UNIVERSITY OF GHANA
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MATERNAL DIETARY HABITS AND KNOWLEDGE: IMPACT ON
NUTRITIONAL STATUS OF CHILDREN

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DECLARATION

I, Esther Ahumah, declare that with the exception of the references cited, all information in this document was obtained via research under the supervision of Dr. Joana Ainuson-Quampah and Mrs. Anna Amoako-Mensah of the College of Health Sciences, University of Ghana. This dissertation has never been presented in part or whole to any institution for the award of any degree or diploma.

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ABSTRACT

Background: Nutritional status is the balance between intake of nutrients and its expenditure in the processes of growth, reproduction and health maintenance, and a critical determinant of growth and development of children. Without proper nutrition, children are likely to face early physical growth failure, delayed motor, cognitive and behavioral development, diminished immunity and increased mortality and morbidity. Appropriate maternal/caregiver counselling and extensive child growth programmes are linked with improved maternal/caregiver’s knowledge on infant feeding, including proper selection of food items, as well as positive anthropometric outcomes of children.

Aim: The aim of the study was to compare the nutritional knowledge, dietary habits and infant feeding practices of mothers with well-nourished children to that of those with malnourished children.

Methods: A cross-sectional study design was employed. A pre-tested questionnaire was used to gather data on the characteristics, nutritional knowledge and infant feeding practices of the mothers. A food frequency questionnaire was used to assess the dietary intake of the children. Saliva samples were taken from the children to determine amylase, total protein and albumin concentrations.

Results: Ninety-two mothers participated in the study (50 mothers with well-nourished and 42 mothers with malnourished children). Mothers of well-nourished children were much older (mean age of 32.84±6.88 years) than the mothers of malnourished children (29±6.73 years). Over one third (38%) of mothers of malnourished children were single parents as compared with 14% of mothers of well-nourished children. More than one in five (21.4%) of mothers of malnourished children had never been to school compared with 8% of those with well-nourished children. Compared to mothers of malnourished children, more of the mothers of well-nourished children had accurate knowledge of the time that breastfeeding...
ought to be initiated after birth; the 6 food groups and foods that protects the body against
diseases. Marital status had a significant association with weight (p =0.0002) and MUAC (p
<0.0001) of the children. Mothers’ educational level did not have any significant association
(all p >0.05) with nutritional status of the children. Mothers’ knowledge of the six food
groups had a significant association with weight (p =0.0.016), MUAC (p <0.0465) and
height (p <0.0089) of the children. Also, mothers’ knowledge of the protective foods had a
significant association with weight (p =0.0126) and MUAC (p <0.0035) of the children.

Conclusion: There was no statistically significant association between both the mothers’
dietary habits and infant feeding practices and the nutritional status of the children.
However, the mothers’ knowledge of the six food groups had a significant association with
weight (p =0.016), MUAC (p <0.0465) and height (p <0.0089) of the children. Also,
mothers’ knowledge of the protective foods had a significant association with weight (p
=0.0126) and MUAC (p <0.0035) of the children. Appropriate infant and young child
feeding practices should be a constant feature of the nutrition education given to mothers
attending child welfare clinics.
DEDICATION

This work is dedicated to my parents, Mr. and Mrs. Ekey for their support.
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Great is your faithfulness, God my father. I owe the successful completion of this work to the Almighty God.

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ABBREVIATIONS

DFID  Department for International Development

FAO  Food and Agriculture Organization

FFQ  Food Frequency Questionnaire

IYCN  Infant and Young Child Nutrition

MAM  Moderate Acute Malnutrition

MUAC  Mid- Upper-Arm Circumference

PEM  Protein Energy Malnutrition

SAM  Severe Acute Malnutrition

WFH  Weight- for- Height

WFP  World Food Programme

WHO  World Health Organization

UNDP  United Nations Development Programme

UNICEF  United Nation International Children’s Emergency Fund
CHAPTER ONE

1.0 INTRODUCTION

1.1 BACKGROUND

Nutritional status which is the balance between intake of nutrients and its expenditure in the processes of growth, reproduction and health maintenance, is a critical determinant of growth and development of children (WHO/UNICEF, 2000). The world’s population is largely affected by hunger and inadequate food supply with serious consequences on health and well-being (Halder & Kejriwal, 2016). Malnutrition leads to early physical growth failure, delayed motor, cognitive and behavioral development, diminished immunity and increased mortality and morbidity (Black et al., 2013). In Ghana, the latest Multiple Indicator Cluster Survey showed that about 11% of children under five years of age were underweight, 19% were stunted and 5% were wasted (Ghana Demographic and Health Survey, 2014).

Apart from food insecurity, poor access to healthcare and the burden of disease, low maternal education also mediates poor child nutrition status. This is because primary care given to children by their mothers and/or caregivers is influenced by their knowledge and understanding of nutrition (i.e. basic knowledge of nutrients and healthy foods) and child health care (Halder & Kejriwal, 2016). In fact, according to research in Ghana and other developing countries, appropriate maternal/caregiver counselling and extensive child growth programmes are linked with improved maternal/caregiver’s knowledge on infant feeding as well as positive anthropometric outcomes of children (Colecraft et al., 2004; Alderman, 2007; Agbozo et al., 2015; Manikyamba et al., 2015). Dewey & Brown (2003) for example, reported that educational interventions for complementary feeding had a positive effect on weight of children 6-24 months of age.
Adequate maternal knowledge helps to ensure efficient breastfeeding practices and complementary feeding which reduces not only malnutrition (PAHO/WHO, 2011), but also death in children under five years of age (UNICEF, 2007). It helps to avoid the early introduction of complementary foods that are of poor quality or incorrect quantity (WHO, 2002). Furthermore, knowledgeable mothers may be less likely to succumb to taboos and traditional beliefs which can impact negatively on the nutritional status and the general health of their children (Sunguya et al., 2013). Nutrition awareness and education of mothers thus plays a significant role in improving the health outcomes of mother and child.

1.2 PROBLEM STATEMENT

Globally, 50-60% of child deaths are attributed to under-nutrition. A third of these are due to inadequate complementary feeding followed by poor breastfeeding practices and low birth weight (UNICEF, 2007). Malnutrition among young children is a widespread problem in developing countries. In Ghana, it is a serious public health issue among children who are below five years of age (Muller & Krawinkel, 2005).

Since the problem of child malnutrition is multifaceted, interventions to address it must take all the contributing factors into consideration. According to literature, one of the factors is poor maternal knowledge and dietary habits which can negatively influence feeding practices and hence nutritional status of the children (Robinson et al., 2007). In fact, according to WHO (2003), aside lack of food, poor knowledge about the appropriate foods and feeding practices is also a determinant of malnutrition (WHO, 2003).

Unfortunately, although a number of studies have investigated the effect of socio-demographic factors and breastfeeding practice on childhood malnutrition in Ghana (e.g. Alderman, 1990; Asenso-Okere et al., 1997; Armah-Klemesu, 2000), there is little
information on the relationship between maternal nutritional knowledge and child nutritional status. One research that was found to have examined this relationship was conducted in the Volta Region (Appoh & Krekling, 2005).

This study was therefore designed to assess and compare the nutritional knowledge, dietary habits and infant feeding practices of mothers of malnourished children to those with well-nourished children.

1.3 SIGNIFICANCE OF STUDY

By virtue of its location, Princess Marie Louise hospital which is a leading children’s hospital in the country, provides services to mothers of different socioeconomic and educational backgrounds typical of the country as a whole. It was thus anticipated that the study will provide unique data on the differences in knowledge, dietary habits and child feeding practices of mothers of children with adequate nutritional status and those with malnourished children. This study will contribute towards filling the knowledge gap and also guide health professionals such as dieticians and public health officers to plan and execute relevant interventions to fight child malnutrition in Ghana.

1.4 AIM AND OBJECTIVES

1.4.1 AIM

The aim of the study was to compare the nutritional knowledge, dietary habits and infant feeding practices of mothers with well-nourished children to that of those with malnourished children.
1.4.2 SPECIFIC OBJECTIVES

The specific objectives of the study were to:

1. Assess the nutritional knowledge, dietary habits and infant feeding practices of the mothers.

2. Assess nutritional status of children using anthropometric measurement (MUAC, WFH) and biochemical analysis (salivary amylase, salivary total protein and salivary albumin).

3. Categorize children according to their nutritional status using the WHO reference ranges.

4. Explore the differences in nutritional knowledge, dietary practices and infant feeding practices of mothers with malnourished children and well-nourished children.
2.0 LITERATURE REVIEW

2.1 NUTRITION

Nutrition refers to how food supports growth and other processes in our bodies (Healingwell, 2009). Nutrition as a concept has been associated with proper use of food for optimal health outcomes. It is the aggregate of all processes through which all living things access nutrients, metabolize them, and use them to support all of life’s processes. Lagua & Claudio (2008), defined nutrition as “the science of food, the nutrients and other substances therein, their action, interaction and balance in relation to health and disease, and the processes by which the organism ingests, absorbs, transports, utilizes and excretes food substances”. According to the US National Library of Medicine (2014), it is the all-encompassing science that interprets the interaction of nutrients and other substances in food in relation to maintenance, growth, reproduction, health and disease of an organism. This comprises the intake of food, absorption, the building of complex cell structure, catabolism and excretion.

Nutrient requirements may vary at the various stages of growth of the individual and therefore the needs of infants and children varies from those of adolescents and adults. In situations where the nutrient needs are not met, significant negative health outcomes may occur. Nutrition therefore plays a very major role in growth and development throughout life (Evelyn, 1987).

Nutrients are classified into macro and micronutrients. Macronutrients consist of carbohydrates, fats and proteins and they are important because they provide material for tissue development and energy. Carbohydrates and proteins are estimated to make available...
4 kcal of energy per gram, while 9 kcal per gram is provided by fat (Dunford, 2006). Absorption and assimilation rate determine how much energy can be derived from any of these nutrients. Micronutrients are made up of vitamins and minerals. Over all, nutrition has a great effect in a child’s life and feeding practices directly have an effect on nutritional status and well-being of a child (Malla & Shrestha, 2004).

2.1.1 Importance of Nutrition in Child Development and Growth

Nutrition is of universal importance and critical for children because it is a major building block in the child’s future health outcomes. Adequate nutrition is important to ensure the health, growth and development of a child and to ensure the development of each child’s full potential (PAHO/WHO, 2011). To facilitate such adequate nutrition, good infant and young child feeding practices are important (Bhutta et al., 2008; Saha et al., 2008, Black et al., 2003). This is especially critical from conception to about twenty-four months after birth (UNICEF, 2012). In the absence of proper feeding practices and quality food, future learning ability, productivity, immune response and reproductive outcomes of an individual can be adversely affected (PAHO/WHO, 2011). Nutritional deficits during early childhood can lead to long-term impairment of intellectual performance, reproductive outcome and health during adolescence and adulthood (WHO, 2002).

