KWAME NKRUMAH UNIVERSITY OF SCIENCE AND TECHNOLOGY

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SCHOOL OF PUBLIC HEALTH

MPH. HEALTH EDUCATION AND PROMOTION

PERFORMANCE OF THE CMAM PROGRAM IN KUMASI METROPOLIS (2015-2018).

A dissertation submitted to the school of graduate studies,Kwame Nkrumah university of science and technology, Kumasi in partial fulfilment of requirements for the award of master of public health (mph) degree in health education and promotion.

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NOVEMBER, 2019

DECLARATION

I Ayim-Appiah Makkedah, hereby declare that, this is the result of my own hand work and that no previous submission for a degree has been done here or elsewhere. The work of others which served as reference has been duly acknowledged.

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Prof. Anthony Edusei

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DEDICATION

I dedicate this work to the Almighty God who has seen me through my duration of study. I also dedicate this work to my father Rev.Dr. Ayim Nyarkoh Amanfo for his support and being a great mentor. Finally to all ministers of the Ghana Baptist Convention, workers of the Baptist Health Services and all members of Royal Life Baptist Church.

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ABSTRACT

Children of ages 6-59 months form a large percentage of the world population, and one of the major causes of death in this age group is malnutrition. In Ghana, different interventions are put in place to manage childhood malnutrition. Amongst the interventions is Community Based Management of Acute Malnutrition (CMAM). In Kumasi, the CMAM program was instituted in most hospitals in the Metropolis, but unfortunately the program collapsed in most of the hospitals that undertook it. There has not been much data on the performance of the CMAM program in the Kumasi Metropolis, this study used a cross sectional study to assess the secondary data of malnourished children who had been on the CMAM program in 2015, 2016, 2017 and 2018. A total of 134 records (for each year) of malnourished children were randomly sampled, demographic characteristics, anthropometric characteristics both during and after admission were assessed for the outcome treatment (cured, defaulted and death). Out of the 134 records selected for each year, children aged 6-12 moths were majority (82, 77, 73, and 81 respectively for 2015, 2016, 2017 and 2018) on the program. Majority recovered (64.5%, 75.4%, 65.2% and 88.4% for 2015, 2016, 2017 and 2018 respectively), whilst quite a number defaulted (35.5%, 24.6%, 34.8% and 11.6% for 2015, 2016, 2017 and 2018 respectively) none died while on the program. The default rate calls for an attention since the percentages cannot easily be over- looked. In addition, the feeding materials like the Ready to Use Therapeutic Foods (RUTFs) for the program should be made constantly available for smooth running of the program.

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CHAPTER ONE

1.0 INTRODUCTION

1.1 BACKGROUND OF STUDY

Acute malnutrition which is a major concern of public health is an underlying factor in almost 50% of the 10 to 11 million children under 5 years of age who die each year of preventable causes (Collins *et al.*, 2006). Under nutrition accounts for just under half of all deaths in children aged under 5 years worldwide. Severe acute malnutrition (SAM) is particularly an important type of under nutrition responsible for over 500, 000 deaths per year. Prevalence estimates suggest around 17 million children worldwide are currently suffering from SAM (Burrell, Kerac and Nabwera, 2017). Malnutrition is a prevalent public health concern in Ghana. While studies have identified factors that influence child malnutrition and related inequalities in Ghana, little effort has been made to decompose these inequalities across various household characteristics (Novignon *et al.*, 2015).

Before the introduction of the CMAM Program, children who suffered from SAM were treated in inpatient facilities with therapeutic milks, commercially called F75 (Formula 75) and F100 (Formula 100). The inpatient model posed many challenges to effective treatment for both health systems and patients long recovery periods (up to 6 weeks); overcrowding and cross-infection; high opportunity costs for families to access and remain in treatment; costly and resource-intensive services for health systems to sustain; concerns about safe preparation and storage of therapeutic milks; and low coverage of services. In the mid-1990s, ready-to-use therapeutic food (RUTF) was developed as an alternative to therapeutic milk (F100) that could be safely consumed at home. This product allowed treatment for uncomplicated cases of SAM to be shifted to the home, paving the way for CMAM (Strategy, 2016).

According to the 2014 Ghana Demographic Health Survey, 19 percent of Ghanaian children under age five (5) were stunted (short for their age), 5 percent were wasted (thin for their height), and 11 percent were underweight (thin for their age). About 3 percent of children were overweight (heavy for their height) (GDHS, 2014).

The national response to nutritional challenges by multiple institutions led to the implementation of health interventions by the Ministry of Health (Ghana) such as Behavior Change Communication in Infant and Young Child Feeding, the Baby Friendly Hospital Initiative, Micronutrient Supplementation and Fortification, Growth Promotion, and Management of Severe Acute Under nutrition (Gongwer, 2014).

The first pilot project tested the CMAM approach in 2000 during humanitarian emergencies. It was found to be very efficient that it was endorsed by United Nations (U.N.) agencies in 2007 and is now considered the standard of care for managing acute malnutrition in emergency and development contexts (Strategy, 2016).

Community based management of acute malnutrition (CMAM) is a relatively recent approach to managing SAM cases which aims to maximize program coverage while maintaining quality of care, it is programmed to treat severe malnutrition and reduce mortality(Chitekwe *et al.*, 2018). A CMAM program consists of a fixed or ambulatory site close to the community where children with 'uncomplicated' severe acute malnutrition, who form the majority of patients, can be treated on a once- weekly basis, in addition to an in-patient facility where the minority of children suffering from SAM with associated serious medical complications are admitted until stable, then they are transferred into the community component to complete treatment (Burza *et al.*, 2015).

1.2 PROBLEM STATEMENT

Under nutrition prevalence remains very high in children under 5 years of age in Africa and South East Asia (Muzigaba, 2018). Addressing child malnutrition is critical for child survival and sustainable development (More *et al.,* 2018). The global prevalence of severe acute malnutrition (SAM) in 2011 for children under 5 years of age, estimated as severe wasting or weight-for-height ≤3 Z-score of WHO reference, was 3% or 19 million children with the highest burden in South Central Asia (5.1%) and central Africa (5.6%) (Sachdev *et al.*, 2017).

Data from the Ghana Demographic Health Survey indicates that 5% of children in Ghana were wasted (GDHS, 2014). Malnutrition threatens Ghana's overall social and economic development though the prevalence of under nutrition is lower as compared to other emergency thresholds (Neequaye *et al.*, 2012).

The Community based Management of Acute Malnutrition treatment model which was formerly known as the community based therapeutic care (CTC) was introduced in response to the limited effectiveness of already existing inpatient model, and also communities were more empowered to hold their rightful role in service delivery (Blanárová *et al.*, 2016).

Malnutrition rate in Ghana has declined over the years due to various interventions, of which CMAM is one, though it cannot be concluded that malnutrition has become extinct in Ghana. Since the inception of the CMAM program in Ghana majority of government hospitals were enrolled on the program but the program seems to be no more in practice in those hospitals that began it, hence this study.

1.3 JUSTIFICATION OF THE STUDY

Working as a Nutritionist in the health sector of Ghana (Asokwa Sub- Metro) predisposed the researcher to some short falls and strengths of the CMAM program in the Kumasi Metropolitan. The researcher therefore was able to assess the performance of the CMAM program from 2015 to 2018 in the study area.

The study generally, sought to assess the performance of the CMAM program (outpatient and inpatient care) services delivered by health professionals in the Kumasi Metropolitan (Subin-sub metro). This was achieved by looking at the program as a unit, structure and organization, processes and outcome of the CMAM program. The results of this study will be of importance to the GHS and policy makers to adopt strategies to strengthen the CMAM program in the study area in the rehabilitation of SAM cases.

1.4 RESEARCH QUESTIONS

The following questions will help address the research objectives:

- How many children have successfully gone through the program from 2015 to 2018?
- How many children on the program have been lost to follow up from 2015 to 2018?
- How many children on the program have died from 2015 to 2018?

1.5 PRINCIPAL OBJECTIVE

The principal objective of the research was to assess the structure, process and outcome of the CMAM program in the Subin sub-metro of the Kumasi Metropolis from 1st January 2015 to 31st December 2018.

