be ready to care for a child, while in older mothers (>35 years), it may be as a result of increased probability of giving birth to low birth weight babies.

5.2 Family Related Factors

This study found that the type of latrine and source of drinking water was associated with stunting and wasting respectively. The number of children in the family was also associated with wasting.

Children, who belonged to households that use private pit latrine were more likely to be stunted compared to children who were in households that used water closet. This study is consistent with a study by Frempong & Annim (2016) who found that, the type of toilet facility has a significant association with children under 5 years who are stunted. According to Frempong & Annim (2016), more children living in households where the bush or bucket (no latrine) is used as toilet facility are stunted as compared to households with flush toilets (water closet).

Furthermore, infants whose source of drinking water was pipe-borne were less likely to be wasted compared to infants whose source of drinking was not pipe-borne. This finding is consistent with a study by Frempong & Annim (2016) who found that, the source of drinking water has a significant association with malnutrition. According to Cuesta (2007), the incidence of malnutrition decreases with improved sources of drinking water. They stated that, good sanitation and water supply improve health by reducing infections and malnutrition (Cuesta, 2007).

Families who have more than five children are more likely to suffer wasting among the children compared to families with less than five children. This study is consistent with studies in Ethiopia by Asfaw et al. (2015), in Vietnam by Amsalu & Tigabu (2008) and in Bangladesh by Islam et al. (2013) who found that infants from families with more than five children, have a higher probability of wasting compared to infants from families with less than five children.

According to Frempong & Annim (2017), the children may have to compete for household resources and caregiving. Poor families may not be able to fulfill the nutritional demands of their children. Fentaw et al. (2013) stated that, families with more children will barely devote time to cater and care for these children.

5.3 Feeding Practices and Nutritional Status

This study found that time of initiation of breastfeeding has an association with stunting. It found that, children under five years who are breastfed within an hour of birth had a lower chance of stunting compared to children breastfed more than an hour after birth.

Early initiation of breastfeeding according to Setegn, Gerbaba, & Belachew (2011) is not only the simplest, but the most cost-effective intervention in improving the health of the new born. Early initiation of breastfeeding adds greatly to the health of the child by curbing malnutrition, gastroenteritis and strengthening the immune system of the child against diseases (Baker, Sanei, & Franklin, 2006). This is as a result of the early manufacture of colostrum in the breast milk, which offers natural resistance to illness which otherwise, can increase prevalence of stunting. This finding supports the guidelines and recommendations by WHO and UNICEF (2013).Mothers are

encouraged to start breastfeeding their children early and this campaign of early breastfeeding among mothers, should be enforced.

Exclusive breastfeeding was also found to have an association with stunting, wasting, and underweight. Exclusive breastfeeding is considered an indispensable tool for the adequate growth and development of infants and for the prevention of childhood illness (Duong, Binns, & Lee, 2004). This is similar to results from a study by Tette et al. (2016) which stated that not breastfeeding exclusively for the first six months has a relationship with stunting.

Bottle feeding also had a relationship with stunting and wasting. This is in line with findings from a study by Baghianimoghadam et al. (2009) who stated that diseases causing organisms may contaminate these feeding bottles leading to recurrent infections and stunting.

This study is not devoid of limitations. Mothers or caregivers were posed with questions assessing the feeding practices of their children. This could have introduced recall bias and some respondents might have given information in order to look good to the interviewers, that is, the social desirability bias.

CHAPTER SIX

CONCLUSION AND RECOMMENDATIONS

6.1 Conclusion of the Study

This study concludes that age of children under 5 years and vaccination status has an association with underweight. Mother's educational status also has an association with stunting. Similarly, maternal age and the number of children in a household have an association with wasting. The type of latrine and source of drinking water also have an association with stunting and underweight respectively. This study also concludes that time of initiating breastfeeding, breastfeeding exclusively and bottle feeding all have an association with stunting, wasting and underweight.