In Africa, malnutrition continues to contribute to half of 9.7 million annual child deaths and is a leading cause of diseases and disabilities in children (WHO, 2002; UNICEF, 2007). In Sub-Saharan Africa, four million children die yearly from preventable diseases, of which 60% is a result of malnutrition (UNICEF, 2008). Unhealthy eating habits in children can also lead to long term health problems such as obesity, type-2 diabetes, coronary heart disease and stroke (Nicklas & Hayes, 2008). In a report, on the importance of nutrition as central to development, the World Bank called for immediate and operative
national programmes to prevent child malnutrition by aiming at pregnancy and the first 2 years of life (World Bank, 2006).

Good nutrition is fundamental for a country’s wellbeing in terms of health, economic growth and development (Kalinski et al., 2008). In communities or countries with inadequate material and social resources, the full growth and developmental potential of children cannot be attained. In order to assess the gaps and challenges in child maternal nutrition in Ghana, a nutrition landscape analysis was undertaken in 2008. The analysis which sought to identify opportunities to integrate and scale-up nutrition-related actions identified lack of a national food and nutrition policy (United Nations, 2009).

2.2 BREASTFEEDING


Breastfeeding protects an infant against diseases, and also promote healthy child development, thus decrease the incidence of death among newborns and young children. The most effective and efficient way to ensure health and survival of an infant is to exclusively breastfeed for the first six month of life. According to the Department for International Development (DFID), about 4 million babies in developing countries die
each year within their first month of life (DFID Research Strategy, 2008-2013) and the WHO also reported that a lack of exclusive breastfeeding during the first six months of life contributes to over a million avoidable child deaths each year (WHO, 2009). For instance, a research in Ghana by the DFID indicated that 22% of newborn deaths could be prevented by initiating breastfeeding within the first hour of birth (DFID Research Strategy, 2008-2013). Globally, optimal breastfeeding could prevent 13% of deaths of children aged less than five years while appropriate complementary feeding practices might result in an additional 6% reduction in mortality (Black et al., 2013).

A study in Kenya found nutritional status of children to be positively related to the child’s breastfeeding status. Children who were exclusively breastfed had better nutritional outcomes than those who were not (Amegah, 2009). There are however a number of socio-cultural factors which hinder breastfeeding. Roy et al., (2009) conducted a study in India that showed that inadequate production of breast milk was a major hindrance to exclusive breastfeeding. A study in Nigeria identified mother-in-law’s insistence to give water because of the cultural belief that water can be used to supplement breastfeeding as interference to exclusive breastfeeding (Sanusi, Leshi & Agada, 2016). In addition, only 24% of children were exclusively breastfed within their first six months in Cameroon and the major reason for this was lack of sufficient information about infant nutrition (Ngameni et al., 2011).

Also in Zimbabwe, a study indicated that while a large majority of infants (75% to 77%) are breastfed from birth to at least the first year of life, only 5.8% were breastfed exclusively throughout the first 6 months of life (ZIMSTAT & ICF International, 2012). In a study in Accra, Ghana, by Gyampoh et al. (2014), it was found that about 81% of mothers with children less than 6 months old exclusively breastfed within 24 hours after
birth, although 36% of the children had been given water since birth. In some cases, mothers may start breastfeeding but introduce other complementary foods for a variety of reasons. For example, another study in Ghana (WHO, 1999), reported that children aged 4-6 months were given water, as well as a thin porridge made from maize or millet, which was fed about 1-5 times a day. The most common reason mothers gave for this practice was that breast milk alone did not satisfy the baby. Thus, whiles exclusive breastfeeding may start at birth, it is not always continued for the first 6 months of the child’s life. Adequate information from health workers and the perception that the baby is satisfied with breast milk can encourage mothers to exclusively breastfeed (Desai et al., 2014).

Breastfeeding education in addition to training in essential newborn care during the antenatal period and maternal support will have a positive impact on early breastfeeding initiation (Jana, 2009). In many sub-Saharan African countries, adequate breastfeeding counselling can increase the rate of exclusive breastfeeding (Tylleskär et al., 2011). A review of Ten Steps to Successful Breastfeeding initiative suggests that “training in breastfeeding and lactation management, changes in maternity and postdelivery policies and practices, and continued support during the postnatal period have a dramatic impact on breastfeeding practices” (WHO, 1998).

2.3 COMPLEMENTARY FEEDING

After 6 months, the intake of breastmilk alone by a child will no longer be sufficient to meet their nutritional requirements and therefore other foods and liquids are needed to supplement the breastmilk (WHO, 2015). Foods and liquid introduced from 6 months of age until 24 months are referred to as complementary feeding (Imdad et al., 2011). The period of complementary feeding is a critical period of growth during which nutrient deficiencies and illnesses contribute globally to higher rates of undernutrition among
children under five years of age (UNICEF/SUN, 2012). Timely introduction of safe and nutritional foods in addition to breastfeeding (Imbad et al., 2011) ensures that the infant is provided the key nutrients such as; iron and other micronutrients, protein and energy required to support its rapid growth at this stage (UNICEF, 2012). In 2003, WHO reported that about half of 6-9 old infants were breastfed and given complementary foods, but only 39% of 20-23 months were provided with continued breastfeeding (WHO, 2003). Inadequate breastfeeding and complementary feeding practices tend to increase the risk of undernutrition and other health related complications that are difficult to reverse later in life (UNICEF, 2012).

Complementary foods bridge the gap in energy, vitamins and iron intake which occur in breastfed infants after six months of age. They may be categorized into special transitional foods (complementary foods specifically designed to meet particular nutritional or physiological need), transitional foods (when it is just a complementary food without any remedial intent) and family foods (when the same foods the whole family eat is given) (Dewey & Allen, 1998).

The specific foods given during complementary feeding may vary depending on household food security, and the energy composition of local/traditional foods (Dewey & Adu-Afarwuah, 2008). This notwithstanding, it is important to ensure that what is given is safe and nutritious. However, since it is not only what is fed that is important but also how, when, where and why it is fed (WHO, 2012), appropriate complementary foods/feeding must satisfy a number of other requirements. For example, the diet of infants at this stage must be diverse in order to supply a variety of nutrients to promote growth and development. For children between 6-24 months of age, the WHO recommends a minimum dietary diversity of consuming of foods from at least 4 food groups out of 7 food groups.
(cereals, fruits and vegetables, legumes and nuts, roots and tubers, dairy products, meat and meat products and water) (WHO, 2007).

Some research such as that by (Kimwele, 2014) indicate that some are able to satisfy this recommendation. That study in Kenya documented mean dietary diversity scores ≥4 food groups, and found that mother’s knowledge on the importance of providing balanced diet for the child was adequate and probably their low socio-economic status may have affected their ability to give diverse diet to their children. Conversely, Masresha et al., (2013) conducted a study in some rural communities of Ethiopia on the pattern of infant feeding and stunting. The study reported that, 86% of the children had dietary diversity below the minimum dietary recommendation by the WHO (median dietary diversity score below 2 food groups).

Complementary foods should also be of appropriate texture and consistency based on the child’s age, neuromuscular and motor development and teeth eruption (PAHO, 2003). This will ensure that the child can comfortably consume the food and thus benefit from it. Furthermore, complementary foods should be given in sufficient quantity to satisfy the nutrient needs of the child. Consequently, the number of times that feeding is done in a day is crucial, as is the energy density of the food. The World Health Organization recommends that children aged six months of age should be given complementary foods 2-3 times a day, and additionally one or two nutritional snacks, and from nine months onward, children should be given 3-4 meals a day with snacks (PAHO, 2003). While highly nutritious foods should be provided during complementary feeding, studies show that meals that are too energy dense might decrease the daily breast milk consumption (WHO, 2009).
Although the age of 6 months has been identified as the best time to introduce complementary food because an infant of that age can eat foods of different tastes and discover new foods that differ from mothers’ milk (Schmitz & Mc Neisch, 1987) the infants do not always readily accept new foods. New foods should be gradually introduced, one at a time to the child. Infants may have to be exposed to a new food eight to ten times before they accept it well (Sullivan & Birch, 1994).

The transition from exclusive breastfeeding to complementary feeding is often confronted by many challenges in the developing countries (Gyampoh et al., 2014) The effectiveness of complementary feeding will depend on adequate provision of information and support from family, communities and healthcare system. As demonstrated by Kimwele (2014), who found that in spite of their low socioeconomic status, mothers in their study were able to provide an adequately diverse diet because of the knowledge they had acquired, aside lack of food, poor nutritional knowledge about the right foods and feeding practices is also a cause of malnutrition (WHO, 2003).

2.4 MALNUTRITION

According to DFID (2009), “malnutrition is an abnormal physiological condition caused by deficiencies, excesses or imbalances in energy, protein and/or other nutrients”. It can affect people of all ages, but has devastating long term affects when it occurs in childhood. The risk of malnutrition increases from the age of six months upwards, because from that age breast milk alone is no longer sufficient to supply all the nutrient’s needs of the growing child. Thus, the principal causes of malnutrition during infancy are poor breastfeeding and complementary feeding practices (Kramer et al., 2001) as well as severe repeated infectious disease (WHO, 1997).
Malnutrition may manifest as undernourishment (undernutrition) or over nourishment (over nutrition) (UNICEF, 2010; Prüss-Üstün et al., 2005). Undernourishment may result from a lack of quality diet (WHO, 2017) including not only inadequate energy but also inadequate micronutrients such as vitamins and trace minerals (Radu & Ciotaru, 2007). Its consequences include wasting, stunting and underweight, nutritional anaemia and rickets. Malnutrition is mostly common in countries with poor resource. In these countries, breastfeeding and complementary feeding practices are not adequate (Lartey, 2008).

For example, a 2004 estimate from UNICEF indicated that about 32% of children in developing countries were malnourished (UNICEF, 2004). In fact, rapid urbanisation in areas where economies are steadily declining results in poverty induced malnutrition, a phenomenon which is particularly prevalent in sub-Saharan Africa (Fotso et al., 2012). Such urban poverty is attendant with overcrowding and poor sanitary conditions which act together to increase child malnutrition caused by infectious diseases, leading to high child morbidity and mortality (Tim & Lush, 1995). The prevalence of stunting in such settings may be as high as 40% and over (Black et al., 2011).

