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PREVALENCE OF ACUTE MALNUTRITION AND ITS ASSOCIATED FACTORS AMONG MOTHERS OF CHILDREN SUFFERING FROM SEVERE ACUTE MALNUTRITION IN THE TAMALE METROPOLIS.

KASSI ABDUL-LATIF TUAHIR

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PREVALENCE OF ACUTE MALNUTRITION AND ITS ASSOCIATED FACTORS AMONG MOTHERS OF CHILDREN SUFFERING FROM SEVERE ACUTE MALNUTRITION IN THE TAMALE METROPOLIS.

BY

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DECLARATION

I certify that this thesis does not incorporate without acknowledgement any material previously submitted for any degree in any university; and that to the best of my knowledge it does not contain any material which is formerly published or written by any other persons except where due reference is written in this thesis.

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…… ……

KASSI ABDUL-LATIF TUAHIR **DATE**

(STUDENT)

I hereby declare that the preparation and presentation of the dissertation were supervised in accordance with the guidelines on supervision of thesis laid down by the University for Development Studies.

…… ……..

DR. THOMAS AZONGO **DATE**

(SUPERVISOR)

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ABSTRACT

Malnutrition is one of the most devastating problems worldwide and is inextricably linked with poverty (Mandal S, et al. 2011). It is a major public health concern in many developing countries particularly for women responsible for a significant proportion of morbidity and mortality in the affected countries (Jeminusi OA, et al, 2015).

Overall, 54 percent of Ghanaian women have a BMI in the normal range, 6 percent are thin (wasted), and 40 percent are overweight or obese. Five percent of women are classified as mildly thin (wasted), and 1 percent are moderately or severely thin (GDHS, 2014). According to the GDHS 2014, the prevalence of wasting (thinness) among women of reproductive age is the highest among all the 10 regions, the prevalence is 11.2% and the lowest being the central region at 3.5%. Malnutrition levels among children, adolescents and women are high in the Northern Region of Ghana as compared to other parts of the country especially the southern part and women in this part of the country play critical roles in the day to day general wellbeing of their households.

The level of malnutrition among mothers in general in the Northern Region is not a well-documented problem and is without enough literature or data to indicate the magnitude of the problem. This study therefore sought to make a small contribution to this less studied area by assessing the nutritional status of only mothers of children who were already severely malnourished and are between the ages of 6 to 23 months. The steps taken in the research were to identify children 6 to 23 months with severe acute malnutrition, to screen the mothers of those children for acute malnutrition and finally to undertake a malnutrition causal analysis, using the results from the screening and the questionnaires administered during the interviews. The malnutrition causal analysis conducted used only data from the mothers who were malnourished to meet objectives of the study.

Out of 265 mothers of all the children with SAM on admission for treatment who were purposefully selected for the anthropometry, 226 were available. The prevalence of malnutrition was determined to be 25.7% with none of the mothers having any history of illness in the past one month before the study. But a very high proportion (91.4%) of the malnourished mothers consumed poor quality diet. Household wealth index, mothers' educational level, mothers' nutrition knowledge and household size were found to be strongly associated ($P<0.001$) with the quality of maternal diet intake. The perception of 94.4% of the malnourished mothers confirm the findings of the research where they believe their poor nutritional status was due to insufficient consumption of adequate nutritious food.

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DEDICATION

This work is dedicated to my late mother, Balchisu Yakubu.

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LIST OF ABBREVIATIONS

ACC/SCN	Administrative Committee on Coordination (of the United Nations) / Sub- Committee on Nutrition
BMI	Body Mass Index
DDS	Dietary Diversity Score
D/MHMT	District/Municipal/Metropolitan Health Management Team
FAO	Food and Agricultural Organisation
FGFS	Food Groups Consumption Frequency
GDHS	Ghana Demographic and Health Survey
GHS	Ghana Health Service
GSS	Ghana Statistical Service
HIV/AIDS	Human Immunodeficiency Virus / Acquired Immunodeficiency Syndrome
IOM	Institute of Medicine
IUGR	Intrauterine Growth Retardation
IDD	Individual Dietary Diversity Score
KAP	Knowledge Attitude and Practice
KNBS	Kenya National Bureau of Statistics
LBW	Low Birth Weight

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MAM	Moderate Acute Malnutrition
MDG	Millennium Development Goals
MICS	Multi-Indicator Cluster Survey
MUAC	Mid-Upper Arm Circumference
NKS	Nutritional Knowledge Score
RDA	Recommended Daily Allowance
SAM	Severe Acute Malnutrition
UNICEF	United Nation Children Fund
WFP	World Food Programme
WHO	World Health Organization

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CHAPTER ONE

INTRODUCTION

1.1 Background to the Study

Malnutrition is one of the most devastating problems worldwide and is inextricably linked with poverty (Mandal S et al., 2011). It is a major public health concern in many developing countries particularly for women responsible for a significant proportion of morbidity and mortality in the affected countries (Jeminusi OA et al., 2015).

About 870 million people are estimated to have been undernourished which is 12.5% of the global population. The vast majority of these, 852 million, live in developing countries (FAO et al., 2012).

Overall, 54 percent of Ghanaian women have a BMI in the normal range, 6 percent are thin (wasted), and 40 percent are overweight or obese. Five percent of women are classified as mildly thin (wasted), and 1 percent are moderately or severely thin (GDHS, 2014). According to the GDHS 2014, the prevalence of wasting (thinness) among women of reproductive age is the highest among all the 10 regions, the prevalence is 11.2% and the lowest being the central region at 3.5%.

Malnutrition levels among children, adolescents and women are high in the Northern Region as compared to other parts of the country especially the southern part and women in this part of the country play critical roles in the day to day general wellbeing of their

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households. For this reason, UNICEF and WFP in conjunction with the MOH and GHS as well as other non-governmental agencies and donors have together instituted measures to prevent, identify and treat malnutrition in children 6 to 59 months of age, pregnant women and lactating mothers of children under 6 months of age. Mothers within the various programme areas who are pregnant or are lactating are often screened for malnutrition (wasting) at various health delivery points through the Community Based Management of Acute Malnutrition (CMAM) Programme. Those identified to be wasted based on Mid Upper Arm Circumference (MUAC) measurements of less 23 centimetres are treated for malnutrition with specialised nutritious foods (SNFs) including Corn Soya Blend (CSB) as part of a delivery package to ensure recovery.

Women play key roles in their families, communities, and societies apart from child bearing and nurturing of children. However, the poor nutritional status of women compromises their capacity to meet the vigorous demands of their multiple roles as mothers and productive workers. Lack of sufficient food or the deficiency of a specific nutrient, such as iron, is clearly implicated in contemporary maternal malnutrition. Often, however, a heavy work-load, made yet more difficult by limited access to basic resources (e.g., water and fuel), pushes a woman with marginally adequate food intake into a state of undernutrition. Thus, it is necessary to look at maternal nutrition in the broad context of the women's life circumstances (UNU, 1982).

Mothers of malnourished children 6 to 23 months or onwards to 59 months who are often not the major focus of nutrition intervention programmes especially when the programme is for the malnourished children may also be at risk of malnutrition. Even though the

mothers often benefit from nutrition and health education as well as counselling for the sake of their children, the nutritional status of these mothers are not assessed and may represent a missed opportunity to understand the context of the children's malnourished situation especially within the household and especially in relation to other household members within the family.

Were the factors associated with the nutritional status of the children of these mothers cause deterioration of the mothers' nutritional status, their ability to care for the children will further be reduced and could exacerbate the already poor nutrition of the children who are also still within a critical age group with heightened susceptibility to morbidity and mortality if they do not receive appropriate care.

When mothers become malnourished, it affects their ability to provide this care and support including appropriate breastfeeding and complementary feeding which will in turn affect the nutritional status of the infants 6 to 23 months of age.

Additionally, a woman who begins life as an undernourished infant, with frequent illness and poor nutrition during childhood arrives at maturity in a less than optimal state to undertake pregnancy and lactation. As the conditions that produce malnutrition continue to affect her, both she and her offspring, as well as the larger community, are further disadvantaged through a vicious intergenerational cycle of poverty and undernutrition (UNU, 1982).

A common exposure to some drivers of malnutrition at the household level for a mother and her infant like inadequate food consumption might result in a poor nutritional status of the mother, the quality of complementary foods being given to the infants 6 to 23 months

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might be poor and the quality of care that will be provided to the infants might also be compromised. This will have an overall negative impact on the nutritional status of the infants 6 to 23 months. In this research therefore, the severely malnourished children 6 to 23 months of age who are undergoing treatment will be used to gain insight into the nutritional status of their mothers and the factors that are influencing their poor nutritional status. A unique opportunity to understand the nutritional wellbeing of their mothers and households which will in turn help in the formulation of better and more sustainable strategies to combat malnutrition in general is unearthed. The foundation to explore the possible links in the nutritional status of mothers and their children older than 6 months will be laid by this research, and hence a contribution to a more robust and integrated strategy to sustainably reduce malnutrition would have been made.

In general, many interrelated factors influence a mother's nutritional status, ranging from her physiological utilization of food and nutrients during pregnancy and lactation, through the socio-economic influences on food availability and her energy expenditure, to the cultural and educational conditions that affect her ability to utilize available resources. On the other hand, severely limited resources have usually permitted only restricted coverage by any intervention and necessitated a narrow approach.

Findings from this research will therefore seek to accomplish this task by making recommendations to various programmes aimed at reducing malnutrition within the Tamale Metropolis in particular and the Northern Region and Ghana in general.

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In essence, this research is exploring the possible burden of the malnutrition status of a mother on her infant 6 to 23 months and what factors are influencing the mothers' malnutrition status.

1.2 Problem Statement and Justification

According to the Ghana Demographic and Health Survey 2014 results, wasting is highest in children 9-11 months (11 percent) and lowest in children 36-47 months (1 percent). The extent to which this level of malnutrition is indirectly related to the mothers' own poor nutritional status is unknown. Specific data on the nutritional status of breastfeeding mothers in the Tamale Metropolis is unknown.

Per the GDHS 2014 report, 54 percent of Ghanaian women have a BMI in the normal range, 6 percent are thin (wasted), and 40 percent are overweight or obese. Five percent of women are classified as mildly thin (wasted), and 1 percent are moderately or severely thin (GDHS, 2014). According to the GDHS 2014, the prevalence of wasting (thinness) among women of reproductive age is the highest among all the 10 regions, the prevalence is 11.2% and the lowest being the central region at 3.5%.

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Malnutrition levels among children, adolescents and women are high in the Northern Region as compared to other parts of the country especially the southern part and women in this part of the country play critical roles in the day to day general wellbeing of their households. For this reason, UNICEF and WFP in conjunction with the MOH and GHS as well as other non-governmental agencies and donors have together instituted measures to prevent, identify and treat malnutrition in children 6 to 59 months of age, pregnant women

and lactating mothers of children under 6 months of age. Mothers within the various programme areas who are pregnant or are lactating are often screened for malnutrition (wasting) at various health delivery points through the Community Based Management of Acute Malnutrition (CMAM) Programme. Those identified to be wasted based on Mid Upper Arm Circumference (MUAC) measurements of less 23 centimetres are treated for malnutrition with specialised nutritious foods (SNFs) including Corn Soya Blend (CSB) as part of a delivery package to ensure recovery.

Researchers or policy makers who are undertaking interventions and programmes aimed at treating the acute malnutrition in children may overlook the nutritional status of their mother, who might be holding the key to a more successful and sustainable way of treating and managing acute malnutrition with a more decreased likelihood of a relapse among children.

A woman's nutritional status has important implications for her health and that of her children. Malnutrition in women results in reduced productivity, increased susceptibility to infections, and slowed recovery from illness. Low body mass index and short stature, anaemia, or other micronutrient deficiencies results in increased risk of complications in pregnancy including poor fetal development, a heightened risk of adverse pregnancy outcomes, and death from postpartum haemorrhage (GSS et al., 2015).

Understanding the factors that drive malnutrition in breastfeeding mothers in the Tamale Metropolis is further highlighted by the fact that, birth weight, child growth, and adolescent

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growth determine nutritional status before and during pregnancy (maternal nutrition). Maternal nutrition also influences foetal growth and birth weight (ACC/SCN, 1992). Ignoring the nutritional status of mothers who are already breastfeeding has the tendency of affecting the quality of care, breastfeeding and appropriate complementary feeding for their infants which can result in undernutrition among those infants. It may also result in the mother going into her next pregnancy with depleted nutritional status and hence the intergenerational cycle of malnutrition will continue to manifest for that in that household.

The presence of an intergenerational link between maternal and child nutrition means a small mother will have small babies who in turn grow to become small mothers. Some findings on the relationship between maternal and child nutrition (Loaiza, 1997; Teller et al., 2000; Genebo et al., 1999) showed that a high proportion of low-birth-weight and stunted children were observed among malnourished mothers (Girma et al., 2002).

1.3 Research Questions

The main research question for this study is: What is the nutritional status of mothers of children who are 6 to 23 months old with severe acute malnutrition?

Other questions, to be answered by the research include:

I. How are factors such as, socioeconomic, educational, nutrition knowledge, food consumption and health of mothers of SAM children who are 6 to 23 months old relate with their nutritional status.

II. What are the perceptions of malnourished mothers of children who are 6 to 23 months old with severe acute malnutrition of their own nutritional or health status and that of the children?

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1.4 Objectives of the Study

The main objective of this study was to determine the nutritional status of lactating mothers of children 6 to 23 months old who are undergoing treatment for Severe Acute Malnutrition at health facilities within the Tamale Metropolis.

Additionally, the research also had the following related objectives:

a) To determine the degree of association of factors such as, socioeconomic, educational, nutrition knowledge, food consumption and health statuses of mothers of SAM children who are 6 to 23 months old and those mothers' nutritional status using the UNICEF Conceptual Framework on Malnutrition as guide.

b) To examine the perceptions of malnourished mothers of children who are 6 to 23 months old with severe acute malnutrition about their own nutritional status.