1.6 SPECIFIC OBJECTIVES

The specific objectives of the research were as follows:

- To determine the relationship between weight and MUAC during discharge
- To determine the relationship between gender and cure rate
- To determine the number of clients who recovered, defaulted and died on the program

CHAPTER TWO

2.0 LITERATURE REVIEW

2.1 MALNUTRITION

Malnutrition remains a significant public health issue in the developing world, especially in South Asia and sub-Saharan Africa. Population diets are often deficient in macronutrients (protein, carbohydrates, and fat, leading to protein-energy malnutrition), micronutrients (electrolytes, minerals, and vitamins) or both (FAO, 2004).

The term malnutrition denotes both under-nutrition and over-nutrition, generally it points toward under-nutrition including protein-energy malnutrition (PEM) and micronutrients deficiency. It was estimated in 2011 that 52 million children under-five years of age were wasted (Park *et al*., 2012). What an individual eats affects health very much, in Africa most children are under nourished due to lack of knowledge on proper nutrition and food insecurity challenges.

Hoddinott et al.,(2008), as cited by Boadi and Kobina (2017), believed that malnutrition at the early stages of life does not only affect the health consequences of the child, but it also has a serious contrary impact on the determinants of their livelihoods, such as physical and intellectual growth, school performance and eventual future earnings and productivity (Boadi and Kobina, 2017). A problem with relying on a single anthropometric indicator for malnutrition is that the predominant form of severe malnutrition is marasmus in some contexts and kwashiorkor in others. This problem is usually addressed by using an anthropometric indicator to define marasmus and the presence or absence of bipedal oedema to define kwashiorkor (Myatt, Khara and Collins, 2006).

2.1.1 Acute Malnutrition

Globally in 2011, 101 million children under 5 years of age were estimated to be underweight with South Asia having the highest prevalence (33 %) followed by sub-Saharan Africa (21 %). Of this global figure, approximately thirty-three million children under 5 years of age are affected by moderate acute malnutrition (MAM), defined as a weight-for-height z-score between −2 and −3, and at least nineteen million children under 5 by severe acute malnutrition (SAM), defined as a weight-for-height z-score of <−3. For children with SAM, the risk of death is approximately 10-fold higher compared with children with a z-score ≥1. High prevalence rates have been reported for low birth weight, protein energy malnutrition, wasting and under- weight among children under 5 years of age (Zotor and Amuna, 2019).

Ainsworth (2010), as cited by Mogre *et al.*, explained that apart from the immediate devastating effects of undernutrition on morbidity and mortality, undernutrition also causes delayed development affecting children's cognitive development and outcomes and their productive capacity as adults (Mogre *et al.*, 2013).

2.1.2 Conceptual Framework for Causes of Malnutrition

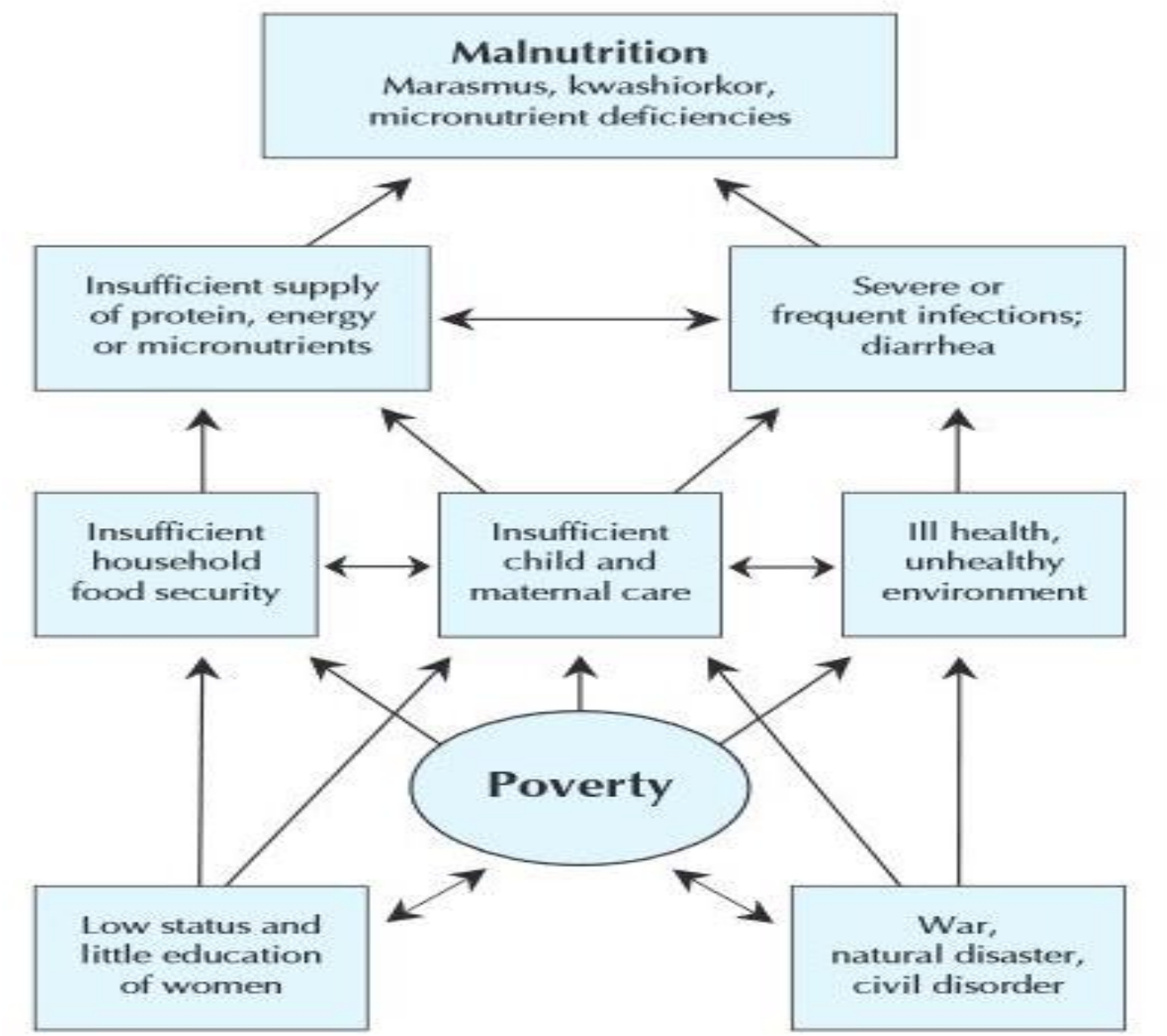

Figure 1.1: Conceptual Framework for Causes of Malnutrition

Source: Müller and Krawinkel (2005)

2.1.3 Conceptual Framework

Malnutrition in children leads to most deficiencies and health risk, the factors that describe the conceptual framework that contribute to malnutrition have been explained below;

Poverty: The formal and non-formal institutions of the society have a great influence on the nutrition state of a country. When the political framework of a country is not properly

managed there can be severe economic break down which can affect the food basket of a nation. A study at the Princess Marie Louise Children's Hospital (Ghana) revealed that poverty remained an important underlying cause of malnutrition in children (Tette, Sifah and Nartey, 2015).

The basic causes of malnutrition may lead to some underlying causes which may not be given much attention in tackling malnutrition but an oversight of these may not make any malnutrition intervention successful.

Food security exists when a household can secure access to food in sufficient quantities and quality for all members of the household to enjoy a healthy and active life (Gillespie *et al.*, 2001). The availability of food in a household plays an important role in the health of an individual. Food insecurity and bad care also pose a danger of morbidity and mortality for children. Food insecure households and less educated mothers are more likely to have children undernourished (Ajao *et al.*, 2010). Food insecurity is the most urgent nutritional issue, particularly for vulnerable communities such as children and women and individuals living with HIV, tuberculosis and other transmissible diseases. (Regional Committee for the Eastern Mediterranean, 2019).

A study conducted in Mozambique among children 0 to 59 months showed that birth weight, mother's educational status, maternal occupation, living in a rural area, family size, number of children under five years of age in the household, cooking with charcoal, inhabiting wooden or straw housing or housing without proper floors, overall duration of breastfeeding as well as duration of exclusive breastfeeding, and time of initiation of complementary feeding were significantly related to stunting (Francisco, Ferrer and Serra-majem, 2017). Hence when maternal and child care are inadequate in any of these forms a child is likely to become malnourished.