6.2 Recommendation

This study found out that exclusive breastfeeding and initiation of breastfeeding early is of outmost importance to the health of the child. It is therefore recommended that mothers are educated more on the need to initiate breastfeeding early and exclusively breastfeed their children to help reduce the risk of undernutrition.

Access to pipe-borne water and good sanitation practices also reduces the risk of undernutrition in children. It is recommended that the drinking water for the children should be from a hygienic source. For homes or communities with no access to pipe-borne water, boiling of other sources of water before drinking should be encouraged. This education can be undertaken by the public health personnel as well as the community and religious leaders.

The research also shows that, in households with more than 5 children, the risk of undernutrition was high. It is recommended that couples should be informed about the

health benefits of family planning through education. Family planning will help the couple to decide the timing and spacing out of their children as well as the number of children such that the economic pressure on their resources with regards to raising and catering for these children is reduced. Thus, they are better equipped to feed their children well.

The results of the study buttresses the fact that vaccination is of utmost importance to the health of the child. Apart from protecting the child from diseases, it reduces the risk of undernutrition in the long term. Hence, it is recommended that mothers are educated during their antenatal visits and at the child welfare clinics to prioritize the vaccination of their children.

Finally, future studies should employ qualitative research methods to assess the views of mothers on the factors affecting the nutritional standing of their children and also extend the scope of study to children between 5 and 14 years and in other communities and regions in Ghana.

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APPENDIX I – RESPONDENT INFORMATION SHEET

Project Title: Assessment of Nutritional Status and Associated Factors in Children Under-Five Years at the Princess Marie Louise Children's Hospital, Accra, Ghana.

Introduction: I am **AKUA ADUTWUMWAA BOAMAH ADDY**, a student of the Department of Epidemiology in the School of Public Health, University of Ghana, Legon, pursuing a Master of Public Health Degree Programme. My number is 0242728541 and e-mail is **akuaboamah@gmail.com**.

Background and Purpose of research- A sufficient nutrition is necessary during childhood to ensure correct organ development, healthy growth, and a strong immune system. Malnutrition has been identified as one of the main factors influencing health in children under 5 years in developing countries. Data from PML indicates malnutrition in children is part of the top 5 causes of mortality for 2017. Infant and young child nutrition have been recognized to improve significantly when appropriate infant and young child feeding strategies are promoted.

Nature of research

My study seeks to assess nutritional status and associated factors in children under five years here in Princess Marie Louise Children Hospital. The study is a cross- sectional design and will consider children under 5 years of age (6 to 59 months old children) whose parent or legal guardian will sign an informed written consent to be part of the study. A total of 300 participants will be needed for the study.

Participants' Involvement

As part of this study, your participation would be appreciated to achieve the objectives of this study. You would be asked specific questions based on the sociodemographic factors of the family, mother and child as well as your knowledge on feeding practices

and guidelines recommended for infants and young children and other relevant information for the purpose of this study. Please respond carefully and sincerely to the best of your knowledge. The questionnaire will take between 10 to 15 minutes to complete.

Potential Risks

The potential risk of this study is loss of time used during this interview.

Benefits

The findings of the study will provide current information on caregivers' knowledge of recommended feeding practices of infant and also assess other factors that influence nutritional status of these children under five years at the Ashiedu Keteku sub- district. It will also help in identifying the gaps in knowledge and inappropriate care practices of infant and young feeding recommendations which will inform relevant stakeholders when planning interventions to improve infant and young feeding practices in the district.

Costs

Participating in the study will not come with any cost.

Compensation

There will be no monetary or material compensation for the study.

Confidentiality

All information given will be kept confidential and used for the research purpose only. All responses obtained would be kept confidential. Forms for each participant would be kept under lock and key. The electronic data would be locked with a password which would be known to the principal investigator to prevent access to unauthorized people.

Voluntary participation/withdrawal

Participation in this survey is completely voluntary and you are free to withdraw your participation at any stage of this study without giving any reason. There would be no consequences on health care provision.