1.5 Relevance of the Study

Problems related to malnutrition are many and can be studied through research. But the problems with acute malnutrition is very common and is receiving a lot of attention from development actors in this area. For instance, the Community Based Management of Acute Malnutrition (CMAM) is the widely accepted and officially approved protocol for the treatment and management of acute malnutrition in Ghana. Focus has largely been on children who suffer from acute malnutrition and in other cases pregnant women as well as lactating mothers of children 6 to 23 months old.

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This study focuses on assessing the nutritional status of mothers of children who have acute malnutrition by simply determining their MUAC measurements. Acquiring this information will lead to a better understanding of the determinants of malnutrition among mothers of malnourished children and how to better target interventions to tackle the root causes of malnutrition among all age groups in the Tamale Metropolis which shares similar geographical as well as demographic characteristics with much of Northern, Upper East and Upper West Regions. It is expected that, the relationship between the wasting in the children and their mothers may lie in the determinants which occur at the household and individual levels and may include both immediate and underlying factors.

It may also be common that, while a child is brought to the hospital by the mother because of the acute and progressive loss of weight by the child, focus and treatment will surely be on the child, neglecting the situation of the mother who may for similar reasons be rapidly losing weight as well. In this situation, the mothers' situation may become chronic and more deplorable such an extent that, her ability to provide care and support to the child may also be affected and this may further result in a relapse of the child's condition despite recovery due to treatment.

So, for a holistic and proper treatment, it may be necessary to have a better understanding of the child's acute malnutrition situation; researchers and health personnel including nutritionists may have to look to the mother's physical or nutritional situation for more clues. This is one of many voids this research hopes to fill. Hopefully, there may also be a

basis for further research into this area or other areas that may be linked to acute malnutrition in a similar geographical setting.

Like the GDHS 2014 findings revealed, there is no clear correlation between other background characteristics such as mother's education or wealth and wasting levels, it will however be a good starting point to figure out which among such characteristics is exist among mothers of severely malnourished children 6 to 23 months old.

Knowing the outcome may suggest to researchers that there is the need to do more research to pinpoint how the effect of a lactating mother's malnutrition can lead to the malnutrition of her infant and what possible way this can be prevented. Policy makers and institutions carrying out nutrition interventions will also have a better idea of targeting when it comes to the treatment of acute malnutrition in infants and mothers. When it is found that, mothers of breastfed infants who suffer from acute malnutrition have optimal nutritional status, this finding will also lay to rest the thought that, acutely malnourished children may have similar nutritional outcome as their mothers when they have the same exposure.

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1.6 Scope of the Study

The aim of this research is to get information on whether breastfeeding mothers of infants 6 to 23 months of age who are severely malnourished do also show signs of acute malnutrition which, if used will contribute significantly in the way acute malnutrition is tackled.

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1.7 Limitations of the Study

This was a cross-sectional study that also had much smaller sample size, but given that all mothers who had severely malnourished children 6 – 23 months were screened, the data gathered will be useful enough and will serve the purpose of this study.

Given that, only malnourished mothers were interviewed, the research was skewed and it will therefore not be possible to understand the characteristics and hence make comparisons with mothers who were not malnourished.

Much of the data was based on the recollection of respondents from memory and the tendency of a recall bias is also existent, to minimize this however dietary intake and eating habits were referenced during a period to 24 hours and seven days.

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CHAPTER TWO

LITERATURE REVIEW

The study sought to assess the nutritional status of the mothers of the children 6 to 23 months who are severely malnourished and the drivers of malnutrition those mothers who are determined to be undernourished from the assessment in the Tamale Metropolis. The literature was reviewed based on the objectives of the study.

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2.1 Nutritional status of breastfeeding mothers

Nutrition is the sum total of the processes involved in the intake and utilization of food substances by living organisms, including ingestion, digestion, absorption, transport and metabolism of nutrients found in food (Melvin, 2006); a fundamental pillar of human life, health and development throughout the entire life span. Proper food and good nutrition are essential for survival, physical growth, mental development, performance and productivity, health and a wellbeing of all living things (WFP, 2010).

Maternal nutrition refers to the nutritional needs of women during the antenatal and postnatal period (i.e. when they are pregnant and breastfeeding) and also may refer to the preconceptual period (i.e., adolescence) (Bryce J, et al., 2008). Undernutrition diminishes the ability of all systems of the body to perform properly, with particularly grave consequences in young children. The relationship between underweight status and ill health, however, is complex because ill health often results in Undernutrition and Undernutrition increases susceptibility to disease, particularly severe disease.

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Lactating women from developing countries are considered nutritionally vulnerable groups because this period places a high nutritional demand on the mother especially for those mothers who often start their pregnancy in poor nutritional and health status (Ogechi PU 2014; Gewa CA, et al., 2012).

A mother's nutritional status at conception, during lactation, plays a key role in determining her health and well-being, as well as that of her child. The nutritional status of an individual is often the result of many inter-related factors. It is influenced by food intake, quantity & quality, & physical health. The spectrum of nutritional status spread from obesity to severe malnutrition. However, the nutrition requirement varies with respect to age, gender and during physiological changes such as pregnancy, infant, lactating mothers and older age groups. Nutrient requirements are considerably elevated during lactation than in any other stage of a woman's reproductive life. (Insel, 2003).

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Some evidence in developing countries indicate that malnourished individuals, that is, women with a body mass index (BMI) below 18.5, show a progressive increase in mortality rates as well as increased risk of illness (Rotimi, 1999). For social and biological reasons, women of the reproductive age are amongst the most vulnerable to malnutrition. Increased perinatal and neonatal mortality, a higher risk of low birth weight babies, stillbirths, and miscarriage are some of the consequences of malnutrition in women (Krasovec and Anderson, 1991).

It has been reported that lactation has different effects on maternal nutritional status depending on its duration, intensity, as well as cultural diversity (Rasmussen and Guire, 2004). In a cross-sectional study (Sansui and Falana, 2009) it was reported that

breastfeeding when practiced either exclusively or otherwise had no significant negative effect on the nutritional status of the mothers. Likewise, a longitudinal study (Ukegbu et al., 20012). Observed that irrespective of breastfeeding pattern, lactation also had no profound effect on maternal body Composition. However, the high energy cost of lactation as well as the nutritional and health risk it could pose for the woman emphasizes the need for continuous monitoring of their nutritional status and dietary intake in poor resource countries.

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2.2 Associated factors of maternal malnutrition

Lactating mothers and children are the most vulnerable to malnutrition due to: low dietary intakes & low family income, inequitable distribution of food within the household, low educational level & low occupational status, frequent round delivery & culture and work over load in the house hold, lack of frequent meal delivery & low family encouragement, limited accessibility of nutritional information and nutritional knowledge, infectious diseases, and health care. If the mother is underweight during lactation, the nutrients that are transferred to the baby will be of poor quality and quantity. On the other hand, if the mother is overweight, it will hamper the blood circulation to the uterus and restricts the quantity of nutrients transferred to the mammary gland of mothers for milk production and to the baby. Lack of nutrition in lactating mothers induce metabolic disturbances early in life of infancy, particularly those related to nutrition, induce irreversible physiologic alterations in infant. Therefore, nutritional inadequacy of the lactating mothers not only affects milk composition and production but also the health of the mothers, infancy and adulthood of human life (Sansui and Falana, 2009).

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The effects of adequate food intake and health of mothers are contingent on care**.** The overlapping Food, Health and Care in the Triple A cycle for instance are meant to imply that these three are related to each other in complex ways, which must be analyzed and properly understood in a given context in order to design appropriate actions. For instance, food secure households may still contain malnourished children because the burden of women's agricultural and other work (as well as other factors such as inadequate caretaker knowledge) may compromise the quality of child care. Moreover, efforts to *increase* household food security may increase or decrease child (and maternal) malnutrition, depending upon how this is achieved. Similar contingencies exist between Care and Health. If this has been widely appreciated and taken seriously, we would expect to see a strong focus on women's time allocation, household division of labor and community child care arrangements in a wide range of sectoral development work (e.g., agriculture, rural development, income generation, workforce preparation, etc.). It is not clear to what extent this has occurred (David, 2002).

Household economic status/wealth index

The economic status of a household is an indicator of access to adequate food supplies, use of health services, availability of improved water sources, and sanitation facilities, which are prime determinants of child and maternal nutritional status (UNICEF, 1990). A study of most of the DHS surveys conducted in developing countries (Loaiza, 1997) showed that women from low economic status households were the most affected by malnutrition.

Place of residence

A comparative study on maternal nutritional status in 16 of the 18 DHS conducted countries (Loaiza, 1997) and a study in the SNNPR of Ethiopia (Teller and Yimar, 2000)

showed that rural women are more likely to suffer from chronic energy deficiency than women in urban areas. These higher rates of rural malnutrition were also reported by local studies in Ethiopia (Zerihun et al., 1997; Ferro-Luzzi et al., 1990). Similarly, studies on child nutrition (Sommerfelt et al., 1994; Yimer, 2000) also showed significantly higher levels of stunting among rural than urban children.

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2.3 Women's employment and control over income

Women's employment increases household income, with consequent benefit to household nutrition in general and the woman's nutritional status. Employment may increase women's status and power, and may bolster a woman's preference to spend her earnings on health and nutrition. Though employed, women without control over their income and decision making authority within the household are deprived of economic and social power and the ability to take actions that will benefit their own well-being. Studies in Africa have indicated that, at similar levels of income, households in which women have a greater control over their income are more likely to be food secure (Kennedy and Haddad, 1991).

Although women's employment enhances the household's accessibility to income, it may also have negative effects on the nutritional status of children, as it reduces a mother's time for childcare. Some studies have revealed that mothers of the most malnourished children work outside their home (Popkin, 1980; Abbi et al., 1991). Another study argued that there is no association between maternal employment and children's nutritional status (Leslie, 1988).

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2.4 Source of water and availability of toilet facility

Unfavourable health environment caused by inadequate water and sanitation can increase the probability of infectious diseases and indirectly cause certain types of malnutrition (UNICEF, 1990; Engle, 1992).

Maternal Dietary Diversity

Ruel (2002) defined dietary diversity as the number of different foods or groups of food consumed over a period, most often in a day or in a week. According to Hatloy et al. (2000) and Arimond and Ruel (2002), the concept of dietary diversity score (DDS) in diet quality assessment has been tried in a number places among some population groups. This approach according to Saaka (2012) places emphasis on non-quantitative assessment of actual food consumption. Dietary diversity score (DDS) is relatively quite simple to apply and it has been shown to reflect micronutrient intake (Arimond and Ruel, 2002). There have been three large multi-country validation studies and several smaller studies which have provided scientific evidence for use of dietary diversity scores as a measure of household food security and/or micronutrient adequacy of diets of women of reproductive age (Arimond et al., 2010). A validation study carried out in a West-African country was able to show that the dietary diversity of an index individual (especially, a woman) was related to a much more comprehensive measure of household nutrient adequacy (Becquey et al., 2010).

2.5 Nutrition Knowledge and Maternal Dietary Quality

Worsley (2002) defined nutrition knowledge to be the factual information the individual knows about nutrition. It includes knowledge of food nutrients, their sources and importance to the body; practices and behavior that impact positively or negatively on

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nutrition; appropriate cooking methods as well as the nutritional needs of different individuals given their age, sex and physiological conditions.

According to Worsley (2002), the status and explanatory role of nutrition knowledge is uncertain in public health nutrition and that much of the uncertainty about this area has been generated by conceptual confusion about the nature of knowledge and behaviors, and nutrition knowledge and food behavior in particular. Correlations between nutrition knowledge and dietary behaviors have failed to reach statistical significance in many studies leading researchers to question the relevance of nutrition knowledge to food choices and the value of nutrition education campaigns (Wardle et al., 2000). The main argument according to Worsley (2002) is that nutrition knowledge is necessary but not a sufficient factor for changes in food consumption behaviours. This seeks to suggest that there is no independent relationship between nutrition knowledge and diet quality (food choices) which is contrary to the views of Wardle et al. (2002) who indicated that nutrition knowledge was significantly associated with healthy eating and that the effect persisted even after controlling for demographic variables. They further indicated that people in the highest quintile for knowledge are almost twenty (25) times more likely to meet current recommendations for fruits, vegetables and fat intake than those in the lowest quintile for knowledge and so concluded that nutrition knowledge is an important factor in explaining variations in food choices.

Miller et al (2009) and Mobley et al (2009) are of the view that educational level and socioeconomic position have important influences on nutrition knowledge which have been identified by Grunert and Wills (2007) as mediators or have association between socioeconomic position and dietary quality.

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2.6 Strategy for addressing malnutrition

In the context of the UNICEF Nutrition Strategy malnutrition is viewed as one important manifestation of a larger development problem. As such, the goal is not only to eliminate the manifestation (i.e. the symptoms) but to address the development problem itself. This is not to diminish the importance of malnutrition and child death in any way, but only to be clear that the way in which these manifestations are addressed is also important. From this perspective, the recent interest in alleviating micronutrient malnutrition would be regarded as attacking the manifestations but, in most cases, doing little to address the root causes which lie in the larger development problem (David, 2002).

As applied to causes, resources and power, the UNICEF Nutrition Strategy emphasizes the importance of developing a sound understanding of the causes of malnutrition in a given setting in order to design appropriate actions. In the most common interpretation of the framework, this relates to the immediate and underlying causes shown in Figure 1. This emphasis on understanding causes reflects a view that the perception of the problem by actors at any level of society has a major influence on which actions are deemed relevant and how resources are deployed. However, perceptions are not the whole story. The UNICEF strategy further suggests that an analysis of basic causes be undertaken, specifically the human, economic and organizational resources potentially available at each level (household through international) and how those resources are controlled at each level (formal and non-formal institutions, political and ideological superstructure and power). The strategy suggests that the analysis of these basic causes should begin at the household/community levels in relation to the relevant causes in a given setting and only proceed to higher levels when the necessary resources cannot be mobilized at those lower

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levels. Analysis of these basic causes is to be accompanied by essentially political actions such as awareness-raising, advocacy, cultivation of strategic allies and other actions to build political commitment and re-direct resources in appropriate ways. Among the hypotheses developed in this paper are that this aspect of the conceptual framework commonly has been misunderstood (e.g., by assuming the basic causes only are relevant at the national and international levels), given little systematic attention in training, and intrinsically is the most difficult aspect to operationalize (David, 2002).

