FACTORS INFLUENCING RECOVERY AMONG CHILDREN WITH MODERATE ACUTE MALNUTRITION TREATED AT KIREHE DISTRICT HEALTH CENTERS

BIHIBINDI KABUNDI VIANNEY

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DECEMBER 2020
DECLARATION

This research study is my original work and has not been presented to any other Institution. No part of this research should be reproduced without the authors’ consent or that of Mount Kenya University.

Students Name: BIHIBINDI KABUNDI Vianney

Sign ____________________ Date ______________

Declaration by the supervisor(s):

This research has been submitted with our approval as The Mount. Kenya University Supervisor(s).

Dr. Erigène RUTAYISIRE

Sign ____________________ Date ______________

OT Marete

Sign ____________________ Date ______________
DEDICATION

To my parents who showed me the importance of studies since my primary school, for my spouse for her love and advices, for my children Chris, Kendrick, Ricky and Landry for their understanding for all time I spend at school, I dedicate this research study.
ACKNOWLEDGEMENT

I am grateful to my parents for their permanent advices and supports, for my wife and children for their love and encouragement.

I would like to give thanks to my supervisors Dr. Erigène RUTAYISIRE also OT Marete for their technical support for all the time spends for this proposal and dissertation.

I would like to say thank you also to my colleague for class for their collaboration and team work also express my gratitude to my colleague of work for advices and for all the persons who help me during my work in field of collecting data.
ABSTRACT

Undernutrition attack 11% of under five children in the world and increases the risk of mortality and morbidity. An efficient treatment of undernutrition could reduce this likelihood. Malnutrition still a big issue Rwanda as in many countries of Africa. The continent has more than 31 million of malnourished children but who out of proportion suffer from infections caused buy poor due immune function and malnutrition represent more than one-third of all deaths in pediatric service. The purpose of this research study is to establish influencing factors of recovery among less than five years moderately malnourished treated at Kirehe District health centers. This was a prospective study, a total of 200 under five years were approached and anthropometrics data were collected for weight, height and weight compared to height in z-score of the children. All children with -3≤WFH<-2 were enrolled in the nutrition program at all health centers in Kirehe district for three months and included in data analysis. The STATA 15 was used for data analysis. P value was used for bivariate analysis to test the significance of factors associated with MAM recovery. Multivariate Logistic regression also was conducted and odds ratios were used to determinate the level of association. After that children spent three months in nutrition program, WFH measurements showed that 77.5% were recovered from MAM. The majority of (81, 40.5%) and (79, 39.5%) the respondents reported that they fed cereals and legumes respectively to their children day before data collection. Small number (6, 3%) of children drunk milk. In this study, male gender, monthly income greater than RWF 5K, and micronutrients and deworming provided at health facilities were established to be linked with recovery of children with MAM (AOR=16.19; p<0.001, AOR=2.8; p=0.029, AOR=2.9; p=0.027 sequentially). The study documented high proportion of recovery in children with MAM who were enrolled in three months’ nutrition program. Results from the study revealed that small proportion of study participants feed animal protein source to their children. The study observed that children are more fed of cereals but less protein from animal source. Therefore, there is a need to educate parents on importance of feeding a balanced diet on daily basis meals. Also program and interventions related to malnutrition should prioritize education of parents on malnutrition co-morbidities prevention. Priority should be given on empowering vulnerable families with malnutrition through existing poverty reduction programs like ubudehe, VUP, GIRINKA among the others.
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<tbody>
<tr>
<td>ACF</td>
<td>Action against Hunger</td>
</tr>
<tr>
<td>CFSVA</td>
<td>Comprehensive Food Security and Vulnerability Analysis</td>
</tr>
<tr>
<td>CIHD</td>
<td>Center for International Health and Development</td>
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<tr>
<td>CMAM</td>
<td>Community based Management of Acute Malnutrition</td>
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<tr>
<td>CRCT</td>
<td>Cluster Randomized Controlled Trial</td>
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<tr>
<td>CSB</td>
<td>Corn Soy Blend</td>
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<td>CTC</td>
<td>Community-Based Therapeutic Care</td>
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<td>ENN</td>
<td>Emergency Nutrition Network</td>
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<td>GAM</td>
<td>Global Acute Malnutrition</td>
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<tr>
<td>HIV</td>
<td>Human Immunodeficiency Virus</td>
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<td>HMIS</td>
<td>Health Management Information System</td>
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<td>ICCN</td>
<td>Incentive Program to Combat Malnutrition</td>
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<td>IMCI</td>
<td>Integrated Management of Childhood Illness</td>
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<td>LNS</td>
<td>Lipid-based Nutrient Supplement</td>
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<td>MAM</td>
<td>Moderate Acute Malnutrition</td>
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<td>MDG</td>
<td>Millennium Development Goal</td>
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<tr>
<td>MUAC</td>
<td>Mid-Upper Arm Circumference</td>
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<td>NCHS</td>
<td>National Centre for Health Statistic</td>
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<td>NFHS</td>
<td>National Federation of State High School</td>
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<td>Acronym</td>
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<tr>
<td>NISR</td>
<td>National Institute of Statistics of Rwanda</td>
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<td>ONG</td>
<td>Non-Governmental Organization</td>
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<tr>
<td>OTP</td>
<td>Outpatient Therapeutic Program</td>
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<td>PIH</td>
<td>Partners in Health</td>
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<td>RCT</td>
<td>Randomized Controlled Trial</td>
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<td>SPHERE</td>
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<td>University College London</td>
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<td>UNHCR</td>
<td>United Nations High Commission for Refugees</td>
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<td>UNICEF</td>
<td>United Nations Children’s Fund</td>
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<td>WASH</td>
<td>Water, Sanitation and Hygiene</td>
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<td>WB</td>
<td>World Bank</td>
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<td>WFH</td>
<td>Weight for Height</td>
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<td>World Food Program</td>
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<td>WHO</td>
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<td>WHZ</td>
<td>Weight-for-Height Z-Score</td>
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OPERATIONAL DEFINITION OF KEY TERMS