Due to unhealthy settings, social, financial and behavioral variables have a significant effect on health results. Poverty-related malnutrition often leads to enhanced susceptibility to infection and the effects of chemical pollutants, as do unhealthy behaviors such as insufficient personal hygiene and absence of a social environment that provides care (WHO, 2002).When a child is born into a filthy environment the rate of infections may become high and child may fall ill due to the dirty environment.

Malnutrition may result immediately there is inadequate dietary intake for some time or if a child has been sick for some time.

Severe or infrequent infections**:** Severe and prolong infections in children may cause loss of energy and micronutrients and this may lead directly to wasting (malnutrition). The major nutrition problems in the Eastern Mediterranean Region are protein–energy malnutrition and high prevalence of low birth weight and of micronutrient deficiencies, including iodine deficiency disorders, vitamin A deficiency, iron deficiency anaemia in young children and women of childbearing age and calcium, zinc and vitamin D deficiencies (Regional Committee for the Eastern Mediterranean , 2019).

2.2 Management of acute malnutrition

In the mid-1990s, the first revolution in the management of severe acute malnutrition occurred with the introduction of specialized milk (initially F100 and later F75) and improved World Health Organization (WHO) protocols. The combination of specialized milk, antibiotic use and better fluid management significantly decreased mortality to as low as 5% (USAID and FANTA, 2008).

Different strategies have been adopted over the years to address the issue of malnutrition across the globe. Most of the strategies emphasizes support for vulnerable groups and deals with the root causes of malnutrition. According to tracking progress towards achieving the

Sustainable Development Goals (SDGs), important progress has been produced in enhancing nutrition for children and young children over the years in different countries in the region (UNICEF, 2006).

In latest years, social, economic, demographic and political changes have had a major impact on the nature, scope and extent of health and nutrition issues and the burden of disease and associated risk factors in most countries (Regional Committee for the Eastern Mediterranean, 2019).

Community Based Management of Acute Malnutrition (CMAM) is the globally endorsed approach for treatment of acute malnutrition. The model is included in government protocols for the management of acute malnutrition in more than 70 countries (World Vision International, 2017).

2.2.1 Community Based Management of Acute Malnutrition (CMAM)

Undernutrition includes a variety of illnesses including impaired growth and deficiencies in micronutrients. Acute malnutrition or waste is an attributable cause of 12.6% of the 6.9 million deaths among children under the age of 5, accounting for more than 800,000 deaths per year (Roederer *et al.*, 2014).

In developing nations, operational organisations engaged in child nutrition have suggested adopting blanket feeding approaches to allow child waste prevention. There is now a fresh variety of nutritional supplements available, claiming they can prevent waste in communities at danger of regular food shortages (Huybregts *et al.*, 2012).

For children aged between 6 and 60 months, the criteria for severe acute malnutrition proposed by the World Health Organization (WHO) and the United Nations Children's Fund (UNICEF) include any of the following: 1) WFH index below three SD or Z scores of the

median WHO growth reference (2006), 2) visible severe wasting, 3) presence of bipedal edema; and 4) mid upper arm circumference (MUAC) below 115 mm (Park *et al*.,2012).

A comparatively fresh strategy to handling SAM is community-based management of severe acute malnutrition (CMAM).It seeks to maximize access from the first indications of SAM to adequate, quality care. Introduced as' Community-based Therapeutic Care' (CTC) in 2001, the approach was designed to address the many shortcomings of traditional SAM treatment, which worked solely through inpatient centers with limited capacity and reach, requiring long stays away from the homes of children (Collins 2001). Following the approval of the United Nations (UN) in 2007, the strategy was officially referred to as' CMAM(Wilford, Golden and Walker, 2012).

The CMAM services include:

(1) Community outreach, for the early identification and referral of severe acute malnutrition (SAM) and later follow-up

(2) Outpatient care for children with SAM without medical complications at health facilities and at home (Outpatient Therapeutic Programme, OTP)

(3) Inpatient care for children with SAM, and medical complications or no appetite (Inpatient Therapeutic Programme, ITP).

The CMAM integration framework is organized into five domains (June, Deconinck and Navarro-colorado, 2008). Within each of these, key elements are defined and examined based on their contributing effect on CMAM integration into the health system and on sustainability of health care.

Harris et al, (2011) found out from a study that, the home based treatment of acute malnutrition in urban poor communities was an example of effective community based

rehabilitation of children with moderate or severe acute malnutrition. Colombatti et al, (2008) found out from a study conducted that all the children who were admitted on the CMAM program recovered with a weight gain of 4.45g/kg per day while none died or relapsed after 1 year. It was further realized that severely malnourished children there were mainly infants, part of large families and had illiterate mothers. Similar results were realized by Ashworth (2004) when it was stated that good malnutrition care led to comparatively better nutritional outcomes.

It is certainly an undeniable fact that appropriate management of SAM cases can lead to a critical reduction in the number of deaths experienced at various facilities (Allen et al, 2007).

The CMAM program in Ghana

The Community-based Management of Acute Malnutrition (CMAM) Programme was introduced in June 2007 and piloted in Ghana in 2008 at two sites; Agona West Municipal and Ashiedu Keteke Sub-Municipal in the Central and Greater Accra regions respectively. Based on the effective results of the programme in addressing the management of severe malnutrition in the two areas where it was first piloted, there was a scale up to other parts of the country which includes the Northern Region. Community –based volunteers (CBVs) play an important role in terms of case detection, referral and follow-ups of Severe Acute Malnutrition (SAM) in the achievement of the program objectives of reducing deaths of children below five (5) years due to SAM. (GHS/UNICEF, 2011).

In a study conducted by Akparibo et al. 2017, in the Upper East Region of Ghana on community-based management of severe acute malnutrition (CMAM) within routine healthcare services in Ghana findings suggest that community-based management of SAM can achieve similar success when delivered in routine non-emergency settings. However, this

success can be diluted by a high default rate, and the factors contributing to this need to be explored to improve programme effectiveness within communities.

One of the main criteria in admitting SAM children to inpatient care is the presence of medical complications and Nhampossa et al, (2013) observed that the kind of medical complications prevailing at a particular time had an effect on the recovery rates of patients. This was particularly so because good nutrition has been identified to significantly boost the immune system of malnourished children.

Transition from IPC to OPC is based on reduced oedema, resolving medical complication and good appetite. The discharge criteria of fifteen percent (15%) weight gain over oedema-free weight on enrolment, for children admitted based on weight-for-height is still in force though (GHS/UNICEF, 2011 and GHS, 2010).

Akparibo et al, also revealed that geographical access is one of the factors that causes defaulting of mothers from the CMAM program in a study done in the Upper East Region of Ghana in 2010.(Akparibo *et al*., 2010). A GHS/UNICEF report in 2011 indicated that migration of people and long distance from OPC sites causes clients to withdraw from accessing CMAM services. (GHS/UNICEF, 2011).

CHAPTER THREE

3.0 METHODOLOGY

3.1 STUDY DESIGN AND TYPE

This study was observational and the design used was a cross sectional study of secondary data taken on malnourished children who are below the age of 5 years. This study used the quantitative method to assess the performance of the CMAM program from 1st January 2015 to 31st December 2018 (4 years) within the Maternal and Child Health Hospital of the Kumasi Metropolis.

3.2 STUDY POPULATION

The study was conducted in hospitals that undertook the CMAM program in the Kumasi Metropolis. The hospital that currently ran the CMAM program was the Maternal and Child Health Hospital (MCHH). The target population were clients 6 to 59 months who had been enrolled on the program from the years 2015 to 2018. Hence the study included 552 clients enrolled on the program from 2015 to 2018 for the sample size.

3.3 SAMPLING TECHNIQUE

The sampling technique used in the study was purposive sampling to select the hospital that still runs the CMAM program in the Kumasi Metropolis and simple random sampling was used to select records of clients who were on the program within the specified date range at the Maternal and Child Health Hospital.

The Maternal and Child Health Hospital (MCHH) popularly known as C.W.C or Kwashiorkor clinic is centrally located in the Subin Sub-Metro within the Kumasi Metropolis. The Maternal and Child Health Hospital (MCHH) was chosen for this study because it is the only Hospital in the Kumasi Metropolis dedicated to care for malnourished children and adults, hence most cases of child malnutrition are referred to the facility.