2.7 Conceptual Framework of the Study

Malnutrition is one of the most important health problems among women in developing countries. Müller O, et al., 2005; Osrin D, et al., 2000) Maternal malnutrition is caused by complex interaction of a multitude of factors (Lartey A, 2008). It is usually a result of a combination of inadequate dietary intake and infection. Inadequate food intake is a consequence of insufficient food available at the household level, improper feeding practices, or both. Feeding practices include both the quality and quantity of foods taken by the individual (Ramakrishnan U et al., 2012). Severe illness, breastfeeding and having several children below 2 years of age are negatively associated with maternal nutritional status, while higher maternal age and socio-economic status, and household food security have positive effect. In addition, social factors, such as marital status, education, and income also have influence (Black RE et al., 2008). Poor sanitation puts women at increased risk of illness, which affects their nutritional status. Both inadequate food intake and poor environmental conditions reflect underlying social and economic conditions (Ransom E, et al., 2003; NIN, 2011).

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The nutritional status of mothers can be influenced by several factors which can also in turn influence the nutritional status of infants. The ability to purchase food could influence the food expenditure of a household which informs the household's food supply which can eventually determine the individual dietary intake in a household. The individual dietary intake predicts the nutritional outcome of the household members which could either be normal or malnutrition. A household's ability to purchase food could also predict the household's wellbeing and the food security situation of the household which together can influence the dietary quality of the household and eventually reflecting in the nutritional status of the household members including mothers and infants.

However, some households may have sound socioeconomic status and for that matter can purchase food for their household's consumption but would consume poor quality diet which has a potential of resulting in malnutrition. Access to health and nutrition education may influence the type of expenditure on food, dietary quality, type of household food supply and the individual dietary intake which can predict good nutritional status. Nutrition education that includes easy-to-use scientific information about the nutritional quality of foods is indicated by some researches (James et al., 1997 and Giskes et al., 2002) to have the potential of improving consumer decision-making about healthy foods.

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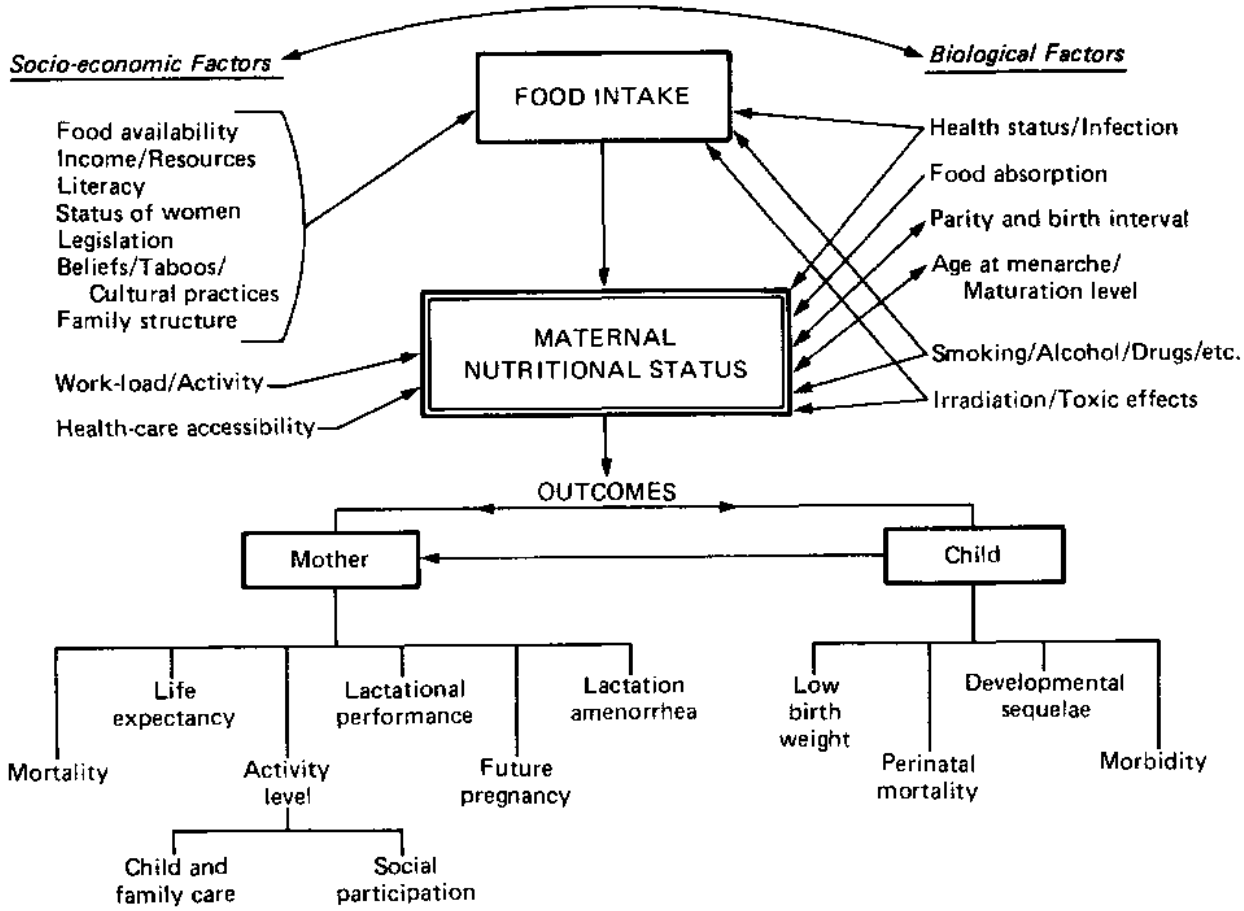
Figure 1: Maternal Nutrition Status and Associated Factors (adopted for the purposes of this research from UNU, 1982)



2.8 Mothers' perception about malnutrition

Research shows that the mother's knowledge, beliefs and attitudes on childhood malnutrition influence decision making and care practice (Nichter, M., 1985; Sivaramakrishnan and Patel, 1993; Mull, 1991; Saito, et al., 1997). Therefore, in order to be effective, health education interventions should be anchored on a good understanding of the mother's perspective.

One of the major criticisms raised by social scientists is that little effort has been made to understand the mother's perspective on malnutrition (Ojofeitimi, 1982; Saito, et al., 1997;

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Appoh, 1999). Many authors have therefore emphasized the fact that malnutrition can be better addressed by taking into consideration the perceptions of mothers when planning interventions (Ojofeitimi, 1982; Saito, 1997; Engle, et al., 1997).

2.9 Summary of the Chapter

The facts reviewed covered areas on maternal undernutrition, causes of malnutrition specifically inadequate diet intake and/or disease and associated factors including maternal diet, diet quality, and maternal socio-economic status among others. Other reviews made are on the importance of understanding a mother's perception about malnutrition when planning interventions to reduce levels of malnutrition among infants and mothers.

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CHAPTER THREE

RESEARCH METHODS

3.1 Introduction

Given the peculiar nature of the study; that is, to find mothers of only malnourished children in the Tamale Metropolis, the researcher reviewed records of all children who were registered at the various health centers for treatment of their acute malnutrition condition, those admitted for severe malnutrition were confirmed and their mothers identified during routine follow up treatment from July to August 2015. This method was adopted as it would have otherwise been difficult to find the target demography using any other method. Once the population of mothers of malnourished children in the metropolis was obtained, it was used as the sampling frame for determining those mothers amongst them that were acutely malnourished themselves. After screening using Adult MUAC Tapes of the population of 226 mothers with malnourished children in the target age bracket, 58 of them were determined to be malnourished and as such constituted the sample for the thesis. This study eventually established whether mothers of children 6 to 23 months suffering from severe acute malnutrition are also malnourished and further examined the associated factors.

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3.2 Study Design

A cross sectional study design was employed to assess nutritional status, and associated factors of lactating mothers of severely undernourished infants from the ages of 6 to 23 months in the study area to gather both qualitative and quantitative data.

3.3 Study population

Breastfeeding mothers of infants from the ages of 6 to 23 months with severe acute malnutrition during the study period were considered as the source of population.

Inclusion Criteria

Only mothers whose children 6 to 23 months of age who were severely malnourished and were undergoing treatment for severe acute malnutrition with or without complications were considered for the anthropometric measurements to determine their nutritional status.

Exclusion Criteria

Mothers who were determined not to be undernourished or wasted from the results of the anthropometric (MUAC) screening were excluded from taking any further part in the study when the questionnaire was administered. Lactating mothers who were critically ill, have hearing impairment and physical deformity during anthropometric measurements would have also been excluded.

The focus area of this research therefore was undertaken at the 14 health facilities within the urban and rural communities of the Tamale Metropolis to ensure a data blend from both the urban and rural areas of the metropolis. These facilities also known as OTP sites are actively identifying and treating severe acute malnutrition within the study area. The reason for focusing on these health facilities were to ensure that the study subjects were easily found to partake in the research.

3.4 The Study Area

Per the profile as documented and broken down below by the Tamale Metropolitan Assembly, the Tamale Metropolitan Assembly was established by legislative instrument

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(L.I. 2068). It is located in the central part of the Region and shares boundaries with the Sagnarigu District to the North-West, Mion District to the East, East Gonja to the South and Central Gonja to the South West.

There is a total of 116 communities in the Metropolis of which 41 (35%) are urban communities, 15 (13%) being peri-urban and 60 (52%) of them being rural in nature (Tamale Metro Assembly, 2014). The rural parts of Tamale are the areas where land for agricultural activities is available to a large extent and serve as the food basket for the Metropolis. However, these communities still lack basic social and economic infrastructure such as good road network, schools, hospitals, markets and recreational centers.

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Education Profile

About (43%) of people have attained at least basic education. The proportion of males (37%) who have attained at least basic education is lower than the females (51.4%) (Tamale Metro Assembly, 2014).

Religious Composition

The majority (90.5%) of the population in Tamale Metropolis are Muslims and followed by Christians, 9.3% however about 0.2% have no religious affiliation (Tamale Metro Assembly, 2014).

Economic Characteristics

The people in the Tamale Metropolis are predominantly farmers specifically located in the adjoining rural communities whilst in the urban areas, the predominant occupation is trading among women of reproductive age especially.

The economically active population is (63.3%) of which (92.6%) are employed and (7.4%) are unemployed. The proportion of economically active males are 65.5 percent of which

(92.8%) are employed and (7.2%) are unemployed. The economically active female population is 61.1 percent with (92.3%) employed while (7.7%) are unemployed (Tamale Metro Assembly, 2014).

Ethnicity

The Metropolis is a Cosmopolitan area with Dagombas forming the majority. Other minority ethnic groupings are Ganjas', Mampurisi, Akan, Dagaabas, and other tribes from the Upper East Region. The area has deep rooted cultural practices such as festivals, naming and marriage ceremonies.

Health Facilities/Outpatient Care Sites (OPC) Sites

The study was carried out in health facilities within the Tamale metropolis that were implementing the Community Based Management of Acute Malnutrition (CMAM) programme for the treatment of acute malnutrition in infants. The facility level was chosen because they have already registered acutely malnourished infants, whose mothers come for the routine treatment and counselling for the sake of the malnourished infants. Hence a register of infants suffering from acute malnutrition already exists at the facilities.

There are 14 health facilities in the Tamale metropolis implementing the CMAM protocol for the treatment of Severe Acute Malnutrition (SAM). These facilities serve several other communities which are mostly rural communities within their respective catchment areas.

According to data available at the Metropolitan Health Directorate of the Tamale Metropolitan Assembly that is responsible for the management of all the health facilities within the metropolis, during the time of the survey, there were about 265 children with Severe acute malnutrition undergoing treatment at the 14 facilities as seen in the table below: 238 of which are receiving outpatient treatment while the remaining 27 are on

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admission in the 3 biggest hospitals where people from the rural communities as well as the urban areas of the metropolis go for medical attention.

Additionally, though most of these cases of severe acute malnutrition were recorded in the hospitals located in the urban centres of the metropolis, these cases were coming from the rural communities within and outside the metropolis, with majority coming from outside the metropolis. Hence other malnutrition cases from other parts of the region may be referred to the facilities especially because they are better equipped with more qualified health professionals and nutritionists.

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3.5 Study respondents

3.6 Severe Acute Malnourished (SAM) Infant

All children under 5 years of age who have MUAC measurements of less than 11.5cm, with weight-for-height z-scores less than -3 SD and/or bilateral nutritional oedema are deemed to be suffering from Severe Acute Malnutrition and will therefore require treatment to recover. The Community Based Management of Acute Malnutrition at the health facilities ensures active case finding through community mobilization and treatment for these malnourished children. The programme had therefore already identified these children hence this situation made it quite simple to target these children who are between 6 to 59 months old and assess their mothers at the health facilities to meet the objectives of this study.

3.7 Mothers of Infants with Severe Acute Malnutrition

A sample of 226 mothers of children 6 to 23 months who were suffering from severe acute malnutrition were screened using MUAC Tapes. Data from the assessment was recorded

on questionnaires and analysed to determine whether a particular mother had MUAC measurements of below 23cm as prescribed in the Community Based Management of Acute Malnutrition (CMAM) guidelines. All the mothers who were found to have MUAC measurements below the 23 centimetres cut-off point were classified as wasted/undernourished or malnourished.

The malnourished mothers became the focus for further assessments using questionnaires to determine and assess the associated factors of malnutrition.

3.8 Sample Size and Characteristics

The sample size determined for this study was drawn from a total of 14 health facilities or Out Patient Care (OPC) facilities where 265 infants with severe acute malnutrition (MUAC less than 11.5cm) were already registered and receiving treatment.

All mothers of the infants with severe acute malnutrition in the 14 selected OPC sites totaling 265 were targeted. However, during the study, 226 mothers of the children were screened because 39 of the beneficiaries/mothers did not turn up for the routine treatment for their infants.

Since the metropolis is heterogeneous in terms of whether they are rural or urban communities, the health facilities where the assessments were conducted has a mix of eight rural health facilities and six urban hospital Sites and hence mothers.