Outcome and Feedback

Findings and recommendations would be available at the School of Public Health.

A copy of the results will be submitted to the district health directorate of the Accra Metropolitan Assembly and findings will be made available to participants through the heads of the outpatient department and child welfare clinic at the Princess Marie Louise Children's hospital.

Funding information

This study is self-funded.

Sharing of participants information/Data

Names are not required for this study. Participant's data and information is solely for the principal investigator and will be kept under lock and key.

Provision of Information and Consent for participants

A copy of the information sheet and consent form will be given to you after it has been signed or thumb-printed to keep.

Thank you.

For further clarification about participation in this study, please contact

RESEARCHER'S CONTACT

Akua Adutwumwaa Boamah Addy

Department of Epidemiology

School of Public of Health

Telephone: 0242728541

E-mail: akuaboamah@gmail.com

For further clarification about ethical issues and rights as a participant of this study, please contact

ETHICAL REVIEW ADMINITRATOR

Hannah Frimpong

Ethics Review Committee

Ghana Health Service

Adabraka

Telephone: 0507041223

APPENDIX II – CONSENT FORM

Project Title: Assessment of Nutritional Status and Associated Factors in Children Under-Five Years at the Princess Marie Louise Children's Hospital, Accra, Ghana.

PARTICIPANTS' STATEMENT

I acknowledge that I have read or have had the purpose and contents of the Participants' Information Sheet read and satisfactorily explained to me in a language I understand (*English /Twi /Ga*). I fully understand the contents and any potential implications as well as my right to change my mind (ie withdraw from the research) even after I have signed this form.

I voluntarily agree to let my child be part of this research.

Name or Initials of Participant…….. ID Code ……..

Participants' Signature ……OR Thumb Print…… OR Mark (Please specify)…….

Date:…….

INTERPRETERS' STATEMENT

I interpreted the purpose and contents of the Participants' Information Sheet to the afore named participant to the best of my ability in the (English /Twi /Ga) language to his proper understanding.

All questions, appropriate clarifications sort by the participant and answers were also duly interpreted to his/her satisfaction.

Name of Interpreter……

Signature of Interpreter……..
Date:……

STATEMENT OF WITNESS

I was present when the purpose and contents of the Participant Information Sheet was read and explained satisfactorily to the participant in the language he/she understood (English /Twi /Ga)

I confirm that he/she was given the opportunity to ask questions/seek clarifications and same were duly answered to his/her satisfaction before voluntarily agreeing to be part of the research.

Name:……

Signature……. OR Thumb Print ……..... OR Mark (please specify)……..

Date:……

INVESTIGATOR STATEMENT AND SIGNATURE

I certify that the participant has been given ample time to read and learn about the study. All questions and clarifications raised by the participant have been addressed.

Researcher's name…….

Signature …….

Date…….

APPENDIX III - QUESTIONNAIRE

TOPIC: Assessment of Nutritional Status and Associated Factors in Children under Five Years at the Princess Marie Louise Children's Hospital, Accra, Ghana.

Instructions: Please answer every question as honestly as possible. Do not leave any question unanswered.

	Variables	Responses	CODE
	SECTION A	**CHILD RELATED FACTORS**	
1	Age	…… months	
2	Sex of child	Male……	0
		Female……	1
3	Child's Weight at birth	…….. kg	
4	Child's Height at birth	.....cm	
5	Child height during survey	……cm	
6	Child weight during survey	……kg	
7	Gestational age at birth	……months	
8	Child birth order	……	
9	**Vaccination Status**		
	Vaccine at Birth		
	BCG	Yes……	1
		No……	0
	Polio-0	Yes……	1
		No……	0
	Hepatitis B	Yes……	1