Even though during the 1990s there was a relative decline in childhood malnutrition globally, the prevalence in Africa actually increased (Blossener & De Onis, 2005). In Ghana, NDPC & UNDP in 2008 reported that malnutrition causes about 40 per cent of childhood deaths annually (NDPC & UNDP, 2008) More recently, the Multiple Indicator Cluster Survey showed that about 11% of children under five years of age were underweight, 19% were stunted and 5% were wasted (GDHS, 2014). In Nigeria, the results of a study of under-five year olds in a local government area showed that 36% were either severely or moderately malnourished (Adegbusi & Sule, 2011). A UNICEF report also on under-fives in Nigeria revealed 14% low birth weight; 14% wasting; 41% stunting and
23% underweight (Leo, 2011). In Kenya, a 2009 documentation by the Kenya National Bureau of Statistics & ICF Macro, reported that about 35% of Kenyan children under 5 years of age are stunted, 16% are underweight, and 7% are wasted. Overall, approximately 40% of all children under 5 years (56 million) in Sub-Saharan Africa were estimated to be stunted (UNICEF, 2012) and a report by Kerac et al., in 2011 using data from Demographic and Health Surveys in 21 developing countries stated that, the occurrence of wasting among children under 6 months may be as high as 34%. Estimates of 2016 global prevalence of stunting and wasting are presented in figures 2.1 and 2.2 respectively.

On the other side of malnutrition is over nourishment which results in overweight and obesity. Over nutrition in children has become a global phenomenon causing childhood overweight and obesity, because of the accumulation of excess fat (Kuzwayo, 2008). According to WHO (2012), over nutrition is the fifth leading cause of global deaths through diabetes, heart disease, hypertension and metabolic disorders. United Nation International Children’s Emergency Fund (UNICEF), World Health Organization (WHO) and World Bank in 2012 estimated the global percentage of overweight children under five years old at 6.7%. The number of overweight children is considerably greater in low income countries. Currently, Africa is experiencing rapid increases in childhood obesity and overweight, with an estimated 7% of under-fives on the continent affected in 2011. (UNICEF/WHO/ World Bank, 2012).
Fig 2.1: Percentage of stunted children under 5, by UN sub-regions, 2016


Fig 2.2: Percentage of wasted children under 5, by UN sub-regions, 2016

2.4.1 Causes of Malnutrition

There are immediate, underlying and basic causes of malnutrition. The immediate causes include inadequate dietary intake and health status of the child. The underlying causes include food insecurity, child care practices, health service delivery and environment. The basic causes include economic, political and ideological structures (UNICEF, 1990; Engle et al., 1999).

Adequate nutrition from conception to the second year of a child’s life is essential with regard to growth, health and survival (Isolauri et al., 2011). Poor care practices through the first 1000 days of life have been widely documented in the low-and middle-income countries (LMICs). For example, about 40% of infants in LMICs are exclusively breastfed for the first 6 months (Lauer et al., 2004). Also in Kenya, it was found that, about one third of children are breastfed exclusively for the first 6 months while about 40% of children between 6–23 months are fed according to IYCN guidelines (PAHO, 2003; WHO, 2005).

Poor infant feeding practices among other factors such as; poor water and environmental sanitation and access to health services are also factors that contribute to malnutrition in children (Kimani-Murage et al., 2011). High levels of undernutrition have been reported among urban poor residents with the occurrence of stunting at over 40% (Abuya et al., 2012). Various studies in some developing countries have identified factors linked with suboptimal breastfeeding and complementary feeding practices. Among these are; maternal characteristics such as age, marital status, occupation and educational level and health education; and the child’s characteristics such as birth weight, method of delivery and birth order (WHO/UNICEF, 2000).
There are other factors which include political instability and slow economic growth, inequality, frequency of infectious diseases, lack of education and poverty. These factors vary across countries (Blössner & De Onis, 2005). Conflicts threaten the ability to achieve the aim of eliminating hunger and malnutrition by 2025. There is a universal perception that reaching these goals may be particularly difficult in countries affected by civil conflict and political instability. In 2013, an estimated 46 percent of the developing world’s population lived in countries affected by civil conflict—compared with 38 percent two decades ago (WHO, 2013).

Conflict can be a major cause of food insecurity leading to malnutrition by causing food scarcity. Food and nutrition insecurity can be both a cause and a result of civil conflict (Breisinger et al., 2014). Globally, chronic undernutrition becomes increasingly concentrated in conflict-affected countries. When food is scarce because of wars and other forms of conflict, women and children are the ones who suffer most because most allocations of the already scarce resource will be made to those who can fight or who can fight to get the food. Conflicts cause national economies to contract as the result of instability and insecurity. Food and nutrition insecurity rises and exposes infants and children to hunger. For example, almost the entire population of Gaza is in need of assistance, and about half of the people in Syria and Yemen are suffering from severe food insecurity because of conflicts in their areas. (World Food Programme, 2010).

Poverty is cited as a major cause of malnutrition. A World Bank estimate indicated that half of those living on the African continent live below $1.25 per day (World Bank, 2011). However, in areas reporting general food security, there could be vulnerable groups as a result of persistent or rising inequalities across wealth, gender and access to education. Impressive economic growth and poverty reduction can thus exist alongside the multiple
burdens of malnutrition (Chen et al., 2007). Poverty resulting from the income inequalities often lead to malnutrition for women and children although the evidence is not unanimous. Some studies have shown that poverty does not necessarily result in malnourished children (Berggren & Wray, 2002). Even in poverty and child malnutrition endemic areas, some mothers successfully raise well-nourished children. Studies, (Webb & Lapping, 2002) however suggest that poverty eradication efforts do not necessarily lead to a commensurate reduction in malnutrition rates in developing countries.

Malnutrition is not only a result of conflict, poverty and maternal circumstances. It is also a result of inequitable distribution of food. A joint International Conference on Nutrition by Food and Agricultural Organization (FAO) and World Health Organization (WHO) declares that “hunger and malnutrition are unacceptable in a world that has both the knowledge and the resources to end this human catastrophe. We recognize that, access to nutritionally adequate and safe food is a right of each individual. We recognize that globally there is enough food for all” (FAO, 1997). What may therefore be causing food shortages that lead to malnutrition may be poor distribution systems or inequitable distribution, ignorance, poor sanitation and societal influences.

Underlying this vicious cycle are household or community deficits in food security, inadequate access to health and environmental services, and household childcare behaviors and practices. These three underlying factors—often summarized as “food, health, and care”—also interact, and they too are underpinned by more basic causes relating to the amount, control, and use of resources and capacity in societies.
2.4.2 Effects of Malnutrition

Malnutrition is a major public health challenge in many developing countries. Malnutrition is the major cause of under-five deaths globally (World Bank, 1999) and is associated with more than half of all child deaths worldwide (Pelletier et al., 1995). “Malnutrition is implicated in infant and child morbidity and mortality, leading to an increased burden of disease, mental and motor development, and increased risk of obesity and metabolic diseases later in the life” (Oddy et al., 2003; Grantham-McGregor et al., 2007; WHO, 2009).

Undernutrition exacts a high toll on all societies. For example, undernutrition of the mother and child accounts for 11% of total global disability-adjusted life years (DALYs), it is a usual measure of the human burden of deaths and disease (Bhutta et al., 2008). In developing countries, malnutrition causes human suffering (Smith, 2003) which may be evident in the emotional pain of losing a child, and/or the family stresses and pain involved in caring for a sick child. It could also be in the form of living with cognitive impairment and other forms disability that have resulted from malnutrition. Malnutrition causes lost efficiency, this is because malnourished children are less physically and intellectually creative as adults (Gillespie & Haddad, 2001).

Malnutrition may lead to stunting (low Height-for-Age (H/A)), or underweight (low Weight-for-Age (W/A)) and wasting (low Weight-for-Height (W/H)). Undernutrition includes severe Protein-Energy Malnutrition (PEM), resulting in marasmus and kwashiorkor (Khuzwayo, 2008). Undernutrition weakens the immune system, stunts mental and physical growth and development. Undernutrition often has permanent negative effects on individuals, affecting the cognitive capabilities and income levels as adults. Consequently, the economic potential of not only the individuals but also the whole nation is affected (Black et. al., 2008). Children who are undernourished in the first twenty-four months but
later gain weight in childhood and adolescence are susceptible to chronic diseases (Victora et al., 2008).

In Ghana, about half of childhood deaths are attributable to malnutrition and other related outcome (Ghana Statistical Service, 2008). There are other consequences. Studies in some rural districts of Ghana have shown that children with stunted growth or thinness-for-age are often held back by their parents from enrolling in school at the right age, and that underdeveloped in the early years of a child’s life may affect academic performance in later years (Buxton, 2010).

2.5 NUTRITIONAL STATUS OF CHILDREN

Nutritional status is the balance between the intake of nutrients and their use in the processes of growth, reproduction, and health maintenance. Child nutritional status is determined by interrelated factors of dietary intake and health status. A child with inadequate dietary intake is prone to disease which in turn depresses appetite, inhibits the absorption of nutrients in food, and competes for a child's energy (UNICEF, 1998). Nutritional status is highly complex and largely individualized (WHO, 2010). It is usually evaluated by means of anthropometric measurement, biochemical or laboratory tests, clinical indicators, and dietary assessment (WHO, 2010).

2.5.1 Anthropometry

Anthropometry is measurement of the variation of physical dimensions and the gross composition of the human body at different age levels. Anthropometry involves the use of measurements such as weight, height, arm circumference and skin fold measurements as indicators to assess nutritional status (Abraham et al., 1977). It is an important tool for the assessment of nutritional status, particularly of children. The WHO recommended growth
indices are weight for age, weight for height, arm circumference and height for age (WHO, 2009). Anthropometric measurements are relatively fast and easy to perform (Jelliffe, 1966).

Weight-for-age does not differentiate between wasting and stunting and can underestimate the prevalence of malnutrition in a population (Wasantwisut, et al., 2011). The mid-upper-arm-circumference (MUAC) is also an indicator of wasting of the lean body mass (Young & Susanne, 2009). A change in the measurement of MUAC can be used to monitor alterations in the body fat and protein reserves of the body (Wasantwisut et al., 2011). Measurement of growth is indeed a valuable tool for the assessment of nutritional status (Vijayaraghavan, 1974), but it cannot be used as single tool in determining the nutritional status of children.

2.5.2 Biochemical analyses and Clinical assessment

Biochemical analyses involve qualitative chemical analyses of urine, blood, or other body fluids which are important in clinical diagnoses. Clinical signs for the assessment of nutritional status are determined by physical examination for signs and symptoms which aid in detecting nutritional deficiencies, delayed growth and development. These signs may include pallor of the skin, pale palm surfaces, and serious signs of protein-energy malnutrition such as changes in hair colour and body appearance and edema. Clinical signs may have no relation to malnutrition (American Journal of Public Health, 1973) and must be followed up by biochemical analyses for the right diagnosis to be made.