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3.9 Sampling Technique

A Purposive sampling technique was generally used for the specific health facilities that were the locations for the data collected since only health facilities that were treating malnutrition cases were required.

Purposive sampling was also used in the general sample of mothers since the study was not focused on assessing the nutritional status of all mothers who visited the health facility but only the mothers of children between the ages of 6 to 23 months of age who were already severely malnourished and were receiving treatment from those health facilities.

All the mothers who met the criteria for inclusion in the anthropometric MUAC screening for malnutrition were then assessed. The reason for doing an exhaustive sampling of the mothers of malnourished children is because the MUAC screening is a relatively straightforward process and requires less time to complete. The other reason was that, the mothers were available and willing to participate.

Selection of study Subjects for Anthropometry (MUAC Screening):

In the 14 facilities that were identified, an exhaustive sampling technique was used and hence all the mothers of the infants who met the inclusion criteria were selected for the anthropometric measurement using adult MUAC Tapes.

Selection of Study Subjects for Interviews (Questionnaires Interviews):

Despite the expectations of screening and interviewing at most 265 mothers, only about 14.7 percent of those mothers were not available throughout the period for the anthropometry and data collection.

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Based on the screening results, all the mothers who were not classified as malnourished were excluded from further interviews and dismissed. But mothers who had MUAC readings of less 23 centimetres were interviewed using structured questionnaires to achieve the objectives of the research.

At the facility, the MUAC screening was done on first-come first-serve basis until all the targeted and available mothers were screened and interviewed. The distribution in terms of the available population and the actual assessed population is presented in the table 3.1.

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Table 3.1: Sampled population, (Source: Ghana Health Services, Tamale Metro Health Directorate) and actual population assessed per facility.

Exhaustively Sampled Population for Study					Actual Population Studied			
SN	Name of Facility	Outpatient SAM Cases	Inpatient SAM Cases	Total SAM Cases	Name of Facility	Outpatient SAM Cases	Inpatient SAM Cases	Total SAM Cases
1	Tamale Central Hospital	21	15	36	Tamale Central Hospital	18	15	33
2	Tamale Teaching Hospital	17	9	26	Tamale Teaching Hospital	17	9	26
3	Tamale West Hospital	17	3	20	Tamale West Hospital	12	3	15
Bilpiela Sub district					Bilpiela Sub district			
4	Kpanvo	13	-	13	Kpanvo	12	-	12
5	Fooshegu	9	-	9	Fooshegu	8	-	8
6	Bamvim	16	-	16	Bamvim	16	-	16
7	Tamale RCH Centre	23	-	23	Tamale RCH Centre	16	-	16
8	Nyohini CHPS	33	-	33	Nyohini CHPS	27	-	27
9	SDA Hospital	11	-	11	SDA Hospital	7	-	7
10	Tamale Nutrition Rehab Centre	41	-	41	Tamale Nutrition Rehab Centre	31	-	31
11	Lahagu CHPS	3	-	3	Lahagu CHPS	3	-	3
12	Zuo CHPS	1	-	1	Zuo CHPS	1	-	1
13	Kotingli CHPS	6	-	6	Kotingli CHPS	6	-	6
14	Vitting Health Centre	27	-	27	Vitting Health Centre	25	-	25
TOTAL		**238**	**27**	**265**	**TOTAL**	**199**	**27**	**226**

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At the health facility level, mothers to be assessed were selected at random. In practicality, whichever mother was present at the health facility on the day of the visit was assessed until the number required per that facility was acquired. However, on the day of the first visit to some of the facilities, when the researcher failed to meet the target for the research per the facility, another visit was scheduled to assess the mothers who came to the facility but were not assessed during the previous visit. This incidence did not however occur often because the researcher went mainly on the days when mothers were expected to come for their ration of nutrient supplements and/or medication.

3.10 Research Variables

The nutritional status of the selected mothers was assessed using MUAC Tapes to ascertain whether they were acutely malnourished. To classify any of the mothers as acutely malnourished, the mother must have a MUAC measurement of less than 23cm (GHS CMAM Guidelines, 2014).

There are various forms of nutritional assessment, however, because the mothers are lactating their weights are unstable and hence assessing their BMIs may not give a true picture about their nutritional status in terms of wasting.

The age category of the children selected ensures that they are children who still largely depend on their mother for their nutritional needs, care and support. Children whose MUAC measurements fall below 12.5cm are classified as having acute malnutrition according to the WHO standards (GHS CMAM Guidelines, 2014). However, those with MUAC measurements below 11.5cm have a more severe form of acute malnutrition or wasting while those with measurements above 11.5cm but less than 12.5cm are considered

acutely moderately malnourished or wasted. This research in using these parameters or standards focused mainly on mothers of children with the severe form of acute malnutrition.

Literature on causes and associated factors of malnutrition in mothers was reviewed to compile a more comprehensive but simple questionnaire that was administered to the acutely malnourished mothers. Data on some indicators or associated factors of acute malnutrition was collected during interviews with the mothers who were classified as wasted.

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3.11 Data Collection and Study Instrument

Documentary Review

The registers/literature on the infants with acute malnutrition at the health facilities were reviewed and those with acute malnutrition were identified. This gave the researcher the confidence that the severely malnourished infants and hence their mothers required are available.

Anthropometric Assessment

Anthropometric assessments were undertaken to measure the Mid Upper Arm Circumference (MUAC) of each selected mother using Adult MUAC Tapes. The assessments were carried out in all cases with the assistance of the nurses at those facilities who were well trained and hence knowledgeable about how the measurements are done properly. The data was then recorded onto the questionnaire for the specific mother.

Because the results for each mother assessed was acquired instantly, there was no need for the mother to wait for long before being interviewed; as soon as the MUAC measurement was taken, and the mother was deemed to be wasted/malnourished, the questionnaire was administered.

Interview Observation

Observations such as the mothers' hygiene, in some cases how they were breastfeeding their infant, their participation during the education sessions at the facility and their overall physical appearance to enable a deeper understanding of findings.

3.12 Research tools

In all, a questionnaire, An Interview Guide/checklist (Focus Group Discussion) and Adult MUAC Tapes were used to carry out the assessment, other data recording tools were used to capture responses and observations.

Questionnaire

The paper questionnaires contained questions on the socio-demographic characteristics of the respondents, the mother's economic status, the MUAC measurements, the feeding patterns of the mother and child (access to at least 3 square meals a day), morbidity information at the household level and mother's perception about malnutrition. The questionnaire also elicits information on the mother's knowledge on basic nutrition.

Interview Guide for Focus Group Discussions (FGDs)

One focus group discussion session was organized in the facilities that had larger caseloads enough to meet the minimum number required for a discussion of that nature. In all 10

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FGDs were held. The main Topic of the discussions was the perception of mothers about malnutrition in children and adults, nutrition knowledge and practices.

MUAC Tape (for Adults)

Mid Upper Arm Circumference is the circumference of the left upper arm and is measured at the mid-point between the tips of the shoulder and elbow.

To measure:

Bend the left arm, find and mark with a pen the olecranon process and acromion. Mark the mid-point between these two marks. With the arm hanging straight down, wrap a MUAC tape around the arm at the midpoint mark. Measure to the nearest 1 mm or cm.

3.13 Data analysis and presentation methods

The results of the MUAC measurements that were used to determine whether a mother was wasted or not were obtained manually at the spot. However, to do a more detailed analysis, in percentage and/or ratio terms, the Statistical Package for Social Scientists (SPSS) 2013 edition and Microsoft Excel for the nutritional data analysis were used; information/values of each mother's mid upper arm circumference was entered in the software for the analysis in terms of how many of the lactating mothers were malnourished and how many were not, etc.

Furthermore, results from the key informant interviews with the malnourished mothers that were captured on the questionnaires were also entered in the 2013 edition Microsoft Excel for more analysis.

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In the report, the results are presented in diagrams including graphs, pie charts and tables for easy understanding and appreciation of the final product of this research.

3.14 Quality Control

To ensure the quality of the data, a few activities were undertaken by the researcher.

First, the questionnaire was pre-tested in the field to ensure that the researcher familiarised himself with the questionnaire and the processes required to elicit the right type of information from the interviewee without making her uncomfortable and hence unwilling to provide quality information. This activity also ensured that whatever errors including typographical errors were spotted and corrected before the actual data gathering commenced.

Another activity that was undertaken to ensure the quality of the data was the calibration of the MUAC tapes with designated health personnel who were assisting with the data collection. This activity was repeated before any screening session necessary to ensure that the placement of the tape on the upper arm and the reading on the tape during the process were done accurately.

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3.15 Research Ethics

Informed consents of the GHS, the authorities at the various selected health facilities and most importantly, the mothers of the acutely malnourished children were sought before all types of data were gathered. Hence all information regarding the research were made available to all the parties involved in the research. The mothers were encouraged to ask questions pertaining to the information that was shared about the research, questions that

were asked were then clarified to the satisfaction of the respondents before the data were gathered.

The respondents upon giving their approval signed/thumb printed on the consent form or gave a verbal approval for the research to be done. They were also promised that information gathered were mainly for academic purposes and hence their privacies will be safeguarded and the data anonymised.

3.16 Limitations of the study

The limitation of this study was the fact that the researcher was unable to cover all targeted population in the 14 OPC sites as planned, since a few of the subjects were unavailable, despite rescheduling separate days to ensure everyone was captured. It would have also being beneficial to compare the nutritional status and factors of mothers who were not malnourished with the mothers who were (main subjects).

3.18 Plan for dissemination of results

The report for this research shall be published in the university library, shared with interested health facilities and published on the internet. By so doing the findings may become more useful to society.

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CHAPTER FOUR

RESULTS

4.1 Introduction

In this chapter, detailed findings are presented to highlight the nutritional status of the mothers of severely malnourished children from 6 to 23 months undergoing treatment at various health facilities in the Tamale Metropolis and associated factors. Independent contribution of socioeconomic status to maternal and infant acute malnutrition in the study area, the education of the mothers and their nutrition knowledge level, employment status of mothers and their control over their own resources as well as that of the household and how these contributes to their acute malnutrition in the study area.

A total of 226 mothers out of the 265 mothers of the severe acute malnourished infants' nutritional statuses were assessed using MUAC Tapes. The rest could not be assessed because they were not available during the assessment. The malnourished mothers identified among the 226 were 58 who then became key informants and also formed part of the focus groups discussions.

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4.2 Socio-demographic Characteristics of Respondents

Of the 58 malnourished mothers studied, the minimum age of 18 years and maximum age of 42 years was detected. From the results, 79.3% (46) were unemployed and had no other source of regular income, none of the respondents was employed in the formal sector. The results also showed that, about 17% (10) of the respondents were petty traders. The majority, 74% (43) of the respondents did not have any formal education at any level, 22.4% (13) had only gone as far as Junior High School or lower and the remaining 2

pursued higher education at the secondary school level. All the mothers interviewed were Muslims with 87.9% (51) of them belonging to the Dagomba ethnic group and they were all from male headed households with 72.4% (42) having more than six household members. Results on the demography of respondents is as summarized in Table 4.1.

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Table 4.1: Socio-demographic Characteristics of Malnourished Mothers

Variable	Frequency	Percentage (%)
Age Groups (years)		
Less than 20	6	10.34
21-35	39	67.25
35^{+}	13	22.41
Total	**58**	**100**
Occupation		
Trader (petty trading)	10	17.24
Farmer/food processing	2	3.45
None (House wife)	46	79.32
Total	**58**	**100**
Educational Level		
No formal education	43	74.13
Primary	6	10.35
Basic (JHS)	7	12.07
Secondary	2	3.44
Total	**58**	**100**
Religion		
Islam	58	100
Total	**58**	**100**
Marital Status		
Married	58	100
Total	**58**	**100**
Ethnicity		
Dagomba	51	87.93
Others	7	12.07
Total	**58**	**100**
Sex of Household Head		
Male	58	100
Total	**58**	**100**
Size of Household		
0-3	10	17.24
4-6	7	12.07
More than 6	41	70.69
Total	**58**	**100**

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4.3 Maternal Socio-Economic Status

The wealth index (proxy for socio-economic status) is a composite measure of a household's cumulative living standard. The wealth index is calculated using easy-to-collect data on a household's ownership of selected assets, such as televisions and bicycles; materials used for housing construction; and types of water access and sanitation facilities. Each household asset for which information was collected was assigned a weight or factor score generated through principal components analysis. The resulting asset scores were standardized in relation to a standard normal distribution with a mean of zero and a standard deviation of one. These standardized scores were then used to create the break points that define wealth quintiles as: Lowest, Second, Middle, Fourth and Highest.

Based on the results, 7 (12%) of the respondents were determined to be wealthy (high wealth index) and the remaining 88% were poor. Majority, 52 (89.7%) of the respondents lived in housing units made of mud and thatch in the rural parts of the metropolis, the remaining 8 (10.3%) lived in a single or chamber and hall room rented accommodation. None of the respondents had toilet facilities in their homes and as a result, they either went to a public toilet facility or engage in open defecation in nearby bushes.

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The main source of energy for cooking for 88% of the respondents were straw, shrubs, wood or grass, another source of energy for cooking was charcoal which was used on a much lesser scale. All the respondents however had access to the electricity grid which they acquired for free through the government's rural electrification programme. All (100%) of the respondents also had access to pipe borne water from public/community stand pipes, the storage of the water they collected however was generally not stored

hygienically with 77.58% storing the water in open and uncovered drums/pots for subsequent usage for cooking and drinking.

Table 4.2: Maternal Socio-Economic Status

Socioeconomic status	Frequency	Percent
Wealth Index		
Low wealth index	51	88
High wealth index	7	12
Total	**58**	**100**
Housing type		
Rooms/compound house	6	10.3
Several huts	52	89.7
Total	**58**	**100**
Type of toilet facility		
VIP/Pit latrine with slab	5	8.6
No toilet/bush/public toilet	53	91.4
Total	**58**	**100**
Main source of energy for cooking		
Straw/shrubs/wood/grass	52	89.7
LPG	2	3.4
Charcoal	4	6.9
Total	**58**	**100**
Main source of lighting for household		
Electric company/VRA	58	100
Total	**58**	**100**
Main source of drinking water		
Pipe water	58	100
Total	**58**	**100**

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4.4 Maternal Nutritional Knowledge

Prior to the first treatment visit to the health facilities, 46 (79.31%) had access to nutrition information or nutrition knowledge and 52 (89.65%) had knowledge of food preparation. A total of 55 respondents (94.8%) agreed that eating a balanced diet containing adequate amounts of protein, carbohydrates and micronutrients is important for healthy growth of

infants and adults of which 46 (79.31%) strongly agree, the results are fully presented in Table 4.3.