3.4 SAMPLE SIZE

The sample size was calculated using the probability sampling formula below:

$n= Z^2 pq/d^2$

Where, n = sample size

z = statistical certainty chosen

p = proportion of children on the CMAM program

q = 1- p (proportion of children not malnourished)

d = precision desired (0.05)

If the value of p = 10% or 0.10 (KMHD, 2010)

$n= Z^2 p (1-p)/d^2$

$n= 1.96^2 (0.10) (0.90)/0.05^2$

$= (3.8416 \times 0.10 \times 0.90)/0.0025$

$= 138.2976$

$= 138$

Hence, 138 records of participants were randomly selected for the respective years. As shown in the table below;

Table 3.1: Table showing the number of respondents for each year

Year	**2015**	**2016**	**2017**	**2018**	**Total**
Number of participants	138	138	138	138	552

3.5 DATA COLLECTION TECHNIQUES AND TOOLS

Records of children on the CMAM program within the period were obtained from the rehabilitation health record books by using the simple random sampling, which meant all records had an equal chance of been selected from the larger sample. Selected records were given serial numbers, the age in months of selected participants were recorded, gender and admission criteria (whether new admission or transfer) were also recorded. The date of admission and discharge, weight (both admission and discharge), whether there was oedema during admission or discharge and also the MUAC (cm) during admission and discharge were also recorded. Finally, the outcome that is whether the participant was cured, died or defaulted was also recorded. All these were done using a structured questionnaire and also quantitative method was used to quantify the variables.

Inclusion Criteria

All malnourished children from 6 to 59 months who had been admitted on the CMAM program within the period of either 2015, 2016, 2017 or 2018.

Exclusion Criteria

Children who were not admitted on the CMAM program, and also children on the program whose age did not fall within 6 to 59 months were also excluded from the study.

3.6 ETHICAL CONSIDERATION

Ethics approval was sought from the ethical review committee (CHRPE/KNUST) before the study began. A written permission was also obtained from the Maternal and Child Health Hospital through the Medical Superintendent and consent was taken from the Public Health DDNS, Nutrition Officer and Health Information Officer before the study was carried out.

3.7 STUDY AREA

3.7.1 Demographic Characteristics

3.7.1.1 Population Size and Distribution

According to the Ghana Statistical Service 2010, the population of Kumasi Metropolis (1,730,249) represents 36.2 percent of the total population of Ashanti Region (4,780,380). It comprises of 826,479 males (47.8%) and 903,779 females (52.2%). The Metropolis covers a land area of 214.3 square kilometers, which is 0.9 percent of the region's land area of 24,389 square kilometers. The Metropolis has a population density of 8,075 persons per sq. km.

Table 3.2: Distribution of population by age, sex and sex ratio

Age	Both sexes	Male	Female	Sex ratio
0-14	573,602	284,394	289,208	98.3
15-64	1,095,190	516,819	578,371	89.4
65+	61,457	25,266	36,191	69.8

Source: Ghana Statistical Service, 2010 Population and Housing Census

3.7.1.2 Geographical Characteristics

Kumasi Metropolis is one of the thirty (30) districts in Ashanti Region. It is located between Latitude 6.35^{o}N and 6.40^{o}S and Longitude 1.30^{o}W and 1.35^{o}E and elevated 250 to 300 meters above sea level. The Metropolis shares boundaries with Kwabre East and Afigya Kwabre Districts to the north, Atwima Kwanwoma and Atwima Nwabiagya Districts to the west, Asokore Mampong and Ejisu-Juaben Municipality to the east and Bosomtwe District to the south. It is approximately 270km north of the national capital, Accra. It has a surface area of approximately 214.3 square kilometers which is about 0.9 percent of the region's land area. However, it accommodates about 36.2 percent of the region's population (GSS, 2010).

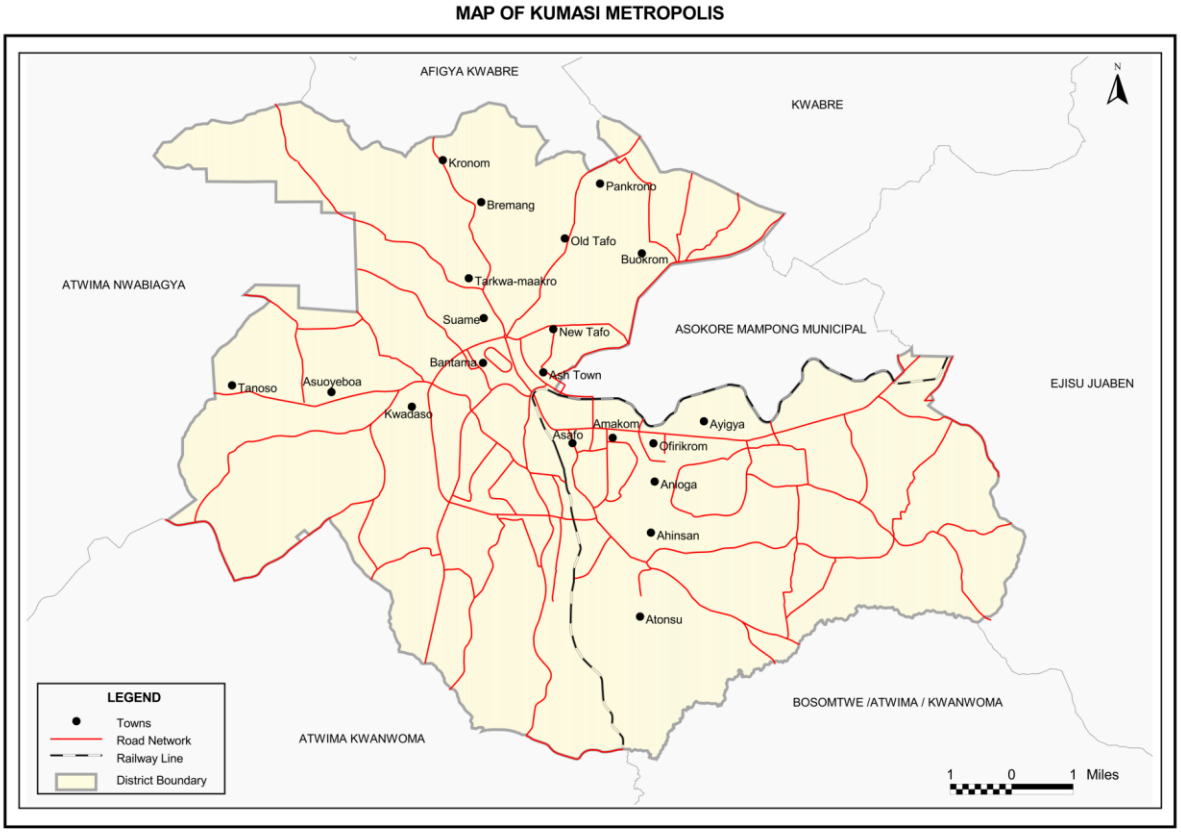

Figure 3.1: Diagram showing the map of Kumasi Metropolis

Source: Ghana Statistical Service, GIS

3.7.1.3 Health Facilities in Kumasi Metropolis

Kumasi has five health districts: Asokwa, Subin, Bantama, Manhyia North and Manhyia South. Komfo Anokye Teaching Hospital (KATH) is located at Bantama Sub-Metropolitan area and serves the whole city as well as its immediate peri-urban communities. It also serves as a reference laboratory for the rest of the hospitals in the metropolis. The Kumasi South Hospital (KSH) is situated at Chirapatre, within the industrial hub of the metropolis and serves the people of Asokwa, Ahensan, Atonsu, Esreso, Gyenyase and Kaase. The Manhyia Hospital, located at Ashanti Newtown near the Manhyia Palace, serves Manhyia, Krofrom, Ashanti Newtown, Aboabo and Asawasi communities. The Suntreso Government Hospital is located at North Suntreso and serves North and South Suntreso, Patasi Estate, Kwadaso, Adoato, Asuoyeboa, Breman and Suame (MCI, 2006).