	No……	0
Vaccine at 6 Weeks		
Polio-1	Yes……	1
	No……	0
DPT-Hep B-Hib-1	Yes……	1
	No……	0
Pneumococcal-1	Yes……	1
	No……	0
Rotavirus-1	Yes……	1
	No……	0
Vaccine at 10 Weeks		
Polio-2	Yes……	1
	No……	0
DPT-Hep B-Hib-2	Yes……	1
	No……	0
Pneumococcal-2	Yes……	1
	No……	0
Rotavirus-2	Yes……	1
	No……	0
Vaccine at 14 Weeks		
Polio-3	Yes……	1
	No……	0
DPT-Hep B-Hib-3	Yes……	1
	No……	0

Pneumococcal-3	Yes……	1
	No……	0
IPV	Yes……	1
	No……	0
Vaccine at 6 Months		
Vitamin A	Yes……	1
	No……	0
Vaccine at 9 Months		
Measles-Rubella-1	Yes……	1
	No……	0
Yellow Fever	Yes……	1
	No……	0
Vaccine at 12 Months		
Vitamin A	Yes……	1
	No……	0
Vaccine at 18 Months		
Vitamin A	Yes……	1
	No……	0
Measles-Rubella-2	Yes……	1
	No……	0
Meningitis A	Yes……	1
	No……	0
LLIN	Yes……	1
	No……	0

	SECTION B	**MATERNAL FACTORS**	
10	Mother's age at birth	……years	
11	Mother's Educational Level	No Formal Education ……	1
		Primary ……	2
		Junior High ……	3
		Senior High ……	4
		Tertiary……	5
12	Number of Children	……	
13	Mother's Occupation	Labourer……	1
		Trader……	2
		Farmer……	3
		Civil Servant……	4
		Others……	
	SECTION C	**FAMILY RELATED FACTORS**	
14	Household Size	……	
15	Type of Latrine	No latrine……	1
		Water closet……	2
		Private Pit Latrine……	3
		Public Latrine……	4
		Pour flush Latrine……	5
		KVIP……	6
16	Source of Water	Pipe- Borne……	0
		Not Pipe-Borne……	1

17	House Structure	Attached House…….	1
		Semi-Detached House……	2
		Detached House…….	3
		Others……	4
18	Ethnic Group	Akan……	1
		Ewe……	2
		Ga/Adangbe……	3
		Fanti/Nzema……	4
		Dagomba/Gonja……	5
		Others…….	6
19	Per capita family monthly income	Less than Ghc 500 ……	1
		Ghc500-Ghc1000……	2
		Ghc1100-Ghc2000……	3
		More than Ghc2000…….	4
	SECTION D	**FEEDING PRACTICES RELATED FACTORS**	
20	Child ever been breastfed	No	0
		Yes	1
21	Early initiation of breastfeeding	.....hours	0
22	Age of addition of complementary food	.....months	1
23	Child was bottle-fed	No	0
		Yes	1
24	Duration of breastfeeding	.....months	

25	Duration of exclusive breastfeeding	.....months	
	Type of Child's Feed		
26	Legumes (beans, peas)	Not everyday	0
		Everyday	1
27	Fruits (orange, banana, mango, pawpaw, watermelon etc.)	Not Everyday	0
		Everyday	1
28	Fats (margarine, cheese etc.)	Not Everyday	0
		Everyday	1
29	Protein (Meat, Eggs, Fish, milk etc.)	Not Everyday	0
		Everyday	1
30	Vegetables (Kontomire, carrot, cabbage, tomatoes, lettuce etc.)	Not Everyday	0
		Everyday	1
31	Carbohydrates (Yam, Rice, Cocoyam, Plantain etc.)	Not Everyday	0
		Everyday	1

APPENDIX IV – ETHICAL CLEARANCE

GHANA HEALTH SERVICE ETHICS REVIEW COMMITTEE

In case of reply the number and date of this Letter should be quoted.

MyRef. GHS/RDD/ERC/Admin/App
Your Ref. No. 19/100

Research & Development Division
Ghana Health Service
P. O. Box MB 190
Accra
Tel: +233-302-681109
Fax + 233-302-685424
Email: ghserc@gmail.com
20th March, 2019

Akua Adutwumwaa Boamah Addy
School of Public Health
University of Ghana

The Ghana Health Service Ethics Review Committee has reviewed and given approval for the implementation of your Study Protocol.