Table 4.3: Maternal Nutrition Knowledge

Variable		**Frequency**	**Percentage (%)**
Access to Nutrition Knowledge/Information			
Have you had any nutrition knowledge or access to nutrition information prior to your first visit for the SAM treatment for your infant?	Yes	46	79.3
	No	12	20.7
Total		**58**	**100**
Knowledge of applied nutrition (KAN) prior to your first visit for the SAM treatment for your infant?		26	44.8
Knowledge of food preparation (KP)		32	55.2
Total		**58**	**100**
	Disagree	1	1.7
	Agree	10	17.3
	Strongly agree	46	79.3
	Don't know	1	1.7
Total		**58**	100

On a scale of one to fifteen, the average score was 7.5±2.4 with minimum and maximum scores being three and fifteen respectively. About 31% of the respondents scored below average.

The malnourished mothers who have high nutrition knowledge demonstrated their knowledge in areas including whether disease affects a person's appetite and hence food intake including that of infants, whether diarhoea causes a person to lose weight rapidly

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including infants, the benefits of meat, fish and eggs and the importance of lactation and the need for lactating mothers to consume more nutritious food. The respondents however demonstrated a lack or iandequate knowledge in other areas such as benefits of consuming iodated salt, what women should do to have enough breastmilk, foods that are good in building strong bones and teeth and nutritional benefits of fruits/vegetables to the body. Details of maternal knowledge and practices on nutrition are captured in Table 4.4.

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Table 4.4: Maternal Nutrition Knowledge and Practices

Nutrition Knowledge and Practices			
Variable	**Knowledge**	**Frequency**	**Percentage**
Knowledge on what fruits/vegetables give to the body	Correct	7	12.07
	Incorrect	51	87.93
Total		**58**	**100**
Knowledge on what meat, eggs and fish and their products give to the body	Correct	11	18.96
	Incorrect	47	81.04
Total		**58**	**100**
Knowledge of whether meat, eggs and fish and their products should be fed to infants	Correct	56	96.55
	Incorrect	2	3.44
Total		**58**	**100.0**
Knowledge on timely start and appropriate complementary feeding	Correct	47	81.04
	Incorrect	11	18.96
Total		**58**	**100**
Knowledge on what women should do to have enough breastmilk	Correct	30	51.72
	Incorrect	28	48.28
Total		**58**	**100**
Knowledge on which food group best help you fight disease	Correct	7	12.07
	Incorrect	51	87.93
Total		**58**	**100**
Knowledge on whether disease affects a person's appetite and hence food intake including that of infants	Correct	58	100.0
Total		**58**	**100**
Knowledge on whether diarhoeal diseases causes a person to lose weight rapidly including that of infants	Correct	58	100.0
Total		**58**	**100**
Knowledge on causes of diarhoeal diseases and management including in infants	Correct	30	51.72
	Incorrect	28	48.28
Total		**58**	**100.0**
Knowledge on whether lactating women should eat more or less	Correct	58	100.0
Total		**58**	**100.0**
Knowledge on benefits of consuming iodised salt	Correct	3	5.17
	Incorrect	55	94.83

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Total		**58**	**100.0**
Knowledge on foods that are good in building strong bones and teeth	Correct	3	5.17
	Incorrect	55	94.83
Total		**58**	**100**
Knowledge on how long infants should be breastfed	Correct	30	51.72
	Incorrect	28	48.28
Total		**58**	**100.0**

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4.5 Mothers' perception about malnutrition (maternal and children's)

4.6 Mothers' perception about the causes of the malnutrition of their infants

The malnourished mothers were interviewed about what in their opinion might be causing their children to become malnourished. Of the 58 mothers who were determined to be malnourished, 7 (12.1%) said their children rapidly lost weight after they fell sick and lost appetite. Per them, the children refused to either breastfeed sometimes or their overall demand for breastmilk significantly reduced, there was also a reduction in their intake of semi solid or solid foods. The 87.9% said there was no enough food at their homes/household level, so they were unable to provide adequate nutritious complementary foods to feed the children properly resulting in their loss of weight. Some of them added that, the children are therefore compelled to eat the same type of food prepared for the general consumption of household members to complement breastmilk. The below pie chart gives the representation as written above.

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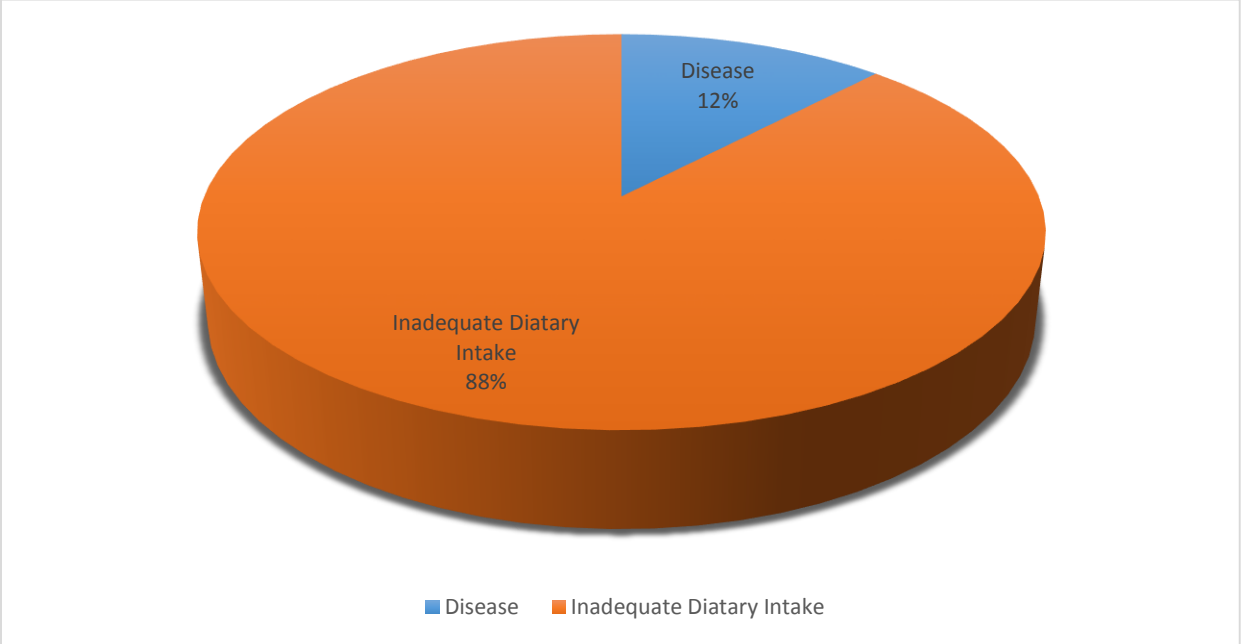

Figure 3: Mothers' perception about causes of the SAM in their infants 6 – 23 months

4.7 Mothers' perception about their own nutritional status and causes of their malnutrition

All except 2 (3.45%) mothers interviewed attributed their weight loss to inadequate food intake, they said it is because they are not eating well. Their responses on the reason behind their rapid weight loss is similar to that of their children. The two mothers who did not attribute their malnutrition state to inadequate food consumption, said they lost weight because they lack peace of mind, according to them, some personal problems are making it difficult for them to have the desire to eat. The remaining 56 mothers added that, even though they may get something to eat, they are often not satisfied with the quality and quantity since they are unable to include meat, fish or eggs to their diet as often as possible. None complained of illness except that they are often tired easily and are not able to work

as hard as they used to. which they attributed to not getting enough to eat at least in the past one month prior to the interview, that has also affected their appetite or ability to provide care and support for their children per them.

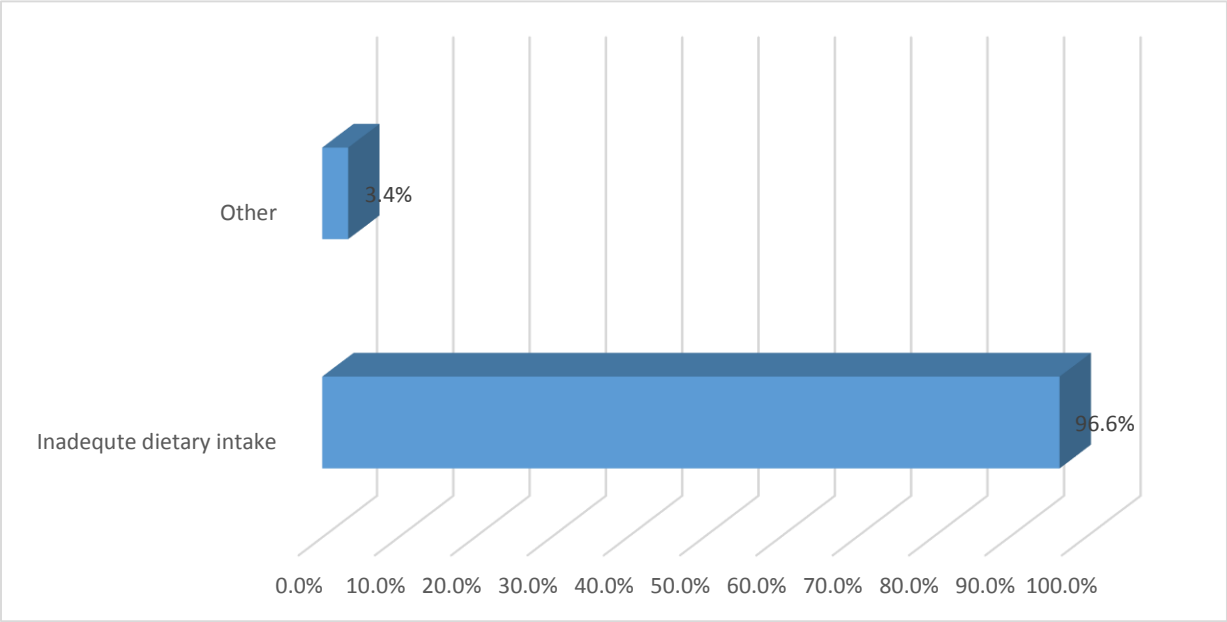

Figure 4: Mothers' perception about causes of their malnutrition

4.8 Mothers' perception about how their poor nutritional statuses affect their SAM children.

Most (84.5%) of the mothers said they do not have as much energy to do chores like they used to and for that matter take longer times to complete basic tasks in the household. Per them, the part of the time they would have spent on caring for their children is used to complete tasks at the household level. According to the mothers, since the children are not feeling well, they should receive more care and attention, but they all agreed they did not have enough time or the energy to constantly provide care for the children.

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4.9 Associated factors of Mothers' Nutritional Status

4.10 Maternal Health Status

Mothers were asked if whether they suffered any of the following sicknesses in the past one month prior to this study. None of the 58 mothers reported they had suffered any form of diarrhea, stomach ache resulting in vomiting, severe constipation nor any fever with chills, body pain and subsequent loss of appetite. Only one mother reported to have suffered from a loss of appetite without any other symptom or illness.

4.11 Quality of Maternal Dietary Intake

The FAO validated 11-item food groups frequency questionnaire (FFQ) was used to assess dietary intake in the past 24 hours prior to the study. Food groups including flesh meats (i.e. beef, pork, lamb, goat, poultry), fish, eggs, milk and milk products, organ meat (e.g. liver, kidney), legumes, cereals, roots & tubers, dark green leafy vegetables, vitamin A rich fruits and fats & oils were selected based on the dietary pattern of the study population.

Maternal dietary intake was also quantified based on 7-day dietary diversity score (usual food consumption in the past one week) preceding the study was assessed and classified into low and high diversified food intake.

Using the 7-day dietary diversity score (normal pattern and type of food consumed in the past 7 days) before the study, maternal dietary intake was hence examined and classified into low and high diversified food intake. The following scores were thus assigned:

- 0 = a particular food group was not eaten in the past 7 days,
- 1 = eaten on 1–3 days, and
- 2 = eaten for at least 4 days.

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This composite index of dietary diversity which considered the weekly food frequency varied from a minimum of 0 to a maximum of 30. The FAO validated 16-item food groups frequency questionnaire (FFQ) was used for the 7-day dietary diversity score.

As much as 58.6 % consumed food from at least four food groups and the remaining 41.4% of the malnourished mothers interviewed consumed food from less than 4 food groups, 91.4% were on low diversified diet as measured by DDS over the past seven days; Dietary diversity is a qualitative measure of food consumption that reflects household access to a wide variety of foods, and is also a proxy of the nutrient adequacy of the diet for individuals. The mean dietary diversity score for the past 24 hours prior to the study was 5.7±1.3. please see Table 4.5a.

Table 4.5a: Food Groups Consumption Frequency

Classification	**Frequency**	**Percent**
DDS in the past 24 hours		
Less than four food groups	24	41.4
At least four food groups	34	58.6
Total	**58**	**100**
DDS in the past 7 days		
Low	53	91.4
High	5	8.6
Total	**58**	**100**

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4.12 Foods Consumed in the Past 24-Hours

The tables 4.5b to 4.5d illustrate the various types of foods that were eaten by respondents in the 24 hours preceding the interview. All but one of the mothers 57 (98.27%) consumed cereal-based foods including foods made of corn, rice, sorghum and millet. The consumption of foods containing protein and optimum levels of micronutrients were consumed less; none of the mothers reportedly consumed eggs in the past 24 hours prior to the interview but almost 16% consumed flesh meat. With regards to vegetables, more of the mothers 45 (77.58%) consumed green leafy vegetables as compared to the 13 (22.42%) who ate Vitamin A rich vegetables. Legumes (predominantly groundnuts) consumption was also very common, with 45 (77.5%) saying they ate legumes. The widespread use of condiment was evident in the study since all the mothers said they ate condiments in the 24 hours prior to the study.