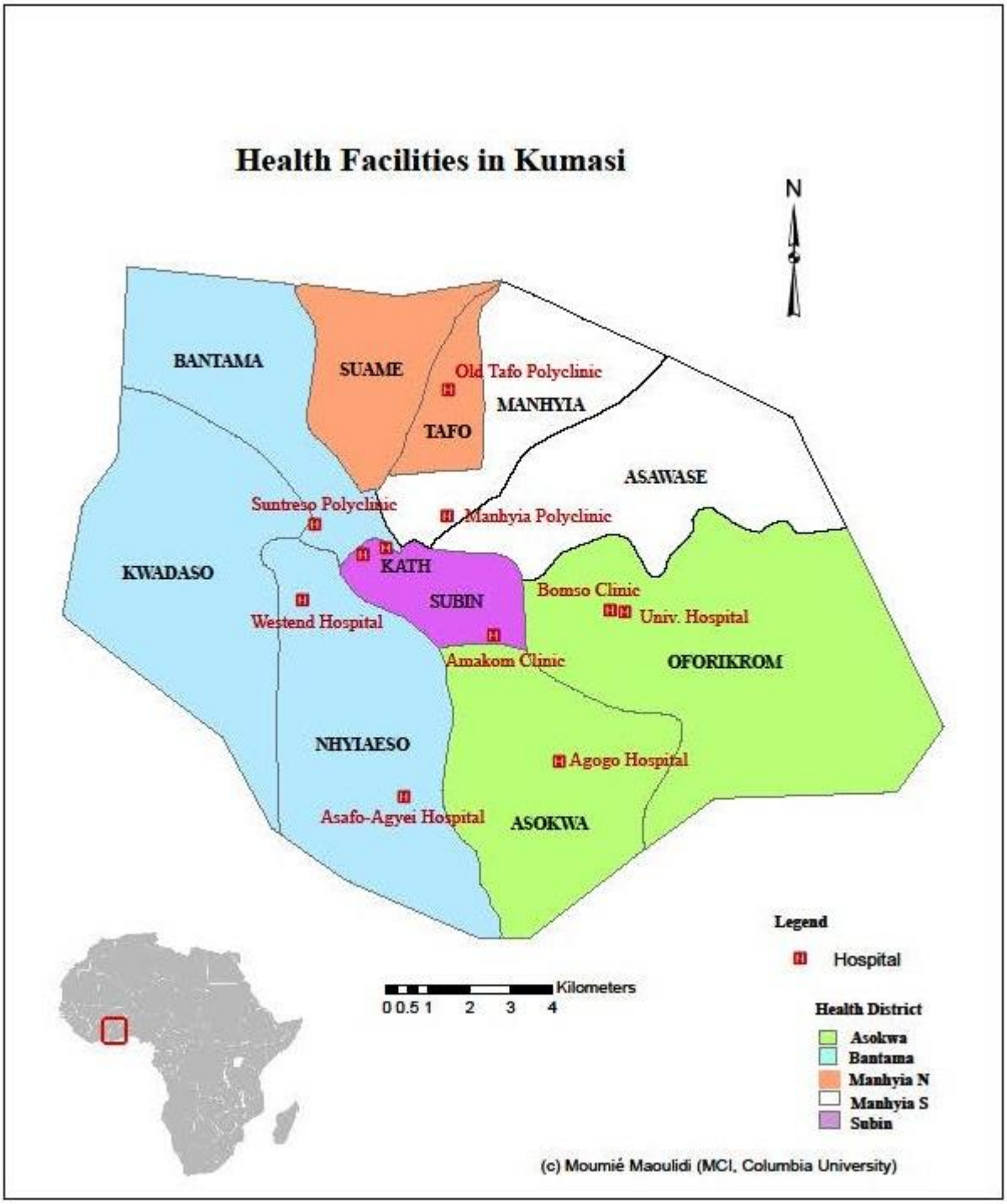

Figure 3.2: Diagram Showing Health Facilities in Kumasi Metropolis

Source: MCI, 2006

3.7.1.4 Maternal and Child Health Hospital

The Maternal and Child Health Hospital (MCHH) popularly known as C.W.C or Kwashiorkor clinic (centrally located in the Subin Sub-Metro) is one of the five (5) Government Hospitals in the Kumasi Metropolis. It was established by the Government of Gold Coast in 1910 and has a projected population of Two Hundred and Thirty-Two Thousand, Four Hundred and Ninety-Three (232,493) as at 2017 projection from the 2010 census 11.0% of the population in Kumasi. There is an estimated population of Five hundred Thousand (500,000) daily at Kejetia, Central Market and Adum stores. MCHH is the only Hospital in the Northern part of Ghana dedicated to care for Malnourished Children and Adults and serves areas such as Adum, Asafo, Fante New Town, Old Amakom and New Amakom.

3.8 STUDY VARIABLES

The dependent variables of the study were the discharge and outcome of the malnourished children.

The independent variables were

- Demographic characteristics of children on the CMAM program
- Condition during admission
- Child’s weight
- Presence of oedema
- MUAC

Table 3.3: Study variables

VARIABLE	INDICATORS	OPERATIONAL DEFINITION	SCALE OF MEASUREMENT
Demographic characteristics of malnourished children	Age	Age of child in months on first appearance	Discrete
	Gender	Whether child is feminine or masculine	Binary
Admission	New Admission	Malnourished child newly admitted on the program	Binary
	Transfer or readmission	Whether child was transferred from another institution	Binary
	Weight	Weight in kilograms	
	Oedema	Whether mild or pitting oedema	
	MUAC	Measurement in centimetres (cm) using MUAC tape	Continuous
			Binary
			Continuous
Discharge	Weight	Weight in kg at discharge	Continuous
	Oedema	Presence of oedema or not	Binary
	MUAC	Measurement in cm	Continuous
Outcome	Cured	Child who went through program successfully	Binary
	Dead	Child who died while on program	Binary
	Defaulter	Child who did not complete cycle of	Binary

3.9 PRETEST OF DATA COLLECTION TOOLS

The data collection tool, the questionnaire for this study was pretested in the Manhyia Government Hospital (found in a suburb of Kumasi Metropolis). Manhyia Government Hospital was chosen for the pretest because the CMAM program was formerly ran in the Nutrition Unit and had most referrals till the program's collapse. The Manhyia Government Hospital's CMAM program had similarities as my study site and after pretest the questionnaire was revised and modified to suit the variables the register presented.

3.10 DATA HANDLING AND ANALYSIS

Data collected were handed over to principal investigator who entered the various responses onto a computer and preliminary analysis started right away. Data was entered using excel and cleaned for abnormal values at regular intervals. Data was then exported to Stata version 14.0 for analysis. The categorical variables were tabulated and reported as frequencies with their respective percentages. Continuous variables were summarised as means with their standard deviation and ranges. Associations between the categorical variables were determined using the chi square test with p-values less than 0.05 considered statistically significant, correlation analysis was also used with +1 signifying a strong positive correlation and -1 signifying a strong negative correlation. Relationships between continuous variables were evaluated using linear regression. Coefficients were then determined with their respective 95% confidence intervals.

3.11 LIMITATIONS OF THE STUDY

The study sought to assess the performance of the CMAM program in 2015, 2016, 2017 and 2018, taking into consideration the weight, oedema and MUAC during admission and discharge. Some of the children on the program were not consistent on the program cycle, also the register did not indicate whether a child was on readmission.

3.12 ASSUMPTIONS

The assumptions made during the study were:

1. The malnourished children on the CMAM program were a representative sample of the program's performance in the Metropolis.
2. Information recorded in registers/ records were valid.

CHAPTER FOUR

4.0 RESULTS

4.1 DEMOGRAPHIC CHARACTERISTICS OF THE MALNOURISHED CHILDREN

Table 4.1 Distribution of the demographic characteristics of respondents

N= 138 (For each year)

Year	Age (months)	Gender		Total
		Male	Female	
2015	6-12	40	42	82
	13-24	25	25	50
	25-59	3	3	6
2016	6-12	39	38	77
	13-24	26	26	52
	25-59	4	5	9
2017	6-12	33	40	73
	13-24	26	30	56
	25-59	5	4	9
2018	6-12	44	37	81
	13-24	38	12	50
	25-59	4	3	7

Source: *Field survey, (2019)*

Five hundred and fifty-two records were selected for the study, for each year one hundred and thirty-eight records were selected for each year respectively. For the year 2015 the records of clients on the CMAM program selected had 82 children aged 6-12 months (40 males,42 females), 50 children aged 13-24 months (25 males,25 females) and 6 children aged 25-59 months (3 males, 3 females).