2.5.3 Dietary assessment

Dietary assessment is a comprehensive evaluation of an individual’s food intake. It can provide information for quantification of food consumed by an individual within a specified
period (Gibson, 2005). There are various dietary assessment tools used in determining food intake including the 24-hour Dietary Recall, Diet History and Food Frequency.

The 24-hour dietary recall is a subjective assessment method used to determine an individual’s intake over a specified 24-hour period. Open ended questions are administered by an interviewer to help the respondent recall food intake. A strength of the 24-hour dietary recall is that, it provides a relatively easy means to estimate energy and nutrient intake. A limitation is that, information provided by depends on the memory of the respondent and skills of the interviewer (Margetts & Nelson, 1997).

Food frequency is used to estimate the frequency of the usual food intake of an individual over a long period. Respondent is asked closed ended questions on the frequency of consumption of each food on the list. Food frequency is cost effective but gives little detail on characteristics of the food eaten; such as cooking methods and the combination of foods in a meal (Willet, 1998).

Diet history is used to determine an individual’s usual intake, frequency and amount of food consumed (Burke, 1947). This method requires the respondent to give information on the composition of their meals. The strength of diet history is that, meals pattern and quantities can be assessed over a short period.

2.6 MATERNAL AND CHILD DIETARY PATTERN

Dietary patterns refer to the quantities, proportions, variety and combination of different foods, drinks and nutrient in diet and the frequency with which they are habitually consumed (Kahan & Kushner, 2016). They are frameworks that influence the selection of food. The Dietary patterns of a children are influenced by their food environment and eating behavior of their parents (Vereecken et al., 2004), particularly, mothers and also
family characteristics (Robinson et al., 2007). Birth order and socioeconomic background also influence food habit.

The nutritional status of a mother can have an effect on the developing foetus, this might have long term undesirable impacts on the health of the child (Marques et al., 2013). Undernutrition in the womb increases the risk of foetal growth restriction, which in turn increases the risk of mortality (Nobili et al., 2008). Children’s nutritional status is negatively affected by women’s low status when they “tend to have weaker control over household resources, time constraints, less access to information and health services, poorer mental health, and lower self-esteem” (Smith et al., 2003). Maternal dietary pattern is therefore important for optimal nutritional outcomes for children.

2.7 NUTRITIONAL STATUS AND SALIVA

Saliva is an oral fluid that is critical in maintaining and preserving oral health. Some of its function includes; inhibiting calcium precipitation, taste perception, inhibiting proteinase and aids in digestion. It is composed of about 99% of water. The major and minor salivary glands in the mouth are the site for saliva production. The glands consist of a pair parotid gland located opposite the maxillary molars, submandibular and sublingual glands. The minor salivary glands can be located at the lower lip, tongue, palate and the pharynx. The average daily flow of saliva varies in health between 1 litre to 1.5 litres (Humphrey & Williamson, 2001).

Saliva comprises a large number of protein compounds, of which the structure and function have been studied with traditional biochemical techniques and lectin probes (Agarwal et al., 1984). Saliva is a useful and non-invasive systemic sampling measure for medical diagnosis
and research (Humphrey & Williamson, 2001). Saliva is progressively being used for diagnosing, monitoring health and disease status, due to its origin, composition, function and interactions with other systems (Mahadevan & Velavan, 2013). Saliva can be used in determining physiological and pathological conditions due to its close relationship between with serum parameters (Sato et al., 2010). A study done in India showed that, there is a significant association between salivary total protein concentration and nutritional status (Murayama, 1999). Also, Mahadevan & Velavan, 2013, conducted a study that showed that nutritional deficiencies can compromise salivary gland function and also increase susceptibility to dental and oral infections.

2.8 MATERNAL KNOWLEDGE AND CHILD DIETARY PATTERNS

The mother is usually the primary caregiver of a child during the first five years of the child’s life. How she fulfills that duty depends largely on her knowledge on nutrition and how it affects the growth and development of the child. Because of the importance of caregiving behaviours in providing conducive environment within which children are raised to nutritional outcomes of children, the International Conference on Nutrition has recommended that they take more centre stage (WHO, 1992). “The global strategy on Infant and Young Child Nutrition (IYCN) highlights the notion that inadequate knowledge about proper foods and feeding practices is often a more important determinant of malnutrition than the availability of food” (WHO, 2002; 2003).

Research shows that, improved maternal nutritional knowledge correlates with children’s nutritional outcomes. Blaylock et al. (1999), found that maternal nutritional knowledge improved overall child nutrition and health, with the relationship stronger for younger children. A study by Chen & Li (2008), showed that maternal nutritional knowledge is an important determinant of children health. A cross-sectional study conducted in India in 2003
found that there is a significant relationship between maternal knowledge and improvement in nutritional status of children under 5 years’ old (Halder & Kejriwal, 2016).

Maternal knowledge about the selection of food items from the different food groups influences how the child is fed and this impact greatly on the development of the child. In developing countries, infants and young children are most vulnerable to malnutrition because of the lack of knowledge on how to feed a child (WHO, 2003). Research shows that maternal knowledge of optimal feeding practices i.e. exclusive breastfeeding, continued breastfeeding and the timely transition to adequate complementary food is basic to keep the health of a child.

The nutritional knowledge of the mother has great impact on feeding practices. In India, an observational study was carried out where nutrition education was given to mothers to improve awareness about infant feeding in terms of quantity, variety and consistency of complementary feeding. The outcome of the study showed that 86% complementary feeding practices were adequate in quality, quantity, frequency and consistency (Sethi et. al., 2003).

Providing the mothers of young children with culture specific nutrition education and recommending varieties of indigenous food stuffs will help improve their dietary practices. Research shows that mothers are willing to prepare enriched complementary foods if they are culturally acceptable and thus improving maternal knowledge on feeding practices will lead to increase in adequate dietary intake and growth of infants (UNICEF, 2007).

Studies (Alderman, 1990; Asenso-Okere et al., 1997, Armar-Klemesu, 2000, Appoh & Krekling, 2005) have shown a significant positive relationship between maternal nutrition
knowledge and nutrition outcomes for children. Elsewhere, studies (Rue et al.; Webb & Block, 2003) found significant positive relationship between maternal nutritional knowledge and children’s nutritional outcomes. Others (Webb & Lapping, 2002; Glenwwe, 1999) also found a significant positive colleration between a mother’s knowledge of maternal practices and children’s nutritional outcomes. However, in an earlier study, Walia & Gambhir, (1975) found no significant relationship between childhood malnutrition and maternal knowledge and belief regarding nutrition.

In addition to caregiver’s knowledge, perceptions and beliefs, feeding practices are also influenced by various determinants; such as time constraints, employment and social support (Pelto et al., 2011). Thus, maternal knowledge alone does not guarantee best feeding practices. Amega (2009), found out in a study in Kenya that, respondents were aware of “optimal infant and young child feeding practices” but were not adhering to good practices because of social-cultural, socioeconomic and socio-demographic factors.

Gyampoh et al., (2014) found that in Accra, Ghana, over 60% of mothers knew the appropriate age of introduction of foods; 86% also gave correct response regarding minimum number of times their child should be fed daily. This knowledge however, did not translate into better feeding behaviour. A study in Cameron by Ngameni, Sajo-Nana & Adie (2011), however suggest a high incidence of poor breastfeeding behaviour because mothers do not have enough information about infant nutrition.
CHAPTER THREE

3.0 METHODS

3.1 STUDY DESIGN

A cross-sectional study design was employed for this research.

3.2 STUDY SITE

The study site was the Princess Marie Louise Hospital located within the Aseidu Keteke submetro of the Greater Accra region. Selection of Princess Marie Louise Hospital was based on the fact that it is one of the few specialist children’s hospitals in Ghana and West Africa. In addition to medical care and disease control, the hospital offers services in reproductive and child health, family planning and nutrition. There is also a collaboration with UNICEF to fight child malnutrition.

3.3 STUDY POPULATION

The study population comprised mothers and their 1-5 years old malnourished or well-nourished children. Malnourished children were defined as 1-5 years old children with either Moderate Acute Malnutrition (a weight for height Z score of ≥3SD to <2SD) or Severe Acute Malnutrition (a weight for height Z score of <-3SD with the presence or absence of bilateral pitting edema). Well nourished children were the 1-5 year olds with a weight for height Z score > -2SD who had reported to the hospital with other medical conditions other than malnutrition.
3.4 EXCLUSION CRITERIA

Mothers with their children who according to the medical folders, had chronic infections or illnesses (such as congenital heart disease, sickle cell) that may influence their nutritional status were excluded from the study.

3.5 SAMPLE SIZE

A sample size of 150 was calculated by using the formula below;

\[ n = Z^2 \times P(1 - P) \div d^2 \] (Crochran, 1977)

Where \( n \) = sample size

\( Z \) = absolute value of selected confidence level (at 95% with standard value of 1.96)

\( P \) = the population portion (prevalence of underweight children in Ghana), \( p = 0.11 \) (GDHS, 2014)

\( d \) = acceptable margin of error of 5% (0.05).

3.6 SAMPLING

Potential participants who satisfied the criteria for inclusion in the study were approached and selected by convenient sampling. Recruitment of participants was done between the first week of June to the first week of July 2017.

3.7 STUDY PROCEDURE

Data of mothers relating to demographic characteristics, feeding practices as well as nutritional knowledge was obtained using a pre-tested questionnaire. Some anthropometric measurements were carried out on the children as described below, and with the assistance of their mothers, saliva samples were obtained from them for determination of salivary
albumin, amylase and total protein. The details of these procedures are described on the next page.

3.7.1 Anthropometry

The weight, height and mid-upper-arm circumference (MUAC) were taken and compared with WHO Child Growth Standards (WHO MultiCentre Growth Reference Study Group, 2006).

Weight was measured twice using a SECA weighing scale to the nearest 0.1kg and an average was determined. Measurements were taken without foot wears or heavy clothing. Height was measured with a stadiometer. The children were measured without their foot wears, while standing with hands by the side and back to the vertical measuring line. In the case of children below 24 months of age, an infantometer was used to measure their supine length. Measurements were taken to the nearest 0.1cm.

Mid-upper- arm circumference (MUAC) measures were taken with a non-stretch tape measure. The measurement was done by determining the midpoint between the shoulder and elbow of the left arm bent. The mid-point was marked and measured while the arm was straightened.