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Table 4.5b: Types of Food (Carbohydrate and Fruits and Vegetables) Consumed by the mothers in the Past 24 Hours

Types of foods	Frequency (n)	Percentage (%)
Cereals		
No	1	1.73
Yes	57	98.27
Total	**58**	**100**
Roots and tubers		
No	38	65.52
Yes	20	34.48
Total	**58**	**100**
Vitamin A rich vegetables		
No	45	77.58
Yes	13	22.42
Total	**58**	**100**
Green leafy vegetables		
No	45	77.58
Yes	13	22.42
Total	**58**	**100**
Vitamin A rich fruits		
No	1	1.73
Yes	57	98.27
Total	**58**	**100**

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Table 4.5c: Types of Food (Oils and Spices) Consumed by the Mothers in the Past 24 Hours

Types of foods Given	Frequency (n)	Percentage (%)
Fats and oils		
No	48	82.76
Yes	10	17.24
Total	**58**	**100**
Spices and condiments		
Yes	58	100
Total	**58**	**100**

Table 4.5d: Types of Food (Protein) consumed by the Mothers in the Past 24 Hours

Types of foods Given	Frequency (n)	Percentage (%)
Organ meat and Eggs		
No	58	100
Total	**58**	**100**
Flesh meat		
No	49	84.49
Yes	9	15.51
Total	**58**	**100**
Fish (not including small quantities of anchovies)		
No	54	93.10
Yes	4	6.90
Total	**58**	**100**
Legumes		
No	13	22.41
Yes	45	77.59
Total	**58**	**100**
Milk and milk products		
No	54	93.10
Yes	4	6.90
Total	**18**	**100**

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4.13 Determinants of Maternal Dietary Quality

Significant associations between 7-day maternal dietary diversity as measured by food groups consumption frequency (FGFS) and factors including household wealth index (proxy socio-economic status), maternal education level, maternal nutrition knowledge and household size were identified in a bivariate analysis (Table 4.6).

The majority (98%) of the mothers (88%) who were poorer consumed poor quality (low diversified) diets in both the last 24 hours and 7 days prior to the study.

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Table 4.6: Bivariate logistic regression test of diet quality of malnourished mothers with selected variables

Variable	Categories	N (absolute number of respondents)	Quality of maternal Diet (FGFS)		Test Statistic	AOR (95%CI)
			Low n (%)	High n (%)		
Educational level	No education	43	42 (97.7)	1 (3.3)	Chi-square ($\chi 2$) = 9.96 p<0.001	13(0.68, 249)
	Low education	13	10 (76.9)	3 (23.1)		
	Higher education	2	1 (50)	1 (50)		
	Total	**58**	**53 (91.4)**	**5 (8.6)**		
Household wealth index	Low wealth index	51	50 (98.0)	1 (2.0)	Chi-square ($\chi 2$) = 23.79 p<0.001	66.67(5.57, 797.5)
	High wealth index	7	3 (42.9)	4 (57.1)		
	Total	**58**	**53 (91.4)**	**5 (8.6)**		
Maternal Nutritional Knowledge Score	Low nutrition knowledge	18	17 (94.4)	1 (5.6)	Chi-square ($\chi 2$) = 0.311 p<0.001	1.89(0.19, 18.21)
	High nutrition knowledge	40	36 (90)	4 (10)		
	Total	**58**	**53 (91.4)**	**5 (8.6)**		
Household Size	0-3 members	10	7 (70.0)	3 (30.0)	Chi-square ($\chi 2$) = 8.08 p<0.001	0.1(0.01, 0.72)
	4-6 members	7	6 (85.7)	1 (14.3)		
	Above 6 members	41	40 (97.6)	1 (2.4)		
	Total	**58**	**53 (91.4)**	**5 (8.6)**		

In a binary logistic regression analyses, all the variables that were significant in the bivariate analyses were fed into the regression model. The results from the bivariate logistic regression analysis show that, the main determinants of poor maternal dietary quality were

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low household wealth index (proxy socio-economic status), maternal educational level, low maternal nutritional knowledge score (NKS) and large household size.

As shown in Table 4.6, there was significant association ($p<0.001$) among maternal diet quality as measured by 7-day dietary diversity score and each of the other variables including household wealth index, maternal nutritional knowledge, mother's education attainment and large household size.

In comparison to mothers who were poor, mothers who were rich (with high wealth) were about 66.7 times less likely to consume low quality diet (AOR= 66.7, 95 % CI [5.57, 797.5]). Comparing mothers based on nutrition knowledge score, mothers with high/adequate nutrition knowledge were about 1.89 times less likely to consume a low diet quality (AOR=1.89, 95% CI [0.19, 18.21]).

Additionally, compared to mothers who had low and no education, mothers with high education were 13 times less likely to consume low diet quality (AOR=13, 95% CI [0.68, 249) and in terms of household size, mothers from small households of at most 3 members were 0.1 times less likely to consume low quality diet (AOR=0.1, 95% CI [0.01, 0.72) than mothers from large households of a minimum of 6 members as shown in the Table 4.6.

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CHAPTER FIVE

DISCUSSION

5.1 Introduction

This chapter will discuss the findings as presented under the results chapter of the study. It is also further based on the main findings linked to the study objectives and hence the overall goal. The areas that were the focus of this study were the nutritional status of mothers of infants from 6 to 23 months who were severely malnourished, the associated factors and the perceptions of the mothers about maternal and infant malnutrition. Other data to be discussed that will help provide more insight include nutrition knowledge of the malnourished mothers, dietary intake and diet quality, the educational level of the mother and the socioeconomic position of the mothers and their households in the study area.

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5.2 Mothers' Nutritional Status

The study revealed that, the prevalence of malnutrition among mothers of malnourished children was high given that the prevalence was at 25.7%. Going by the UNICEF Conceptual Framework on malnutrition, the most immediate causes of malnutrition are either inadequate dietary intake or disease or a combination of both. Other associated factors attributable to the high prevalence of malnutrition among the mothers may be socio-demographic factors such as wealth index, family size, educational level of the mother and nutritional knowledge which may contribute to the incidence of dietary inadequacies.

5.3 Mothers' Health on their Nutritional Status

Per the UNICEF Conceptual Framework on malnutrition, the most immediate causes of malnutrition are either inadequate dietary intake or disease or a combination of both. Of

the 58 who were identified, an attempt was made to examine the associated factors with their malnutrition condition. A retrospective morbidity assessment on the mothers during the one month preceding the study revealed that none of the mothers had suffered any disease condition that affected their food consumption. The effect of the disease on the nutritional status of the mothers was therefore ruled out.

5.4 Maternal Dietary Intake Quality and Mothers' Nutritional Status

Study into the dietary intake of the respondents spanning 7 days prior to the study indicates that the mothers consumed low diversified diet. Per the results about 91.4% of the mothers were on low diversified diet as measured by the Dietary Diversity Score. These findings are consistent with other findings that poor dietary quality intake often leads to or contributes to the incidence of acute malnutrition. This is similar to findings of Emily et al. (2011) where diet quality among mothers was poor and did not meet the Australian national dietary guidelines.

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Food consumption, according to WFP's standard methodology, is made up of the diversity of the diet and the frequency staple and non-staple foods are consumed (WFP, 2009). Together, diet diversity and frequency of food consumption are considered reliable proxy indicators of the access dimension of food security and nutrition intake. Research has demonstrated that diet diversity is highly correlated with caloric and protein adequacy, percentage of protein from animal sources (high quality protein) and household income (WFP, 2009). The 24-hour dietary recall investigation also conducted points to a similar situation of a low diet quality because only 58.6% of the malnourished mothers interviewed had consumed food from at least 4 food groups.

In the 24 hours prior to the study, the consumption of cereal-based foods (grains) by the malnourished mothers was very high at 98% and consistent with the 2008 GDHS findings where about eight in ten women consumed cereal-based foods including corn, millet, sorghum and rice at both regional (Northern region) and national levels.

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Consumption of legumes was reported to be high (77.5%) among the women studied as about seven in ten women consumed foods from this food group. This is contrary to the findings of the GDHS (2008) where consumption was low. This could be due to the availability of this type of food group at that time of the season and also the over dependence on plant source of protein among the study participants for their protein needs. Consumption of organ meat and eggs was reported low as less than half of the respondents consumed these foods 24 hours prior to the study. This is similar to the findings of WFP (2009) but in contrast to the findings of the GDHS (2008) where about eight in ten women consumed these foods at both the regional and national levels. The consumption of certain important proteins and micronutrient were very poor among the respondents, by a combined total of 20.7%, this is also largely due to the relatively high cost of the protein sources such as fish, organ and flesh meats and eggs when compared to other foods including cereals and legumes and given the low wealth of the mothers, it is comprehensible why they are unable to purchase them.

Additionally, due to poor socioeconomic status of the mothers, the focus of eating food is to gain satisfaction hence the mothers mainly rely on the main staples of cereals and

legumes to the neglect of ensuring an adequate balanced diet. But even though some of the mothers are aware of the importance of eating these important sources of protein to maintain a healthy body weight, their inability to afford them makes it difficult to meet such requirements. The consumption however of the green leafy vegetables was high primarily due to their abundance at the time of the season.

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The overall quality and frequency of complementary foods might have been influenced by the associated factors that influenced maternal diets and hence their nutritional statuses consistent with findings by Scaglioni et al. (2008) that maternal diets are likely to influence the diets and the health of children through the modeling of eating behaviors and by influencing the food made available within the home. Consequently, one can deduce that it may not be a coincidence therefore that these mothers and their children sampled are acutely malnourished.

5.5 Associated Factors of Maternal Dietary Quality

The study found **wealth index** (proxy socio-economic status), household size, education of mother and maternal nutritional knowledge to be the main determinants of maternal dietary quality since there was a strong relationship. Maternal educational levels were low, wealth index levels were low and majority of the malnourished mothers were from large households of at least 6 members.

5.6 Household Size

Per the study findings, 3 of the 5 mothers who consumed overall high diet quality were from small household with sizes of 0-3. Hence it implied from further analysis that women

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from smaller households were more likely to consume high quality diet compared to large household size (at least 6). This means that, women from larger households are more likely to consume poor diets and at higher risk of malnutrition. Access to services for child spacing could benefit the youngest child and the mother. Prolonging the intervals between births, through increasing demand for family planning and/or fulfilling unmet need for family planning, could be important elements of strategies to improve breastfeeding mothers' diet quality and overall nutrition status. Making available and encouraging the uptake of family planning services where parents are encouraged to consider their ability to provide adequate care and support to their families and children before deciding on the number of children they wish to have should be a priority for government and stakeholders and other implementing agencies aiming to reduce malnutrition and its impact on health and wellbeing.

The studies revealed that, despite the size of their households, that is whether mothers were from small households with size (0-3) or large households of size at least 6, they consumed low quality diet. This means that, even though other research findings have pointed to the fact that the smaller a household, the higher the chance of consuming high quality diet, the mothers in this study were already disadvantaged in terms of whether they possessed the ability to willingly choose what to eat, when they want to eat and what amount to eat because they did not have the financial strength to do so for the benefit of their households by enhancing the consumption of high quality diet to promote good healthy living. But they have pointed out that, it is more difficult when there are more mouths to feed. Adults often have to sacrifice for the little ones including infants.

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5.7 Wealth Index

The socioeconomic position of the woman as measured by the wealth index proxy was an independent contributor (P<0.001) to maternal diet quality. Similar to other findings; Worsley et al. (1995), Hoddinott and Yohannes (2002) and WFP (2009). This is consistent with the perceptions of the mothers who were interviewed in this study; the mothers believed that they don't eat well (eat poor quality diet) because they do not have the ability to purchase enough food for the household. This finding is also like the findings of Saaka (2012) where he found household wealth index to be a major determinant of maternal dietary diversity (diet quality). According to Saaka (2012), maternal diet quality is sufficiently higher in women of high socioeconomic class, compared to women of low socioeconomic class. Similarly, studies conducted in developing countries have also demonstrated that a diet quality (DDS) is associated with socioeconomic status (Hatloy et al., 2000; Savy et al., 2007). From the study findings, compared to mothers who were poor, mothers who were rich had an incredible 66.7 times likelihood of consuming high diet quality.

In developing countries, it has been reported that the income of a household is an important determinant of its access to food which in turn is a major determinant of child and maternal nutrition and wellbeing (Muller N *et al.*,2005]. Epidemiological studies have reported on the relationship between diet and poverty; and the report established that the purchasing power of a family indicates the level of household food security and types of diets that are ultimately consumed by household members (Kinra S, 2005). Furthermore, economic status of a household is an indicator of access to adequate food supplies, use of health

services, availability of improved water sources, and sanitation facilities, which are prime determinants of child and maternal nutritional status (UNICEF, 1990). A study of most of the DHS surveys conducted in developing countries (Loaiza, 1997) and a study in the Southern Nations, Nationalities and Peoples Region (SNNPR) of Ethiopia (Teller and Yimar, 2000) showed that women from low economic status households were the most affected by malnutrition.

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It can therefore be deduced that; a poor socio-economic standing of women and their households is a determinant of the poor dietary quality of the women which means that improving the socio-economic standing of women and their households can translate into consumption of high quality diet among them and hence improve their overall nutritional status.

5.8 Mothers' Educational Level

Literature reviewed shows that maternal education and knowledge are critical for improved maternal and child nutrition, efforts to improve household economic status, increase the rural farmers benefits from agriculture, and empower mothers to earn income and take decisions, complemented with nutritional and public health services, are more likely to improve both child and maternal nutrition in the rural areas than in urban, especially in regions with the highest burden of malnutrition (Baraka S, 2005; Subramanian SV et al., 2011). Mothers' educational level according to this research was found to be a predictor of diet quality among women. About 98% of mothers who had no education at all consumed poor diet quality and about 77% of those malnourished mothers interviewed who attained low (Primary to Junior High (JHS) level of education also consumed poor diet. However,

half (50%) of the malnourished mothers who attained high (at least Senior High School) level education consumed high quality diet. This means that, education is a pointer of maternal dietary quality since the proportion of mothers consuming high quality diet increased with increasing levels of formal education attained. In line with this conclusion is a finding by the ACC/SCN 1990 that, education may enable women to make independent decisions, to be accepted by other household members, and to have greater access to household resources that are important to nutritional status (ACC/SCN, 1990). A comparative study on maternal malnutrition in ten sub-Saharan African countries (Loaiza, 1997) and a study in the SNNPR of Ethiopia (Teller and Yimar, 2000) showed that the higher the level of education, the lower the proportion of undernourished women who consumed poor diet.