Children aged 6-12 months were 77 (39 males, 38 females), for 13-24 months records selected were 52 (26 males, 26 females) and 25-59 months 9 were selected (4 males, 5 females) for the year 2016.

Majority of children aged 6-12 months (73) that is 33 males and 40 females records of clients were recruited in 2017,also 56 (26 males, 30 females) for age 13-24 months and 9 (5 males, 4 females) for age 25-59 months.

Records selected for the study for the year 2018 had a majority falling in the age of 6-12 months (81; 44 males, 37 females). Few (7; 4 males and 3 females) fell within the age range 25-59 months and 50 (38 males, 12 females) were within the age range 13-24 months.

4.2 ANTHROPOMETRIC CHARACTERISTICS OF RESPONDENTS DURING ADMISSION

The mean weight of malnourished children admitted on the CMAM program for the various selected years revolved around 5.7kg at a standard deviation of around 1.1 with the exception of 2018 having a standard deviation of 0.98. The minimum weights admitted on the program were 4kg, 3kg, 3.9kg and 4kg for 2015, 2016, 2017 and 2018 respectively. The maximum weights admitted on the program were 11.1kg, 10kg, 11kg, and 8.6kg for 2015, 2016, 2017 and 2018 respectively.

The mean Mid Upper Arm Circumference (MUAC) of malnourished children admitted on the program was about 10.9cm with a standard deviation of 0.80, 0.91, 0.77 and 0.75 for 2015, 2016, 2017 and 2018 respectively. The minimum MUAC during admission were 6.2cm, 6.2cm, 8cm and 8.3cm and the maximum MUAC recorded were 12.9cm, 13.0cm, 13.0cm and 12.5cm for 2015, 2016, 2017 and 2018 respectively.

Majority (58.7%, 63.04%, 56.52% and 51.45% respectively for 2015, 2016, 2017and 2018) of children were admitted on the CMAM program with either mild oedema or bilateral pitting oedema, with most (87.68%, 73.19%, 79.71%, 81.88% for 2015, 2016, 2017 and 2018 respectively) of the clients reporting directly to the facility and few being referred from other facilities.

Table 4.2 Anthropometric characteristics of respondents during admission

N= 138 (For each year)

Year	**2015**	**2016**	**2017**	**2018**
Weight				
Mean	5.735507	5.702174	5.891304	5.713043
Std.Dev.	1.046635	1.06411	1.076591	0.9820897
Min.	4	3	3.9	4
Max.	11.1	10	11	8.6
MUAC				
Mean	10.96014	10.81812	10.8942	10.96812
Std.Dev.	0.803872	0.905235	0.7657607	0.7508618
Min.	6.2	6.2	8	8.3
Max.	12.9	13.0	13.0	12.5
Oedema				
YES	81 (58.70%)	87 (63.04%)	78 (56.52%)	71 (51.45%)
NO	57 (41.30%)	51 (36.96%)	60 (43.48%)	67 (48.55%)
Transfer				
YES	17 (12.32%)	37 (26.81%)	28 (20.29%)	25 (18.12%)
NO	121 (87.68%)	101 (73.19%)	110 (79.71%)	113 (81.88%)

Source: *Field survey, (2019)*

4.3 ANTHROPOMETRIC CHARACTERISTICS OF RESPONDENTS DURING DISCHARGE

The average weight recorded during discharge from the CMAM program was about 7.0kg at a standard deviation around 1.2, the minimum weight during discharge for 2015 and 2016 is 4.2kg with different maximum weights on discharge being 13.6kg and 11.2kg for 2015 and 2016 respectively. The minimum weights on discharge for 2017 and 2018 were 4.7kg and 4.5kg at a maximum weight of 12.7kg and 13.9kg respectively.

The mean Mid Upper Arm Circumference (MUAC) recorded on discharge was about 12.2cm with different standard deviations of 0.97, 0.89, 1.02 and 0.87 for 2015, 2016, 2017 and 2018 respectively, with the maximum MUAC on discharge being 15.5cm for 2018 and 8cm for minimum MUAC on discharge for 2015.

Majority (82.6%, 93.5%, 79% and 86.2%) of children were discharged from the program without any form of oedema with few (17.4%, 6.5%, 21%, 13.8%) who defaulted having oedema for 2015, 2016, 2017 and 2018 respectively.

Table 4.3 Anthropometric characteristics of respondents during discharge

Year	**2015**	**2016**	**2017**	**2018**
Weight				
Mean	6.894928	6.973913	7.014493	6.996377
Std.Dev.	1.297967	1.179342	1.238704	1.24434
Min.	4.2	4.2	4.7	4.5
Max.	13.6	11.2	12.7	13.9
MUAC				
Mean	12.22826	12.19348	12.1913	12.29348
Std.Dev.	0.9717911	0.8875626	1.021483	0.8676006
Min.	8	8.7	8.5	9.0
Max.	15.3	14.1	14	15.5
Oedema				
YES	24 (17.39%)	9 (6.52%)	29 (21.01%)	19 (13.77%)
NO	114 (82.61%)	129 (93.48%)	109 (78.99%)	119 (86.23%)

Source: Field survey, (2019)

4.4 RELATIONSHIP BETWEEN WEIGHT AND MUAC DURING DISCHARGE

Table 4.4 Correlation analysis of Weight and MUAC during discharge

	MUAC (Discharge)
Weight (Discharge)	
2015	0.3010
2016	0.5795
2017	0.4434
2018	0.3186

Source: Field survey, 2019

To ascertain the statistical association between weight of participants during discharge from the CMAM program and their MUAC during discharge, the correlation analysis test was used. A correlation coefficient of +1 showed a strong positive correlation while a coefficient of -1 showed a strong negative correlation and 0 meant no correlation between variables. From table 4.4 the results for the respective years showed a moderate correlation for all the respective years that was studied.

4.5 RELATIONSHIP BETWEEN GENDER AND RECOVERY

Concerning on whether gender of participants could determine if a participant recovered from the CMAM program, the correlation analysis test was used. From the table below a correlation coefficient of 0 denotes no correlation between gender and recovery and the coefficient with the negative (-) sign denotes a negative correlation between the two.

Table 4.5 Correlation Analysis between Gender and Recovery/ Cured

	Recovery/ Cured
Gender	
2015	-0.0562
2016	0.0000
2017	-0.0226
2018	0.1225

Source: Field survey, 2019

4.6 OUTCOME TREATMENT FOR CMAM PROGRAM

Table 4.6 Outcome for CMAM program

Outcome	**2015**	**2016**	**2017**	**2018**
Cured	89 (64.49%)	104 (75.36%)	90 (65.22%)	122 (88.41%)
Defaulted	49 (35.51%)	34 (24.64%)	48 (34.78%)	16 (11.59%)
Died	0	0	0	0
Total	138 (100%)	138 (100%)	138 (100%)	138 (100%)

Source: Field survey, 2019

Majority (64.5%, 75.4%, 65.2%, 88.4%) of malnourished children who were enrolled on the CMAM program were cured for 2015, 2016, 2017, and 2018 respectively, while few (35.5%, 24.5%, 34.8% and 11.6%) defaulted for the years chosen for the study. None (0%) died while on the program or during discharge for all the four years that was chosen for the study. This is further represented in figs.4.1, 4.2, 4.3 and 4.4.