3.7.2 Dietary Assessment

A food frequency questionnaire (FFQ) (Appendix II) was used to gather information on the regular eating pattern of the children from their mothers. Mothers were asked about how often their child had consumed the food items on the list in the past three months.
3.7.3 Saliva Sample Collection

Unstimulated saliva samples were collected from the children into well-labelled centrifuge tubes between 9am to 2pm after a single mouth rinse with clean water. The collected samples were immediately kept on ice. Samples were taken to the Chemical pathology laboratory of the School of Biomedical and Allied Health Science and centrifuged at 3000 rpm for 5 minutes. The supernatant was used for analysis of albumin, amylase and total protein.

3.7.4 Biochemical Estimation

Salivary pH was measured using a universal indicator (pH test strips, China). Total protein estimation of samples was determined based on the Biuret method (Frenk et al., 2007). Salivary albumin estimation was done by the Bromocresol green method (Doumas et al., 1971) and salivary amylase by the Rohleder and Nater method (Rohleder & Nater, 2009).

3.8 DATA ANALYSIS

Statistical analyses were done using SPSS Version 24 for Windows and Graphpad Prism version 7. Independent sample t-test was used to compare the mean values for numeric variables between malnourished and well-nourished subjects. Frequencies of categorical variable were compared with the Chi-Square test. Correlation was used to test the association between mothers’ knowledge and nutritional status of the children. Children's nutritional status was correlated to the biochemical parameters. A 'p' value less than 0.05 was considered statistically significant.
3.9 ETHICS

Ethical approval was obtained from the Ethics and Protocol Review Committee of the College of Health Sciences. Approval was also sought from Ghana Health Service Regional Directorate and the Princess Marie Louise Hospital. Participants gave Informed consent (Appendix I), after a detailed explanation of the study and understood that they could choose to withdraw their participation at any time without any consequences whatsoever.
CHAPTER FOUR

4.0 RESULTS

4.1 SOCIO-ECONOMIC CHARACTERISTICS OF MOTHERS

A total of 92 mothers with their children participated in the study. Table 1 summarizes the socio-economic characteristics of the mothers of both groups. Out of the 92 mothers, 50 had well-nourished children and 42 had malnourished children. The two groups of mothers differed in age, marital status and educational background (p = 0.042, 0.015 and 0.033 respectively). Specifically, mothers of the well-nourished children were older and mostly married and only 8% of them had no formal education as compared to 21% of the mothers of malnourished children. Monthly household income and number of people dependent on it were similar for both groups.

4.2 BACKGROUND CHARACTERISTICS OF CHILDREN

Table 4.2 shows a summary of the characteristics of the children (well-nourished vs. malnourished). There were more females than males in both groups. The two groups of children differed significantly from each other in terms of their age, weight, height and nutritional status (p= 0.0023, <0.0001, 0.0016 and <0.0001 respectively), with the well-nourished children being, older, heavier, taller. Also, as would be expected because of the selection criteria, all the children in the well-nourished group were normal in terms of nutritional status. It was observed that, the distribution of children with various medical conditions, those whose immunizations were up to date and those that were not, as well as those born at term and preterm were all similar for both groups.
Table 4.1: Socio-economic characteristics of mothers

<table>
<thead>
<tr>
<th>CATEGORY</th>
<th>VARIABLE</th>
<th>WELL-NOURISHED % (N = 50)</th>
<th>MALNOURISHED % (N = 42)</th>
<th>P-VALUE</th>
</tr>
</thead>
<tbody>
<tr>
<td>AGE (Mean ± SD)</td>
<td></td>
<td>32.84 ± 6.88</td>
<td>29.90 ± 6.73</td>
<td>0.042</td>
</tr>
<tr>
<td>MARITAL STATUS</td>
<td>Single</td>
<td>14 (7)</td>
<td>38.1 (16)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Married</td>
<td>84 (42)</td>
<td>61.9 (26)</td>
<td>0.015</td>
</tr>
<tr>
<td></td>
<td>Separated/Divorced</td>
<td>2 (1)</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>NUMBER OF CHILDREN (Mean ± SD)</td>
<td></td>
<td>2.44 ± 1.37</td>
<td>2.24 ± 1.12</td>
<td>0.448</td>
</tr>
<tr>
<td>EMPLOYMENT STATUS</td>
<td>Employed</td>
<td>94 (47)</td>
<td>76.2 (32)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Unemployed</td>
<td>6 (3)</td>
<td>23.8 (10)</td>
<td></td>
</tr>
<tr>
<td>EDUCATIONAL LEVEL</td>
<td>Primary</td>
<td>58 (29)</td>
<td>28.6 (12)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>JHS</td>
<td>20 (10)</td>
<td>23.8 (10)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>SHS</td>
<td>6 (3)</td>
<td>4.8 (2)</td>
<td>0.033</td>
</tr>
<tr>
<td></td>
<td>Tertiary</td>
<td>8 (4)</td>
<td>21.4 (9)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>None</td>
<td>8 (4)</td>
<td>21.4 (9)</td>
<td></td>
</tr>
<tr>
<td>MONTHLY HOUSEHOLD INCOME (Gh¢)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>50</td>
<td>2 (1)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>50-100</td>
<td>12 (6)</td>
<td>7.1 (3)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>150-200</td>
<td>6 (3)</td>
<td>7.1 (3)</td>
<td></td>
<td>0.452</td>
</tr>
<tr>
<td>200-500</td>
<td>30 (15)</td>
<td>47.6 (20)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>500-1,000</td>
<td>42 (21)</td>
<td>31 (13)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1,000</td>
<td>8 (4)</td>
<td>7.1 (3)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>NUMBER OF PEOPLE DEPENDENT ON</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>INCOME (Mean ± SD)</td>
<td></td>
<td>4.64 ± 2.17</td>
<td>4.31 ± 1.80</td>
<td>0.435</td>
</tr>
</tbody>
</table>
Table 4.2: Background characteristics of children

<table>
<thead>
<tr>
<th>CATEGORY</th>
<th>VARIABLE</th>
<th>WELL-NOURISHED % (N = 50)</th>
<th>MALNOURISHED % (N = 42)</th>
<th>P-VALUE</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>GENDER</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Male</td>
<td>42 (21)</td>
<td>40.5 (17)</td>
<td>0.999</td>
<td></td>
</tr>
<tr>
<td>Female</td>
<td>58 (29)</td>
<td>59.5 (25)</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>AGE in months (Mean ± SD)</strong></td>
<td>37.50 ± 13.351</td>
<td>28.62 ± 13.754</td>
<td>0.0023</td>
<td></td>
</tr>
<tr>
<td><strong>WEIGHT in kg (Mean ± SD)</strong></td>
<td>14.91 ± 3.217</td>
<td>8.99 ± 2.092</td>
<td>&lt;0.0001</td>
<td></td>
</tr>
<tr>
<td><strong>MUAC in cm (Mean ± SD)</strong></td>
<td>16.02 ± 1.491</td>
<td>11.82 ± 0.885</td>
<td>&lt;0.0001</td>
<td></td>
</tr>
<tr>
<td><strong>HEIGHT in cm (Mean ± SD)</strong></td>
<td>94.13 ± 10.470</td>
<td>86.62 ± 11.313</td>
<td>0.0016</td>
<td></td>
</tr>
<tr>
<td><strong>NUTRITIONAL STATUS</strong></td>
<td></td>
<td></td>
<td></td>
<td>&lt;0.0001</td>
</tr>
<tr>
<td>Normal</td>
<td>100 (50)</td>
<td>0</td>
<td></td>
<td></td>
</tr>
<tr>
<td>SAM</td>
<td>0</td>
<td>52.4 (22)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>MAM</td>
<td>0</td>
<td>47.6 (20)</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>MEDICAL CONDITIONS</strong></td>
<td></td>
<td></td>
<td></td>
<td>0.1989</td>
</tr>
<tr>
<td>Diarrhoea</td>
<td>18 (9)</td>
<td>42.9 (18)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Malaria</td>
<td>30 (15)</td>
<td>16.7 (7)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fever</td>
<td>24 (12)</td>
<td>19 (8)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cough</td>
<td>10 (5)</td>
<td>7.1 (3)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cold</td>
<td>6 (3)</td>
<td>9.5 (4)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Measles</td>
<td>2 (1)</td>
<td>0</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Appetite loss</td>
<td>0</td>
<td>11.9 (5)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Others</td>
<td>10 (5)</td>
<td>14.3 (6)</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>IMMUNIZATION</strong></td>
<td></td>
<td></td>
<td></td>
<td>0.1072</td>
</tr>
<tr>
<td>Up to date</td>
<td>88 (44)</td>
<td>73.8 (31)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Not up to date</td>
<td>12 (6)</td>
<td>26.2 (11)</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>PREGNANCY TERM</strong></td>
<td></td>
<td></td>
<td></td>
<td>0.9999</td>
</tr>
<tr>
<td>Up to term</td>
<td>92 (46)</td>
<td>93 (39)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Preterm</td>
<td>8 (4)</td>
<td>7 (3)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
4.3 NUTRITIONAL KNOWLEDGE OF MOTHERS/ CAREGIVERS

Results obtained about the nutritional knowledge of mothers are presented in table 4.3. Compared to mothers of malnourished children, more of the mothers of well-nourished children had accurate knowledge of the time that breastfeeding ought to be initiated after birth; the 6 food groups and foods that protects the body against diseases. Knowledge of specific foods that aid in the development of strong bones and teeth was very low in both groups. A similar proportion of both groups failed to state the correct age that complementary food must be introduced. Also, almost all participants in both groups thought that children under the age of 5 years should be fed less than 3 times a day.