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5.9 Mothers' Nutrition Knowledge

The findings of this study further indicate a strong association ($P<0.001$) between maternal nutrition knowledge and diet quality. The nutrition knowledge acquired by these mothers were during antenatal, postnatal and because of the treatment services they were seeking for their severely malnourished children and the knowledge they imparted to them at the health facilities has given them more insight to better manage their diets and their children's. This is similar to the findings of others; Wardle et al. (2002) and Olsen (2005) where the studies found nutrition knowledge to significantly associate with healthy eating and first-time mothers who were connected more to health and nutrition service systems to be more receptive and for that matter increased their nutrition knowledge and this translated into improved dietary quality. Despite the generally encouraging levels of maternal nutrition knowledge among the malnourished mothers, consumption of poor diet quality

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remains high even among those mothers who have been determined by this study to have adequate maternal nutrition knowledge contrary to a study conducted in Malaysia which demonstrated that individuals with better nutritional knowledge levels are significantly higher in educational level, nutritional attitude and occupational status. The results show that, individuals with higher educational levels had better nutrition knowledge and higher nutrition knowledge of employed women in the study may be explained by more access to internet, books and magazines as source of information in work area (Melkie *et al*., 2005). Per this study, compared to mothers who had inadequate nutrition knowledge, mothers who had adequate nutrition knowledge were 1.8 times more likely to consume high quality diet. This means that, provision of nutrition information to mothers during antenatal and nutrition treatment services is critical and can improve the diet quality of women who are still breastfeeding.

Nutrition knowledge and information among the mothers was however not enough to positively influence the mothers' ability to manage and ensure the consumption of high diet quality even in the absence of enough variety of foods at the household level. For mothers who do not have access to nutrition information, it means those mothers may not know the critical windows to maintain healthy nutrition behavior by consuming high diet quality. Hence such lack or inadequate knowledge when high, results in the decreased application of best nutrition practices to enhance growth which is detrimental by leading to other forms of malnutrition and complications.

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5.10 Mothers' Perceptions about the Causes of Malnutrition

All but 2 of the 58 malnourished mothers of malnourished children attributed their malnourished status to the lack of adequate food consumption. Per them, they are unable to procure enough food for their households because they did not have enough income. This perception of the mothers is consistent with the findings of this research where the adequacy of the diet consumed has been found to be poor. The effect of disease on one's food intake was known to all the mothers. In their view, apart from not having enough food to eat at the household level, disease affects appetite and can cause a decrease in food intake, which will lead to weight loss. Despite this perception of the malnourished mothers, neither of them was found to have suffered from any disease within the past one month prior to the study. The mothers however believe that malnutrition is preventable with adequate diet and timely intervention. The finding is consistent with studies conducted in other developing countries (Saito, *et. al.*, 1997, Abubakar, *et. al*., 2011). Although malnutrition was considered as a common occurrence in childhood, mothers believed that it was a dangerous disease which could kill, but was curable if it was treated early. This knowledge forms a good basis for preventing malnutrition. Increasing nutrition knowledge and practices is recommended by the World Health Organization (2007).

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The malnourished mothers also added that, due to this shortage of food at the household level, they are unable to prepare adequate complementary foods that are appropriate to complement the breastmilk for the infants. So apart from the breastmilk which is usually not enough to satisfy the infants, the infants are often fed the same meals that the mothers eat which are not specially made for them.

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Few mothers think stress from personal problems can cause weight loss by reducing one's desire or appetite for food hence food consumption will be inadequate. According to the mothers, even though they noticed that they were losing weight, they were not aware the extent of their weight loss was indicative of acute malnutrition and required attention and possible treatment.

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CHAPTER SIX

SUMMARY, CONCLUSION, RECOMMENDATIONS AND CONTRIBUTION TO KNOWLEDGE

6.1 Introduction

The summary of the study including the results, conclusion, recommendations and limitations of the study are presented in this final chapter. The import of the study was to assess the nutritional status of mothers of severely malnourished children from 6 – 23 months and to examine the associated factors or characteristics of the mothers who are determined to be malnourished by the results of the assessment.

The study first screened the 226 mothers of children between the ages of 6 to 23 months for acute malnutrition (mothers with MUAC less than 23cm). Per the findings of the MUAC screening, 58 mothers had MUAC measurements of less than 23cm. The malnourished mothers identified went on to become the focus of the investigation, from and about whom more data was collected and analyzed. The data on their perceptions on the causes of malnutrition in their infants and themselves was gathered. The study further analyzed data to determine the most likely immediate causes of the malnutrition as seen in the mothers. None of the mothers per their recall suffered any form of disease r infirmity that affected their food intake. From the data gathered, inadequate dietary intake was chronicled among 91 percent of the mothers who were malnourished.

Per the UNICEF Conceptual Framework of Malnutrition of 1990 and from the data gathered, the cause of the malnutrition in the mothers is inadequate dietary intake attributable to poor low diet quality. hence more data on the associated factors including

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diet quality, overall nutrition knowledge of the malnourished mothers living in the Tamale Metropolis was collected. Household Wealth Index, Education of Mother, Household Size and Maternal Nutrition Knowledge were all found to be strongly associated with the quality of diet of the malnourished mother.

6.2 Summary of Main Findings

The main findings of the study are as follows:

A total of 226 mothers of severely malnourished children aged from 6 to 23 months were selected from health facilities in the Tamale Metropolis. These mothers were part of the 265 mothers who were targeted for assessment, however the remaining 39 defaulted from treatment of their SAM children and were therefore not available during the assessment.

Fifty-eight (25.7%) of the 226 mothers were determined to be malnourished with MUAC measurements of less than 23 centimeters based on the screening results. Additionally, it was computed that, there was a 34.5% chance that a mother whose infant is 6 to 23 months of age and suffering from severe malnutrition will also become malnourished.

Majority of the respondents (67%) were within the age brackets of 21 and 35 years and majority, 88% of the respondents were from the Dagomba ethnic group. All the 58 malnourished mothers came from male headed households and 71% are from large households of at least 6 members.

Even though none of the mothers had suffered any form of illness at any point in the past one month prior to the study, majority of them consumed poor quality diet as already presented in the results and discussions section.

Access to nutrition information or nutrition information was considerably high among respondents, but nutrition knowledge prior to the study was not as high. Of those who did,

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21 (45.7%) had knowledge of applied nutrition and a total of 54.3% had knowledge of food preparation. Most of the respondents agree that meet, fish and eggs and their products are necessary for a healthy growth and life. All respondents also agree that, sickness can affect a person's ability to eat or breastfeed. Eighty-nine percent (88.9%) of respondents believe their children are severely malnourished because of lack of adequate food at the household level to complement breastmilk.

A total of 34 (58.6%) malnourished mothers consumed food from at least four food groups mostly 1 to 3 times in the past 7 days but a very high proportion of 91.4% of the malnourished mothers were on low diversified diet as measured by DDS over a period of one week. Most of the mothers (98%) consumed cereal-based foods (made of corn, sorghum, millet, rice) but the consumption of foods known to have good content of micronutrients and protein was very poor. Legumes consumption specifically groundnuts per the study was high among the malnourished mothers interviewed. Consumption of flesh meat, organ meat, eggs and their products in the past 24 hours prior to the study interview was 0%. Only one respondent consumed fish in the past 24 hours prior to the study interview.

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With regards to their employment status, seventy-nine percent (79%) were unemployed while another 17% engaged in small scale petty trading of spices and condiments. The mothers who were all in the low socioeconomic status group had significantly lower nutrition knowledge.

Household Wealth Index, Education of Mother, Household Size and Maternal Nutrition Knowledge were all found to be strongly associated with the quality of diet of the malnourished mother.

In comparison to mothers who were poor, mothers who were rich (with high wealth) were about 66.7 times less likely to consume low quality diet (AOR= 66.7, 95 % CI [5.57, 797.5]).

Comparing mothers based on nutrition knowledge score, mothers with high/adequate nutrition knowledge were about 1.89 times less likely to consume a low diet quality (AOR=1.89, 95% CI [0.19, 18.21]).

Compared to mothers who had low and no education, mothers with high education were 13 times less likely to consume low diet quality (AOR=13, 95% CI [0.68, 249).

In terms of household size, mothers from small households of at most 3 members were 0.1 times less likely to consume low quality diet (AOR=0.1, 95% CI [0.01, 0.72) than mothers from large households of a minimum of 6 members.

Based on the results of the focus group discussions that assessed mothers' perceptions the poor socioeconomic status of the mothers accounted for the mothers' inability to consume and provide high quality diet. The mothers sacrificed the quality of their diet for bigger quantities that will ensure all household members get to eat. About Ninety-four (94.4%) attribute their malnutrition to inability to provide and consume adequate food. No diseases or illnesses were reported prior to study. Hunger and illness were cited as the main causes of malnutrition/wasting according to the mothers' perception.

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6.3 Conclusions

Given that, a sizeable proportion (25.7%) of the mothers of the severely malnourished children from the ages of 6 to 23 months were malnourished, there is perhaps enough grounds from this research to conclude that exposure to some factors may cause malnutrition in both mothers and children and addressing the malnutrition will require a wholistic understanding based on research or assessment for an all-encompassing and integrated response to achieve a sustainable improved nutrition and health outcome.

The survey concludes that, the manifestation of malnutrition among the mothers of the severely malnourished children is attributable to inadequate dietary intake rather than disease or illness. This is because in the one month preceding the interview, none of those mothers suffered from any disease that deprived them or affected their food intake. However, their dietary intake was inadequate as measured by the dietary diversity and food consumption frequency where about 91.4% of the mothers were on low diversified diet. The mothers' perception about their nutritional status and the cause of their acute weight loss is consistent with this conclusion.

The association between inadequate dietary intake and the wasting in the mothers of the severely malnourished children has been established. Other factors including Socioeconomic status, household size, nutrition knowledge and educational status have also been established in the research to be strongly associated with the poor diet quality of the mothers by this research. Even though, the overall nutrition knowledge of the mothers was inadequate, some mothers had high nutrition knowledge, but they still consumed poor diet because they were poor and did not have the ability to adequate nutritious food. This

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is a testament that, nutrition knowledge alone is inadequate to improve nutrition outcomes of mothers.

6.4 Recommendations

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

i. The GHS and Nutrition partners should include the screening and treatment of mothers and caregivers whose children are suffering from acute malnutrition in nutrition programmes. If possible, other household members or siblings of the child with SAM should be screened and a proper assessment carried out to determine the cause of the malnutrition.

ii. Sustainable nutrition sensitive approaches should be implemented by government to ensure mothers of reproductive age have regular income from livelihood opportunities available to them.

iii. A strategy to address malnutrition in poor households that cannot afford to buy adequate amounts of food that involves those households using substitutes that are cheaper and readily available should be considered and rolled out in at risk populations.

iv. Nutrition education should be intensified by nurses and health promoters to include all topics concerning the health and nutrition of women and children during out-reach and static health delivery points. The role of community based health

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volunteers should be strengthened to ensure application of nutrition and health knowledge acquired by the mothers.

v. Government should intensify its poverty reduction efforts targeting women and mothers in the rural settings. There are several people within urban areas who are poor and in need of some support to become financially secure and hence feed their families sufficiently.

vi. Government through the Ministry of Education and Gender and Social Protection should identify and target girls with programmes that will make formal education accessible and affordable for girls.

vii. Promoting the consumption of first class protein (animal source) will help improve the overall health and wellbeing of infants and their mothers through livestock and poultry farming assistance programmes where mothers can produce for sale and for consumption.

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6.5 Contribution to knowledge

This study demonstrates that severe acute malnutrition in infants may also be an indication of a bigger malnutrition problem at the household level.

This research also lays the foundation for more in depth studies into the link between acute malnutrition in children above 6 months and the nutritional status of their mothers. While the impact of malnutrition in pregnant women on the growth and development of the foetus is well documented, that link is not well known after the child is born and breastfeeding.

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APPENDICES

Appendix I: Consent form

ASSESSING THE COMMON DETERMINANTS OF ACUTE MALNUTRITION IN MOTHERS OF CHILDREN 6 – 23 MONTHS OLD UNDERGOING TREATMENT FOR SEVERE ACUTE MALNUTRITION IN THE TAMALE METROPOLIS

INFORMED CONSENT

Good morning/afternoon/evening. My name is (name of enumerator), a student at University for Development Studies (UDS) conducting a study on the topic "**ASSESSING THE COMMON DETERMINANTS OF ACUTE MALNUTRITION IN MOTHERS OF CHILDREN 6 – 23 MONTHS OLD UNDERGOING TREATMENT FOR SEVERE ACUTE MALNUTRITION"**. I would like to have an interview with you on the topic and would very much appreciate your participation in this study. This interview usually takes between 20 and 30 minutes to complete. All of the answers you will give will be confidential and will not be seen by anyone other than members of our team. If we should come to any question you don't want to answer, just let us know and we will go on to the next question. However, we hope you will participate fully in the survey since your views are important.

May we begin the interview now?