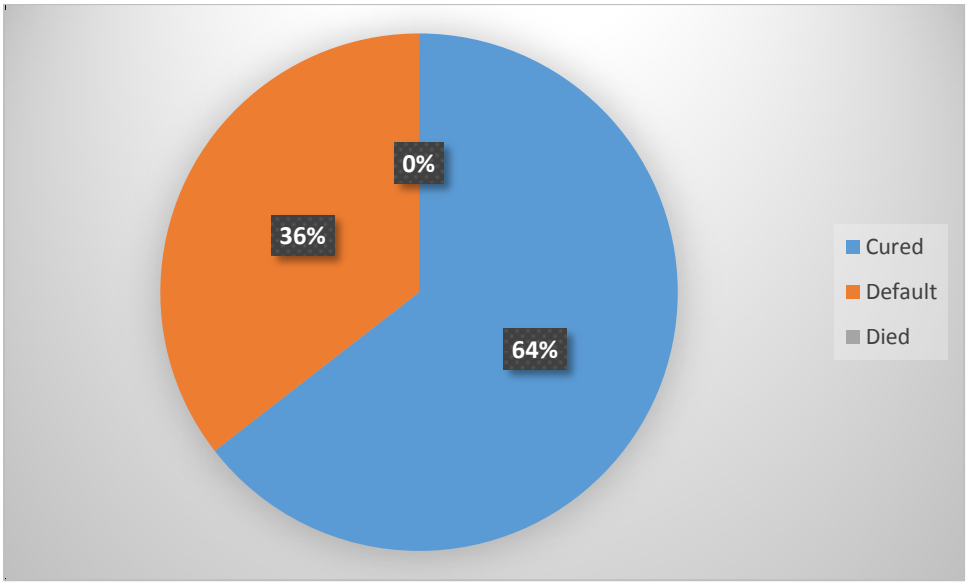

Figure 4.1 Diagram showing the outcome for CMAM 2015

Source: Field survey, 2019

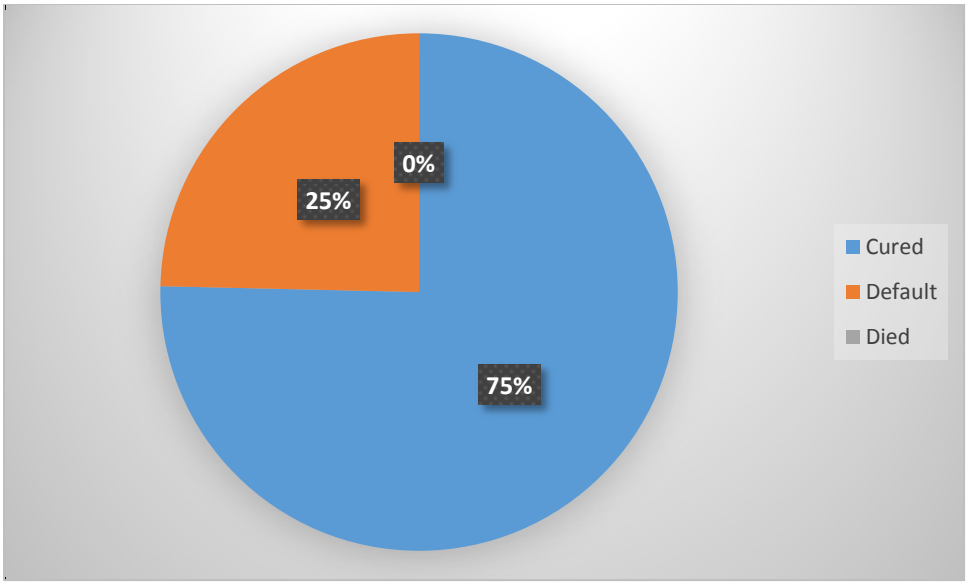

Figure 4.2 Diagram showing the outcome for CMAM 2016

Source: Field survey, 2019

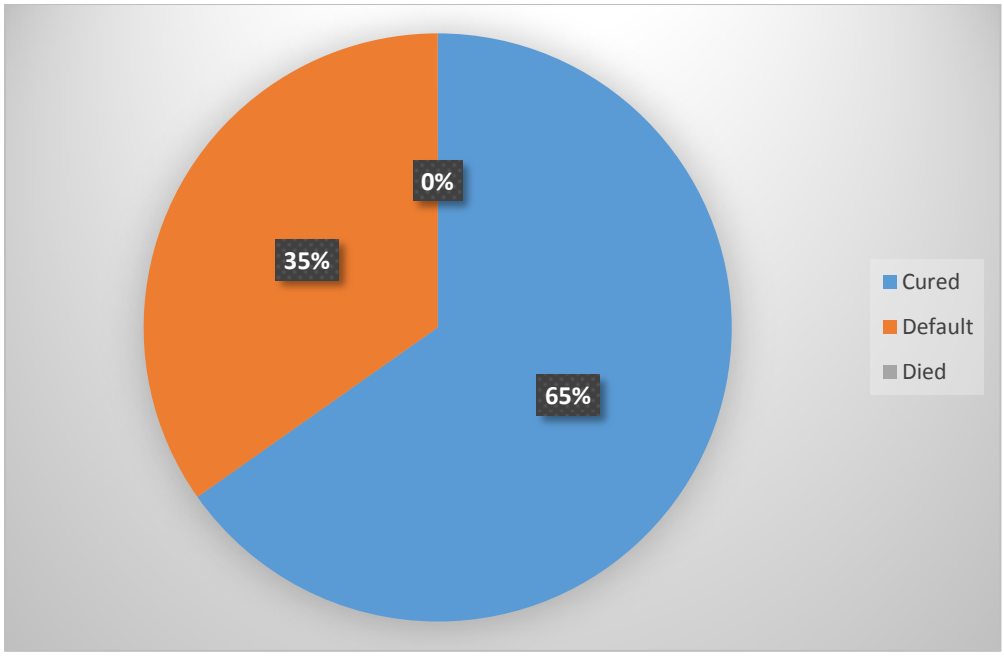

Figure 4.3 Diagram showing the outcome for CMAM 2017

Source: Field survey, 2019

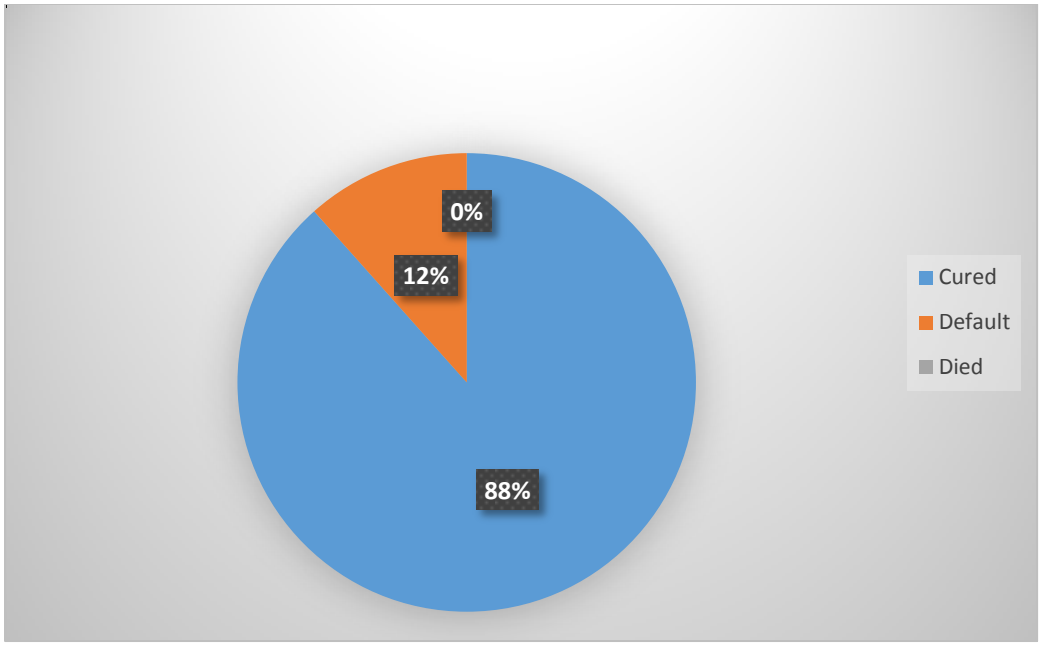

Figure 4.4 Diagram showing the outcome for CMAM 2018

Source: Field survey, 2019

CHAPTER FIVE

5.0 DISCUSSION

5.1 DEMOGRAPHIC CHARACTERISTICS OF THE MALNOURISHED CHILDREN

The records selected were records of malnourished children on the CMAM program whose ages ranged from 6 to 59 months who were either admitted directly at MCHH or referred from another facility. The study revealed that most malnourished children (82%, 77%, 73% and 81% for 2015, 2016, 2017 and 2018 respectively) whose ages ranged from 6 to 12 months were admitted on the CMAM program. This conforms to a study by Tette et al (2015) on the factors affecting malnutrition in children and the uptake of interventions to prevent the condition where the findings ascertained that children whose ages ranged from 6-12 months were found to be most malnourished. This finding has confirmed this study and clearly proves that the first year of a child is very vital in its nutrition and hence if proper nutrition guidelines are not followed the child may end up being malnourished or may die.