4.4 MOTHER’S INFANT FEEDING PRACTICES

Table 4.4 presents the general infant feeding practices of the mothers. Eighty-eight percent (n=44) of the mothers of well-nourished children exclusively breastfed their children but about half of that number exclusively breastfed for 6 months. Among the mothers of malnourished children, while 78.6% (n=33) exclusively breastfed, 51.5% (n=17) exclusively breastfed for 6 months. Infant feeding practices of the two groups of mothers were similar in all the aspects assessed except for mode of breastfeeding, for which there was a significant difference. Twenty-four percent (n=21) of the mothers of well-nourished children fed their children using both breast and feeding bottle as compared with about 2.4% (n=1) of mothers of malnourished children.
### Table 4.3: Nutritional knowledge of mothers/caregivers

<table>
<thead>
<tr>
<th>CATEGORY</th>
<th>VARIABLE</th>
<th>MOTHERS OF CHILDREN</th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>WELL-NOURISHED % (N = 50)</td>
<td>MALNOURISHED % (N = 42)</td>
<td>P-VALUE</td>
<td></td>
<td></td>
</tr>
<tr>
<td>TIME OF INITIATING BREASTFEEDING</td>
<td>Soon after birth</td>
<td>94 (47)</td>
<td>78.6 (33)</td>
<td>0.034</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>≥24 hr after birth</td>
<td>6 (3)</td>
<td>21.4 (9)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>AGE OF INTRODUCING COMPLEMENTARY FOOD</td>
<td>Age 6 months</td>
<td>50 (25)</td>
<td>52.4 (22)</td>
<td>0.837</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Age ≥6 months</td>
<td>50 (25)</td>
<td>47.6 (20)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>FREQUENCY OF FEEDING CHILD</td>
<td>3 times</td>
<td>94 (47)</td>
<td>85.7 (36)</td>
<td>0.292</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>≥4 times</td>
<td>6 (3)</td>
<td>14.3 (6)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>CAUSES OF KWASHIOKOR</td>
<td>Lack of the right type of food</td>
<td>4 (2)</td>
<td>0</td>
<td></td>
<td>0.254</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Lack of food</td>
<td>6 (3)</td>
<td>7.1 (3)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Evil spirits</td>
<td>4 (2)</td>
<td>9.5 (4)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Too close birth</td>
<td>50 (25)</td>
<td>33.3 (14)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Don’t know</td>
<td>36 (18)</td>
<td>50 (21)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>KNOWLEDGE OF 6 FOOD GROUPS</td>
<td>Yes</td>
<td>85.7 (36)</td>
<td>90.5 (38)</td>
<td>0.034</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>No</td>
<td>28 (14)</td>
<td>9.5 (4)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>FOODS THAT PROTECT THE BODY AGAINST DISEASE</td>
<td>Correct</td>
<td>72 (36)</td>
<td>45.2 (19)</td>
<td>0.011</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Wrong</td>
<td>28 (14)</td>
<td>54.8 (23)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>FOOD FOR STRONG BONES AND TEETH IN CHILDREN</td>
<td>Correct</td>
<td>30 (15)</td>
<td>14.3 (6)</td>
<td>0.086</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Wrong</td>
<td>70 (35)</td>
<td>85.7 (36)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>FOOD THAT “GIVES CHILDREN BLOOD”</td>
<td>Correct</td>
<td>98 (49)</td>
<td>97.6 (41)</td>
<td>0.999</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Wrong</td>
<td>2 (1)</td>
<td>2.4 (1)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>CATEGORY</td>
<td>VARIABLE</td>
<td>MOTHERS OF CHILDREN</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>----------------------------------</td>
<td>-----------------------------------------</td>
<td>---------------------</td>
<td>---</td>
<td>---</td>
<td>---</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>WELL-NOURISHED % (N = 50)</td>
<td>MALNOURISHED % (N = 42)</td>
<td>P-VALUE</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>EXCLUSIVE BREASTFEEDING</strong></td>
<td>Yes</td>
<td>88 (44)</td>
<td>78.6 (33)</td>
<td>0.265</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>No</td>
<td>12 (6)</td>
<td>21.4 (9)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>DURATION OF EXCLUSIVE BREASTFEEDING</strong></td>
<td>6 months</td>
<td>54.5 (24)</td>
<td>48.5 (16)</td>
<td>0.999</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>6 months</td>
<td>45.5 (20)</td>
<td>51.5 (17)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>MODE OF BREASTFEEDING</strong></td>
<td>Breast only</td>
<td>74 (37)</td>
<td>95.2 (40)</td>
<td>0.012</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Breast and cup/spoon</td>
<td>2 (1)</td>
<td>2.4 (1)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Breast and feeding bottle</td>
<td>24 (12)</td>
<td>2.4 (1)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>FREQUENCY OF BREASTFEEDING</strong></td>
<td>On demand</td>
<td>78 (39)</td>
<td>81 (34)</td>
<td>0.800</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Others</td>
<td>22 (11)</td>
<td>19 (8)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>DOES CHILD EMPTY ONE BREAST BEFORE THE OTHER DURING BREASTFEEDING</strong></td>
<td>Yes</td>
<td>54 (27)</td>
<td>33.3 (14)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>No</td>
<td>46 (23)</td>
<td>66.7 (28)</td>
<td>0.059</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>TYPE OF COMPLEMENTARY FOOD INTRODUCED</strong></td>
<td>Koko only</td>
<td>38 (19)</td>
<td>42.9 (18)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Weanimix</td>
<td>62 (31)</td>
<td>57.1 (24)</td>
<td>0.674</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Koko/infant formula</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Semi-solid foods</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>FREQUENCY OF COMPLEMENTARY FOOD/ DAY</strong></td>
<td>≤ 3</td>
<td>42 (21)</td>
<td>47.6 (20)</td>
<td>0.675</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>≥ 4</td>
<td>58 (29)</td>
<td>53.4 (22)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>INFLUENCE OF CHILD'S FOOD CHOICE</strong></td>
<td>Nutritional Value</td>
<td>26 (13)</td>
<td>42.9 (18)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Affordability</td>
<td>12 (6)</td>
<td>7.1 (3)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Availability</td>
<td>56 (28)</td>
<td>42.9 (18)</td>
<td>0.507</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Cultural/Religious beliefs</td>
<td>2 (1)</td>
<td>2.4 (1)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Time</td>
<td>4 (2)</td>
<td>4.8 (2)</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
4.5 DIETARY HABIT OF MOTHERS

Dietary habits of the mothers/caregivers are summarized in table 5. The two groups of mothers did not differ in the daily frequency of meals and snacks they consumed; meal skipping and the reasons for doing so; or any of the other variable assessed under dietary habits.

4.6 NUTRITIONAL STATUS USING BIOCHEMICAL ANALYSES

4.6.1 Salivary pH

Figure 4.1 shows the values of salivary pH of the children in both groups. The averages of pH value were 5.36 ± 0.598 and 5.262 ± 0.586 for well-nourished and malnourished children respectively. Normal salivary pH value is between 5.6-7.9. From the figure, it was observed that the children in both groups are within the normal range.

4.6.2 Salivary amylase

Figure 4.2 shows the salivary amylase concentration of the both the well-nourished and malnourished children. For the well-nourished children, the average concentration was 1878 ± 1451 U/L and that of the malnourished children was 2026 ± 1287 U/L.
Table 4.5: Dietary habits of mothers

<table>
<thead>
<tr>
<th>CATEGORY</th>
<th>VARIABLE</th>
<th>MOOTHERS OF CHILDREN</th>
<th>WELLP-</th>
<th>MALNOURISHED</th>
<th>P-VALUE</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>(N = 50)</td>
<td>(N = 42)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>MEAL FREQUENCY/DAY</td>
<td>Once</td>
<td>0</td>
<td>0</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Twice</td>
<td>44 (22)</td>
<td>40.5 (17)</td>
<td></td>
<td>0.834</td>
</tr>
<tr>
<td></td>
<td>Thrice</td>
<td>56 (28)</td>
<td>57.1 (24)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>SNACKING</td>
<td>Yes</td>
<td>34 (17)</td>
<td>40.5 (17)</td>
<td></td>
<td>0.665</td>
</tr>
<tr>
<td></td>
<td>No</td>
<td>66 (33)</td>
<td>59.5 (25)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>FREQUENCY OF SNACKS/DAY</td>
<td>Once</td>
<td>32 (16)</td>
<td>33.3 (14)</td>
<td></td>
<td>0.460</td>
</tr>
<tr>
<td></td>
<td>Twice</td>
<td>2 (1)</td>
<td>7.1 (3)</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>None</td>
<td>66 (33)</td>
<td>59.5 (25)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>SKIPPING OF MEALS</td>
<td>Yes</td>
<td>44 (22)</td>
<td>42.9 (18)</td>
<td></td>
<td>0.534</td>
</tr>
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<td></td>
<td>No</td>
<td>56 (28)</td>
<td>57 (24)</td>
<td></td>
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<td>REASON FOR MEAL SKIPPING</td>
<td>Financial</td>
<td>27.3 (6)</td>
<td>38.9 (7)</td>
<td></td>
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<td></td>
<td>Work Schedule</td>
<td>22.7 (5)</td>
<td>27.8 (5)</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Weight</td>
<td>22.7 (5)</td>
<td>5.6 (1)</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Management</td>
<td>22.7 (5)</td>
<td>27.8 (5)</td>
<td></td>
<td>0.476</td>
</tr>
<tr>
<td></td>
<td>Loss of Appetite</td>
<td>22.7 (5)</td>
<td>27.8 (5)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>BUYING OF FOOD</td>
<td>Yes</td>
<td>60 (30)</td>
<td>59.5 (25)</td>
<td></td>
<td>0.999</td>
</tr>
<tr>
<td></td>
<td>No</td>
<td>40 (20)</td>
<td>40.5 (17)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>PLACE OF PURCHASING OF FOOD</td>
<td>Restaurant</td>
<td>12 (6)</td>
<td>16.7 (7)</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Chop bars</td>
<td>16 (8)</td>
<td>11.9 (5)</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Cafeteria</td>
<td>10 (5)</td>
<td>0</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Street Vendors</td>
<td>12 (6)</td>
<td>31 (13)</td>
<td></td>
<td>0.296</td>
</tr>
<tr>
<td></td>
<td>None</td>
<td>40 (20)</td>
<td>40.5 (17)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>FOOD TABOOS</td>
<td>Yes</td>
<td>18 (9)</td>
<td>14.3 (6)</td>
<td></td>
<td>0.779</td>
</tr>
<tr>
<td></td>
<td>No</td>
<td>82 (41)</td>
<td>85.7 (36)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
**Fig. 4.1**: Salivary pH values of children.

P-value = 0.413

**Fig. 4.2**: Concentration of salivary amylase of children.

P-value = 0.608
4.6.3 Salivary total protein

Figure 4.3 shows the salivary total protein concentration of the children. For the well-nourished children, the average concentration was $6.031 \pm 3.617$ g/L and $3.915 \pm 2.493$ g/L for malnourished children. The total protein concentration of the two groups significantly differed from each other with malnourished children having a lower concentration of total protein as compared with the well-nourished children.

Fig. 4.3: Salivary total protein concentration of children.
4.6.4 Salivary albumin

Figure 4.4 shows the concentration of salivary albumin in both groups. The mean concentrations of salivary albumin were 2.426 ± 1.357 g/L and 1.826 ± 1.283 g/L for well-nourished and malnourished children respectively.

P-value = 0.0348

Fig. 4.4: Salivary albumin concentration of children.
4.7 FOOD FREQUENCY OF CHILDREN

4.7.1 Cereals and grains

Figure 4.5 shows the frequency of consumption of cereals and cereal products by the children. The most common cereal consumed by the children (60%) in both groups was rice which was consumed once a day. Cereal products such as tom brown was consumed once a day by 45% of the malnourished children and 20% of the well-nourished children.