1. Yes 2. No

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Appendix II: Field Questionnaire

Questionnaire to be completed by Interviewer

Interviewer's name: ……. Date: ... .../... .../2014/

Interviewer ID: …. …. /…. Questionnaire Number:

Locality/Community name:…… Health Facility:……

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SECTION 1 - DEMOGRAPHICS

1.1	Name of respondent	……..			
1.2	Age in years	_ _			
1.3	Marital status	1	Single	3	Divorced
		2	Married		
1.4	Sex of household head	1	Male	2	Female
1.5	Occupation of respondent	1	Trader	2	Farmer
		3	Food Processor	4	Salaried/service sector
		4	Skilled labourer		
1.6	What is the number of persons living in your household?	_ _			

1.7	Highest level of education attained	1	No education	4	SSS/SHS/Tec/Voc
		2	Primary	5	Tertiary
		3	Middle/JSS/JHS		
1.8	What ethnic grouping does your household belong to? (circle one) if more than one indicate the HH head's ethnic group.	1	Akan (twi)	6	Dagomba
		2	Ga-adangme	7	Mamprusi
		3	Ewe	8	Konkomba (Likpakpa)
		4	Gonja	9	Other, specify, _____
		5	Grusi		
1.9	What main religion is practiced by the household? **Circle one.**	1	Christian	4	No religion
		2	Islam	5	Don't know
		3	Traditional	6	Other (specify)……

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SECTION 2 A - MATERNAL DISEASE HISTORY		
Did you have any of the following illnesses in the past 1 month?	------	1 = Diarrhoea 2 = Prolonged Lack of appetite 3 = stomach pain and vomitting 4 = Fever, chill, body pains, headache and no appetite 5 = Other illnesses

SECTION 2 B- MATERNAL NUTRITIONAL KNOWLEDGE EVALUATION							
2.1	Have you had any nutrition knowledge, education or access to nutrition information	1	Yes			2	No
2.2	If Yes, on what subject matter	1	Knowledge of Applied Nutrition	2	Perceived Confidence in Cooking Skills (PC)	3	Knowledge of Food Preparation (KP)

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2.3	What do we get by eating foods like green leafy vegetables, carrots, apricots, mangos, and papaya are **ALL** good sources of which vitamin?"	1	Protection from diseases (correct answer);	2	Energy	3	Growth and repairs	4	Can't tell.		
2.4	Eating well is important for living a healthy life? How much do you agree to this?	1	Strongly disagree (irrelevant)	2	Disagree	3	Agree	4	Strongly agree	5	Don't Know
2.5	Should babies be fed colostrum (the first yellowish breast milk ?	1	Yes					2	No		
2.6	At what age should babies begin to eat		_ _ (mths)								

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	semi-solid foods like koko?											
2.7	What should a woman do to have enough breastmilk?	1	Eat more food	2	Frequent breastfeeding	3	Drink more fluids	4	Can't tell			
2.8	Among the group of food stuffs, you normally eat, name <u>one</u> which you think <u>best</u> helps you fight diseases?	1	Animal food and products ….	2	Carbohydrates (grains, starchy roots) ….	3	Fat and oils ….	4	Fruits/Vegetables …….	5	Legumes (nuts and pulses) ….
		6	Other (specify) ……	7	Don't know							
2.9	Which food can give lactating mothers more blood?											
2.10	What is the importance of taking oranges?											

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2.11	Should a lactating mother eat more or less food?	
2.12	Should a lactating mother and infants eat eggs?	
2.13	Give one reason for your answer in question 12	
2.14	Please state the benefit of taking iodated salt	
2.15	Name one food that is good for building strong bones and teeth	
2.16	How long should babies be exclusively breastfed?	

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SECTION 2 C - MOTIVATORS AND BARRIERS TO EATING BALANCED HEALTHY DIET					
2.17	What stops you from eating a well balance healthier diet?	1	I don't have time	6	It costs too much
		2	I don't have the cooking ability	7	It doesn't satisfy hunger
		3	My family won't eat healthy foods	8	It is hard to change my eating habits
		4	It is hard whilst being pregnant	9	I am not motivated to
		5	Something else	10	I think my diet is already healthy
2.18	What would encourage you to	1	Advice from doctor or nurse	6	Advice from family member

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	make improvements to the way you eat during lactation?	2	My own ill health	7	Family member's ill health
		3	Increased income	8	Lower cost of food
		4	Better access to shops and markets	9	Clearer advice from the government
		5	Being motivated to	10	Something else
2.19	What is your major problem during lactation?	1	Less breastmilk	4	Eating all the time
		2	Excess breastmilk	5	Food cravings
		3	Easily fall hungry	6	None of these

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SECTION 2 D – MOTHER'S PERCEPTION ON THE UNDERLYING CAUSE OF MALNUTRITION				
4.1	**In your Opinion, what is the cause of your child's severe acute malnutrition**	1	Sickness	
		2	Insufficient Food Intake	
		1	Sickness	

	In your Opinion, what is the cause of your acute malnutrition	2	Insufficient Food Intake	

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SECTION 3 - MATERNAL DIETARY DIVERSITY DURING LACTATION			
3.1	1. In the past 24 hours, did you eat from the following food groups?		
	Food Group	Yes	No
A	Flesh meats (beef. Lamb etc)		
B	Poultry		
C	Organ meats (e.g. liver)		
D	Fish		
E	Cereals		
F	Roots & tubers (yam, cassava etc.)		
G	Legumes (e.g. beans, nieri, groundnuts)		
H	Milk products		
I	Egg		

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J	Fruits		
K	Leafy green vegetables		

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Could you please tell me how many days in the past week your household has eaten the following food items, prepared and /or consumed at home, and what their source was? **Use acquisition codes on the right.**

3.2	Food items **Focus on food eaten inside the house**	Number of days eaten in past **7 days** 0 = not eaten 1 = 1 day 2 = 2 days 3 = 3 days 4 = 4 days 5 = 5 days 6 = 6 days 7 = 7 days	How was this food acquired ? **Write the main source of food for the past 7 days**	**Food acquisition codes** 00 = not eaten 01 = Own production (crops, animals) 02 = Hunting, fishing 03 = gathering

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A	**CEREALS:** Maize, millet, (including maize production, guinea corn, banku, Tuo zafi, kenkey, etc), Rice, "rice water", wheat flour, Bread, and other cereals	____	___	04 = borrowed 05 = market (purchased on credit) 06 = market (purchased with cash) 07 = exchange labor for food 08 = exchange items for food 09 = gift (food) from family relatives or
B	**VATAMIN A RICH VEGETABLES AND TUBERS:** pumpkin, carrots, squash, or sweet potatoes that are orange inside + *other locally available vitamin-A rich vegetables(e.g. sweet pepper)*	____	___	
C	**WHITE TUBERS AND ROOTS:** white potatoes, white yams, cassava, or foods made from roots (fufu, gari, tapioca etc)	____	___	
D	**DARK GREEN LEAFY VEGETABLES:** dark green/leafy vegetables, including wild ones + *locally available vitamin-A rich leaves such as cassava leaves, cocoyam leaves, "ayoyo"," bra",* okro *etc.*	____	___	
E	**OTHER VEGETABLES:** other vegetables (e.g. tomato, mushroom, onion, eggplant) , including wild vegetables	____	___	

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F	**VITAMIN A RICH FRUITS:** ripe mangoes, pawpaw *other locally available vitamin A-rich fruits*	____	___	friends 10 = beg for food 11 = food aid from civil society, NGOs, governmen t, WFP etc. 12 = Other, specify: _____ _____
G	**OTHER FRUITS:** other fruits, including wild fruits	____	___	
H	**ORGAN MEAT (IRONRICH):** liver, kidney, heart or other organ meats or blood-based foods	____	___	
I	**FLESH MEATS:** beef, pork, lamb, goat, rabbit, wild game, chicken, duck, or other birds	____	___	
J	**EGGS:**	____	___	
K	**FISH:** fresh or dried fish or shellfish	____	___	
L	**LEGUMES, NUTS AND SEEDS:** beans, peas, lentils, nuts(incl. peas, cowpeas, neri, cashew, soya bean), seeds or foods made from these	____	___	
M	**MILK AND MILK PRODUCTS:** milk, cheese, yogurt or other milk products	____	___	

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N	**OILS AND FATS:** oil, fats or butter added to food or used for cooking	____	___
O	**SWEETS:** sugar, honey, sweetened soda or sugary foods such as chocolates, sweets or candies	____	___
P	**SPICES, CONDIMENTS, BEVERAGES:** spices(black pepper, salt), condiments (dawadawa, maggi, spices, fish soy sauce, hot sauce), coffee, tea, alcoholic beverages OR *local examples(pito, bear etc)*	____	___
Individual level only	Did you eat anything (meal or snack) OUTSIDE of the home yesterday?	1=Yes	2=No
Household level only	Did you or anyone in your household eat anything (meal or snack) OUTSIDE of the home yesterday?	1=Yes	2=No
3.3	In the past 7 days, if there have been times when your household did not have enough food or money to buy food, how often has your household had to:		

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	a. Rely on less preferred and less expensive foods?	___ days
	b. Borrow food, or rely on help from a friend or relative?	___ days
	c. Limit portion size at mealtimes?	___ days
	d. Restrict consumption by adults in order for small children to eat?	___ days
	e. Reduce number of meals eaten in a day?	___ days

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SECTION 4 – SOCIOECONOMIC STATUS *(Housing, Facilities and Assets*)					
4.1	**OBSERVE AND RECORD. Do not ask questions!** Describe the housing	1	Separate house (bungalow)	5	Several huts/buildings [same compound]
		2	Semi-detached house	6	Several huts/buildings [different compound]

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	structure. **Circle one**.	3	Flat/apartment	7	Other (specify):……..
		4	Room(s)/compound house		
4.2	Do you or your household own or rent this dwelling? **Circle one**	1	Own	4	Don't know
		2	Don't own but live for free	5	Other, specify: _____
		3	Pay Rent		

4.3	Do not read answers. Circle one. What kind of toilet do members of your household usually use?	1	Flush/Pour Toilet
		2	Ventilated Improved Pit Latrine (VIP)
		3	Pit latrine with slap
		4	Pit latrine without slap/open pit
		5	Bucket/Pan
		6	Composting toilet
		7	No facilities (bush, beach, etc)

4.4	Do not read answers. Circle one. What is the main source of energy for cooking?	1	Electricity	5	Kerosene
		2	Straw/Shrubs/Grass/wood	6	Charcoal
		3	Liquefied Petroleum Gas (LPG)	7	Solar
		4	Animal dung	8	other:_____

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4.5	What is the main source of lighting for this house? Circle one.	1	Oil, kerosene or gas lantern	5	Electric company		
		2	Battery flashlights/fluorescent light	6	No lighting		
		3	Electric generator/Invertor	7	Solar		
		4	Candles/firewood	8	Other (specify)……..		
4.6	What is the main source of drinking water for members of your household? Circle one.	1	Piped water in/out side	6	Protected spring		
		2	Tube well/borehole	7	Unprotected spring		
		3	Unprotected dug well	8	Rain water		
		4	Protected dug well	9	Tanker truck		
		5	Surface water (river,dam,lake etc)	10	Other (specify)…….		
4.7	Does the household do anything to the water to make it safer to drink?	1	Yes	2	No	3	Don't know

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4.8	What does the household usually do to make the water safer to drink? Circle all that apply	1	Boil	5	Use water filter
		2	Add bleach/chlorine/alum	6	Let stand and settle
		3	Strain through a cloth	7	Solar disinfection
		4	Other, specify _____	8	Don't know

4.9 Do your household own any of the following assets (should be in good working condition)? Circle all that apply. Also observe.

A	Bed	K	Bicycle	U	Refrigerator
B	Table	L	Sofa	V	Freezer
C	Generator	M	Clock	W	Computer
D	Sewing machine	N	Radio	X	Digital camera
E	Car/truck	O	Black-white television	Y	Non-digital camera
F	Animal-drawn cart	P	Colour television	Z	Video deck

	G	Motorbike/scooter	Q	Land-line telephone	AA	DVD/VCD
	H	Cupboard, Cabinet	R	Axe	BB	Cooker
	I	Mobile phone	S	Tractor	CC	Fishing gear
	J	Hoe	T	Cutlass	DD	Sickle (i.e. rice)

IODISED SALT CONSUMPTION		
Read: We would like to check whether the salt used in your household is iodized. May I see a sample of the salt used to cook the meal eaten by members of your household last night? **Insert one.**	------	1 = Not iodized 2 = less than 15 PPM 3 = 15 PPM or more 4 = No salt at home 5 = Salt not tested

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Appendix: Practical demonstration of the measurement of MUAC

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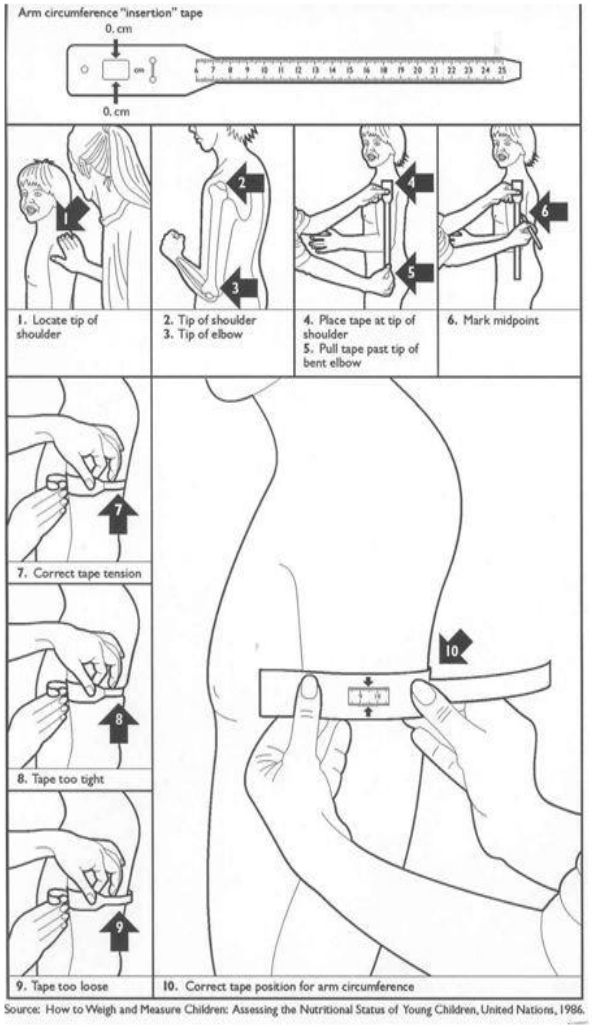
Measuring MUAC



Source: How to Weigh and Measure Children: Assessing the Nutritional Status of Young Children, United Nations, 1986.