Table 4.1 of the results shows that few children aged 25-59 months were enrolled on the CMAM program, this bears similarities with a joint child malnutrition estimates publication by UNICEF, WHO and the World Bank Group which their key findings of the 2019 edition presented most children under 5 years in Asia and Africa to be either stunted or wasted with few of the children falling within the age group of 25-59 months. The alignment of this study's findings and that of UNICEF, WHO and the World Bank Group clearly depicted that few children within the Metropolis that falls within the age range of 25-59 months were not properly fed hence suffered malnutrition and was admitted on the CMAM program.

5.2 ANTHROPOMETRIC CHARACTERISTICS OF RESPONDENTS DURING ADMISSION

The mean weight of malnourished children admitted on the CMAM program for the various selected years revolved around 5.7kg, the mean Mid Upper Arm Circumference (MUAC) of malnourished children admitted on the program was about 10.9cm. Majority (58.7%, 63.04%, 56.52% and 51.45% respectively for 2015, 2016, 2017and 2018) of children were admitted on the CMAM program with either mild oedema or bilateral pitting oedema. This findings is consistent with submissions of the Ghana Health Service Training Course on Inpatient Management of Severe Acute Malnutrition 2012, which states that malnourished children aged 6-59 months with weight less than 10.0kg either with no oedema or +, ++, +++ oedema may be admitted on the program and given RUTF as specified. Also currently in Ghana, the admission criteria for CMAM for children 6-59 months are W/H of <- 3 z-score or MUAC < 115 mm and occurrence or absence of bilateral pitting oedema, poor or good appetite or any other medical complication (GHS, 2010). This study confirms the submission of the Ghana Health service and hence a child with a low weight or lesser MUAC or any of the alternate could be considered in admitting a child onto the CMAM program, also the presence of any type of oedema as the study revealed could also be used as a criteria for admission.

5.3 ANTHROPOMETRIC CHARACTERISTICS OF RESPONDENTS DURING DISCHARGE

The maximum weight of discharge was 13.9kg, with the maximum MUAC on discharge being 15.5cm with no sign of oedema. This findings is consistent with a submission in the trainer's manual of the outpatient care of children with acute malnutrition of the Ministry of Health, Uganda 2007, which explained that malnourished children aged 6-59 months who had been on the CMAM program for the recommended duration may be discharged if their

MUAC are found in the green region without any sign of oedema with an appreciable weight to match.

A study by Kerac et al (2012), on the admission and discharge criteria for the management of severe acute malnutrition in infants aged under 6 months also gave that there must be an appreciable increase in weight for a child to be discharged from the CMAM program. The findings of this study confirms that of the various studies conducted in different parts of the world on the discharge criteria of children on the CMAM program, hence either the weight of the child could be considered , MUAC as an alternative of the absence of oedema of any form from the child.

5.4 RELATIONSHIP BETWEEN WEIGHT AND MUAC DURING DISCHARGE

There was a clear relationship between the weight of the participants and their mid-upper arm circumference during discharge of participants from the CMAM program. This meant that as the weight of participants increased their MUAC also increased. The current findings from this study agreed with a study which was conducted in three different countries (Ethiopia, Malawi and Bangladesh) on children with SAM, hence treatment for SAM could be monitored using MUAC as an alternative for weight (Binns *et al.*, 2015). Though the findings from this study did not show a strong correlation as the study conducted in the three countries but there was still a positive correlation between the weight of participants and their MUAC during discharge.

5.5 RELATIONSHIP BETWEEN GENDER AND RECOVERY

Findings from this study showed that there was no correlation between the gender of participants and their recovery. Results from table 4.5 is contrary to findings from a study conducted in Chicago which demonstrated a correlation between the masculine gender and recovery status while the feminine gender did not have much influence on recovery status

(Scott, Foss and Dennis, 2011). This study revealed that whether a participant was masculine or feminine it did not affect the rate at which the child on the CMAM program could recover even the study conducted by Scott and his group proved otherwise. Other studies conducted in different locations on whether the gender of children on the CMAM program influenced their recovery status had some similarities with the findings of this study.

5.6 OUTCOME TREATMENT FOR CMAM PROGRAM

Majority (64.5%, 75.4%, 65.2%, and 88.4%) of malnourished children who were enrolled on the CMAM program were cured/ recovered for the years that were selected for the study. A report on the management of malnutrition also showed a high recovery rate of children admitted on the CMAM program (Bollinger and Trehan, 2016). Also a study by Farouk et al., 2016 on improving the outcome of severe acute malnutrition by community‐based management recorded a high rate of recovery for children who were enrolled on the program (Farouk *et al.,* 2016). The high recovery output of this study which was consistent with the various studies conducted in various parts of the world to assess the performance of the CMAM program clearly showed that the CMAM program is effective in achieving its main aim of child mortality due to malnutrition.

A publication by UNICEF in 2015 titled "How many lives do our CMAM programs save? A sampling-based approach to estimating the number of deaths averted by the Nigerian CMAM program", recorded a high proportion of children who were cured by the CMAM program with few defaults. The results published by UNICEF on the performance of the CMAM program within eleven states in Nigeria has similarities with my findings, which is majority of the children enrolled on the program recovered whilst few defaulted. Though the study by UNICEF conducted in the eleven states in Nigeria gave a very high recovery rate from malnutrition due to the CMAM program death was recorded in that study which is something

contrary to the findings in this study in which no mortality was recorded for any of the years that was under study.

CHAPTER SIX

6.0 CONCLUSION AND RECOMMENDATION

6.1 CONCLUSION

The study points to the fact that out of the 138 records selected for each year and assessed majority (82, 77, 73 and 81) of the children admitted on the program were found within the ages of 6-12 years for all the four years.

Children who were admitted on the program for the four years that was studied had their weight around 5.7kg with an average MUAC of about 10.9cm and most (58.7%, 63.0%, 56.5% and 51.5% respectively for 2015, 2016, 2017 and 2018) had either mild or bilateral pitting oedema. Majority (87.7%, 73.2%, 79.7% and 81.9% for 2015, 2016, 2017 and 2018 respectively) of the malnourished children reported directly to the hospital while few were referred from other facilities in the Metropolis.

Children discharged from the program had a maximum weight of about 13.9kg with a maximum MUAC of about 15.5cm. Majority (82.6%, 93.5%, 79% and 86.2% respectively for 2015, 2016, 2017 and 2018) were discharged without any form of oedema.

Recovery rate of the program was high though it did not have a uniform trend along the years of study (64.5%, 75.4%, 65.2% and 88.4% for 2015, 2016, 2017 and 2018 respectively). Defaulter rate was quite high (34.8%) in 2017 and low (11.6%) in 2018. There was no mortality for the period of study.

6.2 RECOMMENDATIONS

GHANA HEALTH SERVICE

The study revealed that children aged 6-12 years were predominant on the program, hence the first year off the new born should be carefully looked at in terms of nutrition. Exclusive breastfeeding campaigns should be intensified in communities and homes and not just at the hospitals, also proper weaning practices should be taught and encouraged.

METRO NUTRITION DIRECTORATE

The Metro Nutrition Directorate is advised to encourage Nutrition Officers within the Metro whose facilities no longer ran the CMAM program to refer clients immediately to the MCHH and also monitor efficient book and record keeping system at the site. Again Community Health Officers should be trained to follow up on clients to reduce defaulter rates.

6.3 Areas for Further Research

1. Factors responsible for the collapse of the CMAM program in facilities in the Metropolis
2. Assessment of dietary intake of children 0-1 year in the Metropolis

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APPENDIX

Questionnaire

Section A (Demographic characteristics): identification and General Information Section

1. Serial number:

2. Patient code:

3. Address:

4. Age (months):

5. Gender (F/M):

6. New admission (Y/N):

7. Transfer or readmission (Y/N):

Section B (Admission): Anthropometric Characteristics

8. Date:

9. Weight (kg):

10. Oedema (Y/N):

11. MUAC (cm):

Section C (Discharge): Anthropometric Characteristics

1. Date:
2. Weight (kg):
3. Oedema (Y/N):
4. MUAC (cm):

Section D (outcome)

5. Cured (Y/N):
6. Dead (Y/N):
7. Defaulter (Y/N):