Fig. 4.5: Frequency of consumption of cereals and cereal products by the children
4.7.2 Starchy foods

Figure 4.6 shows the frequency with which starchy foods were consumed. The commonest starchy foods consumed by the children in both groups were banku/tuo zaafi (TZ) and fufu. Gari and cocoyam were rarely taken by the children.

![Frequency of consumption of starchy food and plantain by the children](image)

**Fig. 4.6**: Frequency of consumption of starchy food and plantain by the children

4.7.3 Animal and animal products

Figure 4.7 presents the frequency of consumption of animal and animal products by both the well-nourished and malnourished children. From the figure, about 50% of the children in both groups had fish and eggs once a day. Forty percent (40%) of well-nourished children were given milk once a day as compared with 50% of malnourished children. Mothers of
malnourished children never fed their children game as compared with < 5% of mothers of well-nourished children who had ever fed their children with game. Sausages and offal were rarely given by mothers in both groups.

Fig. 4.7: Frequency of consumption of animal and animal products by the children. (*Evaporated milk)

4.7.4 Legumes, oily seeds and nuts
Figure 4.8 presents the frequency of consumption of legumes, oily seeds and nuts. Approximately 60% of the mothers in both groups never fed their children with soy flour and Bambara beans. Majority of mothers (about 65%) of well-nourished children and malnourished children gave groundnut soup and palm nut soup 1-2 times in a week.
4.7.5 Fats and oils

Figure 4.9 shows the frequency of consumption of fats and oils by the well-nourished and malnourished children. From the figure, white oil was the most frequent oil used in meal preparation by mothers in both groups. Both well-nourished children and malnourished children were rarely fed with margarine and peanut butter. Most of the mothers (62% of well-nourished children and 68% of malnourished children) never fed their children wagashie.
4.7.6 Fruits and vegetables

Figure 4.10 shows fruits and vegetable consumption of both the well-nourished and malnourished children. The frequency of consumption of fruits and vegetables in both groups were similar. Kontomire (coco yam leaves) and okro were the common vegetables children in both groups were fed. Fruits like mango, pawpaw, pineapple and apple were rarely consumed by children in both groups. A vast majority of the mothers (90% of mothers of malnourished children and 65% of mothers of well-nourished children) never fed their children guava.
Fig. 4.10: Frequency of consumption of fats and oils by the children. (1 - kontomire/ademe; 2 – garden eggs; 3- pineapples; 4- citrus fruits; 5- avocado pear; 6-coconut; 7- sugarcane)
CHAPTER FIVE

5.0 DISCUSSION AND CONCLUSIONS

5.1 DISCUSSION

5.1.1 SOCIO-ECONOMIC CHARACTERISTICS OF MOTHERS

The aim of the study was to compare the nutritional knowledge, dietary habits and infant feeding practices of mothers with well-nourished children to that of those with malnourished children.

A total of 92 mother and child pairs participated in the study. In this study, some differences were observed in the socio-economic variables of the mothers/ caregivers. Unlike the observation made by Appoh & Krekling (2005) who found no differences in maternal age in a study in the Volta region of Ghana, mothers of well-nourished children in this study were significantly older than the mothers of malnourished children, $p < 0.042$. Other studies by Raj et al., (2010) and Fall et al., (2015) reported an association between maternal age and the nutritional status of their children. In their studies, they found that, younger mothers might breastfeed their children for a shorter duration compared with older mothers. Also because they may be relatively less mature, they may give less than the needed attention to the needs of their infant. The effect of maternal age could be mediated by lack of experience and adequate health-care seeking behavior of the mothers of malnourished children as compared with the mothers of well-nourished children.

There were significant differences in the marital status of mothers. Although most of the mothers in both groups were married, a high percentage of mothers of malnourished children were single (38.1%) as compared with 14% of mothers with well-nourished children. Single parenthood is an important determinant of the nutritional status of children under 5 years of age due to the frequent low income levels of single mothers. This will
likely affect their selection of food for their children. This is in agreement with the results of studies by Kingsley (2003) and Udoh (2004) in Nigeria who reported that children growing up with single mothers usually suffer from inadequate intake of food.

Maternal formal education is associated with nutritional status of children. From this study, a greater percentage of the mothers of malnourished children had never been to school. Mothers are the primary caregivers of children during the early years of life. Their knowledge and understanding of some basic nutrition impact on the growth and development of their children. The result of this study is similar to studies done in Nigeria by Chen (1986), Bhuiya et al., (1986) and Abidoye & Sefabofor (2010). Also a study in Ghana by Appoh & Krekling (2005) showed that there is a positive association between maternal education and the nutritional status of their children.

5.1.2 BACKGROUND CHARACTERISTICS OF CHILDREN

Anthropometric measurement is a tool globally used in determining nutritional status of children (Hakeem et al., 2004). The measurement considers the age of the child in relation to their weight and height. Severe acute malnutrition (SAM) in children is defined as weight-for-height (WHZ) less than -3 z-scores, or absence or presence of oedema and a mid-upper arm circumference (MUAC) < 11.5cm. Moderate acute malnutrition is defined as a weight-for-height z-scores ≥3SD to <-2SD. For the well-nourished children, their weight-for-height might be greater than a z-score of -2SD and a mid-upper-arm circumference > 12.5cm (WHO, 1997). In this study, the mid-upper-arm circumference of the well-nourished children was significantly higher than that of the malnourished children. This result was expected because based on the WHO reference value for classification of child growth, the mid-upper circumference of well-nourished children should be greater.
than 12.5 cm and those of malnourished children should be less than 12.5cm. A study by Steenkamp et al.,(2016) in South Africa reported similar findings.

It was noted that the well-nourished children were relatively older than the malnourished children (37.50 ± 13.351 months vs 28.62 ± 13.754 respectively). This difference in age may be attributable to the fact that children below 36 months of age are more prone to be malnourished if adequate healthcare and nutrition are not provided.

5.1.3 NUTRITIONAL KNOWLEDGE OF MOTHERS/ CAREGIVERS

The growth, development and survival of a child do not depend solely on the intake of food and health but also on maternal knowledge (Engle et al., 2009). Aside unavailability of food, inadequate nutritional knowledge is a determinate of malnutrition among children (WHO, 2003). There are various sources through which nutritional knowledge can be acquired. These sources include; formal education, mass media, community health services, friends and family (Glewwe, 1999). Nutrition knowledge can either be positive or negative and its application is also important. Inadequate application of basic nutrition knowledge can result in malnutrition. Various studies have been conducted on the association between maternal nutritional knowledge and nutritional status of children. Findings from these studies were inconsistent, for instance a study Webb & Block (2003), found an association between maternal nutritional knowledge and nutritional status of children (weight- for – age), while Grant & Stone (1986) found no association between nutritional knowledge and nutritional status. The results of this present study showed that there was some association between maternal nutritional knowledge and the nutritional status of their children. Mothers’ knowledge of the six food groups had a significant association with weight (p =0.0.016), MUAC (p <0.0465) and height (p <0.0089) of the children. Also, mothers’
knowledge of the protective foods had a significant association with weight (p =0.0126) and MUAC (p <0.0035) of the children.

Early initiation of breastfeeding after birth has a positive impact on the nutritional status of an infant. The WHO recommends initiating of breastfeeding within the first hour after birth, exclusively breastfeeding for the first 6 months of life, and then continuation of breastfeeding in addition to complementary foods for 2 years of life (WHO, 1998). In this study, there was significant difference in the appropriate time of initiation of breastfeeding reported by mothers in the two groups. About 21.4% of mothers with malnourished children selected ≥ 24 hours as the appropriate time to initiate breastfeeding as compared with 6% of mothers of well-nourished children. The knowledge of the mothers might have impacted on the nutritional status of the children. A study by Bhutta et al. (2008), reported that, effective caregiver counselling can influence the initiation of breastfeeding and the rate of feeding. Although various studies reported different findings, it must be noted that, the variables for measuring maternal nutritional knowledge might be different and also the age groups of the children may vary.

From the study, knowledge about the age of introducing complementary food to an infant, the number of times to feed a child under 5 years old and the causes of kwashiokor were not significantly different between the two groups of mothers. Mothers were not asked what age they actually introduced complementary food. However assuming they practiced what they know, then a similar proportion of mothers of well-nourished and malnourished children introduced complementary foods before 6 months of age. This is contrary to the results of studies conducted by Appoh & Krekling (2005) and Castle et al., (2001) both of who found an association between the age of introducing complementary foods and nutritional status. It is worth noting that half (50%) of mothers of malnourished children did not know of the
causes of kwashiorkor. There is therefore a need to review the content of nutrition education at the child wellfare clinics.

Mothers of malnourished children knew more about the six food groups and the foods that protect children against diseases, however this was not reflected in the nutritional status of their children. Possibly, these mothers acquired this knowledge as a result of counseling they received because their children are malnourished.

5.1.4 MOTHER’S/ CAREGIVER’S INFANT FEEDING PRACTICES

Breastfeeding is a common infant feeding practice worldwide. The frequency at which mothers breastfeed is dependent on some maternal characteristics such as age and the nutritional knowledge of the mother. From the study, although all the mothers in both groups breastfed, a greater number of malnourished mothers breastfed exclusively for 6 months. This finding could indicate that, although a greater portion of mothers of malnourished children exclusively breastfed, their complementary feeding practices might have been suboptimal (Onyango et al., 2014). It was observed that a greater portion of mothers of well-nourished children were fed using both breast and feeding bottles. This mixed feeding practice is being discouraged due to poor hygienic practices that might result in contamination leading to various infections (Metandan et al., 2014).

Although, the infant feeding practices of the mothers in both groups was similar, some interesting findings were observed. About 42.9% of mothers of malnourished children mentioned that the nutritional value/content of a food influenced their food choices for their children as compared with 26% of mothers of well-nourished children. Despite their influence of food choices, the diversity of feeding might not be adequate (Onyango et al., 2014). This is evidenced in the frequency of feeding of complementary foods (47.6% of
mothers of malnourished children feeding ≤ 3 times in a day as compared 42% of mothers of well-nourished children).

5.1.5 DIETARY HABITS OF MOTHERS

Dietary habits of mothers influence the feeding patterns of children. The quality of a child’s diet and the meal preference a child develops are based on the mother’s/caregiver’s dietary habit (Savage et al., 2007). From this study, both groups of mothers had similar dietary habits. There was no statistically significant association between the mothers’ dietary habit and the nutritional status of children. A study in Uganda by Kikafunda et al., (1998) assessing the risk of malnutrition, found that food taboos did not impact on children nutritional status. In Ghana, UNICEF, 2002, reported that poor nutritional status of children can be linked to the food taboos of their mothers. Food taboos in Ghana is mostly based on cultural or religious beliefs, it leads to restricting the child access to some nutritious foods such as meat and eggs. There is not much evidence on how food taboos impact a child’s nutritional status. From this study, the lack of association between the dietary habit of mothers and the nutritional status of their children, could be that the response of the mothers to questions asked did not reflect their practice and also because a dietary recall of the mothers was not taken.