GHS-ERC Number	**GHS-ERC024/02/19**
Project Title	Assessment of Nutritional Status and Associated Factors in Children Under Five (5) Years at the Princess Marie Louise Children Hospital, Accra, Ghana
Approval Date	20th March, 2019
Expiry Date	19th March, 2020
GHS-ERC Decision	**Approved**

This approval requires the following from the Principal Investigator

- Submission of yearly progress report of the study to the Ethics Review Committee (ERC)
- Renewal of ethical approval if the study lasts for more than 12 months,
- Reporting of all serious adverse events related to this study to the ERC within three days verbally and seven days in writing.
- Submission of a final report after completion of the study
- Informing ERC if study cannot be implemented or is discontinued and reasons why
- Informing the ERC and your sponsor (where applicable) before any publication of the research findings.
- Please note that any modification of the study without ERC approval of the amendment is invalid.

The ERC may observe or cause to be observed procedures and records of the study during and after implementation.

Kindly quote the protocol identification number in all future correspondence in relation to this approved protocol

SIGNED.....
DR. CYNTHIA BANNERMAN
(GHS-ERC CHAIRPERSON)

Cc: The Director, Research & Development Division, Ghana Health Service, Accra

APPENDIX V- EXTRACT FROM PML ANNUAL REPORT 2017

TOP TEN CAUSES OF OUT- PATIENTS ATTENDANCE - 2017

CONDITIONS	NO. OF CASES	%
Upper Respiratory Tract Infections	**12812**	31
Uncomplicated Malaria suspected	**8427**	20
Skin Diseases	**3484**	8
Diarrhoea Diseases	**3326**	8
Acute Eye Infection	**2345**	5
Acute Urinary Tract Infection	**1663**	4
Other Acute Ear infection	**1581**	4
Pneumonia	**1560**	4
Otitis Media	**1476**	4
Septiceamia	**1159**	3
All other Diseases	**18943**	9
TOTAL	**56776**	**100**

The top ten conditions at the OPD was toppled with upper respiratory infections with **12812** cases followed by malaria suspected with **8427** cases in all about **41130** conditions were seen at the OPD with attendance of **56109**.

TOP 10 CAUSES OF ADMISSION 2017 ANNUAL

NO.	CONDITIONS	NO.OF CASES	%
1	SEPTICEAMIA	1220	**14.74**
2	PNEUMONIA	1049	**12.68**
3	MALARIA	876	**10.59**
4	GASTRO	540	**6.53**
5	URTI	434	**5.25**
6	DEHYDRATION	394	**4.76**
7	ANAEMIA	387	**4.68**
8	DIARRHOEA	318	**3.84**
9	UTI	276	**3.34**
10	VOMITING	195	**2.36**
	ALL OTHERS	2585	**31.24**
	TOTAL	8274	**100**

From the table above, the top cause of admission is septicaemia with **14.74%** and followed by pneumonia with **12.7%, the** least is vomiting with approximately **2.4%**.

TOP TEN CAUSES OF DEATH FOR THE YEAR 2017

RANK	CONDITION	NO.OF CASES	%
1	SEPTICAEMIA	31	**17**
2	PNEUMONIA	31	**17**
3	MALNUTRITION	24	**13**
4	HIV/AIDS	15	**8**
5	DIARRHOEA	8	**4**
6	HEART DISEASES	7	**4**
7	ANAEMIA	7	**4**
8	HEPATITIS	6	**3**
9	MALARIA	5	**3**
10	MENINGITIS	5	**3**
	ALL OTHERS	46	**25**
	TOTAL	185	**100**

Form the above table, septicaemia and pneumonia are tie ranked with **17%**, followed with malnutrition as the third condition of death with **13%** with finally malaria and meningitis also tie ranked with each with **3%.**