5.1.6 NUTRITIONAL STATUS USING BIOCHEMICAL ANALYSES

Salivary diagnostics can be impacted by infant and child health. The pH levels of the well-nourished children did not differ from the levels in the malnourished children and both were within the normal reference range. The normal pH level of the saliva of the children in both groups indicate a good mineral reserve of the body (Edgar, 1990).
From this study, the concentration of salivary amylase in the well-nourished children was similar to the concentration in the malnourished children. Digestion of starch in the mouth is aided by salivary amylase, but its concentration differs from one individual to the other (Mandel & Breslin, 2012).

Salivary functions can be compromised by nutritional deficiencies. Total protein and albumin concentration are considered important biochemical indicators of malnutrition (Kumar & Singh, 2013). Mahadevan & Velavan (2013) reported that protein energy malnutrition can result in the reduction of salivary proteins. This study showed not much difference in salivary albumin concentration among the well-nourished and malnourished children, but the mean concentration of salivary total protein for the well-nourished children was higher than that of the malnourished children. This confirms the nutritional diagnosis of the children.

5.1.7 FOOD FREQUENCY OF CHILDREN

The quality (composition) and quantity of an individual’s diet can determine the nutritional status of the individual. A diet that is of low nutritional quality and insufficient in quantity can predispose children to retardation in growth and development. Dietary diversity is a measure of the different food groups consumed over a given period of time (Ruel, 2003). A study in Malaysia by Chua, et al. (2012) reported that children who consumed a diverse diet are more likely to have better nutritional status. From this study, the frequency of consumption of most of the individual foods in the various food groups (cereals and grains, starchy foods and plantains, animal and animal products, legumes, oily seeds and nut, fats and oils and fruits and vegetables) by the well-nourished and malnourished children were similar. These results are limited in the sense that it gives no idea of the quantity of food
consumed by the children and therefore there is no way of knowing the adequacy or otherwise of their diet in terms of quantity.

5.2 CONCLUSIONS

There was no statistically significant association between maternal dietary habits and infant feeding practices, and the nutritional status of the children. However, the mothers’ knowledge of the six food groups had a significant association with weight \( (p = 0.016) \), MUAC \( (p < 0.0465) \) and height \( (p < 0.0089) \) of the children. Also, mothers’ knowledge of the protective foods had a significant association with weight \( (p = 0.0126) \) and MUAC \( (p < 0.0035) \) of the children.

5.4 RECOMMENDATIONS

1. Appropriate infant and young child feeding practices should be a constant feature of the nutrition education given to mothers attending child welfare clinics. Special emphasis need to be placed on appropriate initiation of breastfeeding, mode of breastfeeding and the six food groups.

2. A national assessment of child welfare clinics may be helpful to establish the effectiveness of nutrition education given in these clinics. The content and approach of education should be evaluated and if necessary revised.

5.3 LIMITATION

1. The results obtained are subject to the accuracy of information obtained from mothers/caregivers. It is possible that the mothers/caregiver’s response may not reflect their true practice.
2. The sample size was relatively small. Furthermore, the sample size obtained was smaller than the calculated size and this is likely to affect the statistical power of the study.
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APPENDIXES

APPENDIX I - INFORMED CONSENT FORM

I …………………………………………… willingly agree to participate in this study being conducted by Esther Ahumah, Dr. Joana Quampah and Mrs. Anna Amoako-Mensah all of the department of Nutrition and Dietetics, School of Biomedical and Allied Health Sciences, Korle-Bu. I understand that I do not have to go ahead if I do not want to do so. There are no harms or benefits that I will get by taking part in this study. Findings of this study will be kept confidential and would be made available to me if I make a request. I may also ask any questions I have now or later. I have been informed that this proposal is reviewed, approved and granted ethical clearance by the School of Biomedical and Allied Health Sciences and Princess Marie Louise Hospital, Accra. They are responsible for protecting research participants from harm. By signing this form, I am agreeing to take part in this research study.

…………………………………….  …………….  ……………….

Name of Principal Investigator     Signature        Date

…………………………………….  …………….  ……………….

Name of Participant     Signature/ Thumb print        Date

Questions can be addressed to the Principal Investigator (0267238947, estherahumah@gmail.com). Additional questions or problems concerning your rights as a research participant should be addressed to: The Chairman, Ethics and Protocol Review Committee, School of Biomedical and Allied Health Sciences, University of Ghana, Korle-Bu, Accra.
APPENDIX II - DATA COLLECTION QUESTIONNAIRE

PARTICIPANT’S CODE ……………………………

DEMOGRAPHIC DATA

MOTHER/CAREGIVER

1. Gender Male [ ] Female [ ]
2. Age …………………
3. Traditional language ……………………………
4. Marital status
   Single [ ] Married [ ]  Married [ ]  Married [ ]  Widowed [ ]
5. Number of children ……………………………
6. What is your employment status?
   Employed [ ] Unemployed [ ]
7. Occupation ………………………………………
8. Educational level
   Primary [ ]  JHS [ ]  SHS [ ]  Tertiary [ ]  None [ ]
9. What is your household income in a month?
   GH¢50 [ ]  GH¢ 50- GH¢ 100 [ ]  GH¢ 150-200 [ ]
   GH¢ 200-GH¢ 500 [ ]  GH¢500-GH¢1000 [ ]  > GH¢1000 [ ]
10. How many people depend on this income? ……………………………

DATA OF CHILD

1. Age ……………………………
2. Gender Male [ ] Female [ ]
3. Birth order ……………………………
4. Age difference between the next sibling ……………………………
5. Anthropometric Data
   Birth weight ………………… Current weight
   ……………………………
   Length ………………… MUAC …………………
6. Diagnosis of child SAM [ ] MAM [ ]
7. Presence of any comorbidity? Yes [ ] No [ ]
8. If Yes, state comorbidity …………………………………………………………………………………………….
9. Is the child immunized/ is the immunization up to date?  Yes [ ]  No [ ]
10. Was the pregnancy of the child carried to term?  Yes [ ]  No [ ]
11. If No, how many months or weeks was the child delivered?………………………………………

MATERNAL NUTRITIONAL KNOWLEDGE AND PRACTICES

NUTRITIONAL KNOWLEDGE

1. What is the appropriate time to initiate breastfeeding?  Soon after birth [ ]
   24 hrs. after birth [ ]
2. At what age should children start eating same foods as their parents?
   One to six months [ ]
   After six months [ ]
   Six to nine months [ ]
   By twelve months [ ]
   Others (specify)……………………………
3. How many times a day should children below 5 years be fed?……………………………………
4. What causes kwashiorkor?  Evil spirits [ ]
   Too close births [ ]
   Lack of food [ ]
   Lack of the right type of food [ ]
   I don’t know [ ]
5. Do u know about the 6 food groups?  Yes [ ]  No [ ]
6. If Yes, please give some examples?
   ……………………………………………………………………………………………………………………………
   ……………………………………………………………………………………………………………………………
   ……………………………………………………………………………………………………………………………
   ……………………………………………………………………………………………………………………………
7. What food(s) help protect the body against diseases?
   Roots and tubers [ ]
   Fruits and vegetables [ ]
   Fish and meat [ ]
   Milk and milk products [ ]
   Fats and Oil [ ]
   I don’t know [ ]
8. Which of these foods will help a growing child build strong bones and teeth?
   Koko [ ]
   Weanimix [ ]
   Milk [ ]
   Banku [ ]
   I don’t know [ ]
9. Which of these food products would give your child blood?
   Kontomire [ ]
   Oranges [ ]
   Banku [ ]
   Margarine [ ]
   Koko [ ]
   Fish [ ]
10. What influences the types of food you give your child?
    Affordability [ ]
    Availability [ ]
    Nutritional value [ ]
    Cultural/religious beliefs [ ]
    Time [ ]
    Others (Specify)……………………………

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PRACTICES

1. Was the child exclusively breastfed?  
   Yes [ ]  No [ ]

2. Duration of exclusive breastfeeding?  
   ........................................................................................................

3. In what mode was the child breastfed?  
   Breast only [ ]  Breast and cup/spoon [ ]  Spoon and Cup [ ]  
   Breast and feeding bottle [ ]  Feeding bottle only [ ]

4. How many times is the child breastfed in a day?  
   ........................................................................................................

5. When breastfeeding, does the child empty one breast before sucking the other?  
   Yes [ ]  No [ ]

6. Was/ is the child on infant formula?  
   Yes [ ]  No [ ]

7. Was/ is the child being fed on both breast milk and formula?  
   Yes [ ]  No [ ]

8. If Yes, how many times a day?  
   ........................................................................................................

9. How many scoops of formula per feeding?  
   ........................................................................................................

10. Quantity of water added to the formula?  
    ........................................................................................................

11. When did u start given water to the child?  
    ........................................................................................................

12. Was/ is the child any multivitamin supplement?  
    Yes [ ]  No [ ]

13. Has your child been weaned off the breast?  
    Yes [ ]  No [ ]  N/A(not breastfed) [ ]

14. If Yes, at what age did you stop breastfeeding?  
    ........................................................................................................

15. What was the complementary food you first introduced to your child?  
    ........................................................................................................

16. How many times was the child fed complementary food in a day?  
    ........................................................................................................
### Food Frequency Questionnaire (Adopted from WHO, 2010)

How often does your child usually eat the following foods? (Please tick one)

<table>
<thead>
<tr>
<th>Food/Dish</th>
<th>Once a day</th>
<th>More than once a day</th>
<th>5-6x a week</th>
<th>3-4x a week</th>
<th>1-2 a week</th>
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<th>Rarely</th>
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University of Ghana  http://ugspace.ug.edu.gh
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DIETARY PATTERNS OF MOTHER

1. How many times do you eat in a day?
   
   Once [  ]    Twice [  ]   Thrice [  ]   Others (specify) …………………

2. Do you usually snack between your meal?   Yes [  ]       No [  ]

3. If Yes, how many snacks do you take in a day?……………………………..

4. On the average how many times do you buy food in
   
   a) A day?..........................

   b) A week? ………………

5. Where do you normally buy your food?
   
   Restaurant [  ]   Chop bars [  ]   Cafeteria [  ]   Street vendors [  ]

6. Which of the following meals do you usually skip?
   
   Breakfast [  ]    Lunch [  ]    Supper [  ]

7. What is the reason for skipping a meal?
   
   ……………………………………………………………………………………………

8. Do you have any food taboos?   Yes [  ]   No [  ]