Acute malnutrition: Also known as ‘wasting’, acute malnutrition is characterized by a rapid deterioration in nutrition status over a short period of time. In children, it can be measured using the weight-for-height nutritional index or mid-upper arm circumference.

Comorbidity: coexistence of two or more diseases process

Dietary pattern: is the quantity, quality, or combination of foods variety, drink, part of the diet and the number of times usually taken.

Deworming: is the administration of an anthelmintic drug to a human or animal to eliminate them from helminths parasites, such as roundworm, flukes and tapeworm

Food supplement: is a preparation that is planned to supply a nutrient that is missing from a food.

Micronutrient: a chemical element or substance required in trace amounts for the normal growth and development of living organisms.

Factors: In this study review, factors are associated to demographic, socio-economic characteristics and health conditions that could influence the apparition of undernutrition in children less than five years.

Malnutrition: is the pathology which appears when the organism is not receive the require of nutrients needed to play a role in maintaining the tissues, the function of organs and allowing adequate growth and development. It includes the under and over nutrition.

Moderate Acute Malnutrition (MAM): Defined as weight compared to height between minus two and minus three standard deviations from the median weight compared to height for the standard reference population.
**Primary caretaker:** refers to the parent who has the considerable responsibility for the daily care and rearing of a child.

**Recovery:** is when children get target weight-for-height over minus 2 in z-score or MUAC greater than 12.5 cm without pitting edema.
CHAPTER ONE: INTRODUCTION

1.0 Introduction

This chapter provides the background to the study, the problem statement and research objectives. The significance, limitations and scope for the study are comprised as well.

1.1 Background of the study

Globally, wasting (moderate and severe) affects nearly 52 million of under five years and among these wasted children, 17 million are suffering with SAM. Seventy-five (75%) of all those children suffering from malnutrition live in low and middle income countries while only one percent (1%) live in high income countries (UNICEF& WHO, World Bank, 2017).

The Africa continent is the one have the high number of malnutrition in the world after Asia and the joint estimate of malnutrition reported that children affected by undernutrition in Africa Sub-Saharan regions are 14.0 million that 4.1 million have SAM (UNICEF, WHO & World Bank, 2017). These statistics show that undernutrition represent an important health issue in Africa countries.

In 2011, the East Africa region had high prevalence of chronic malnutrition compared to three UN Sub regions and the second UN sub region with a prevalence of 42% being second to South-Central Asia (Black & Victoria, 2013).

The survey on Nutrition, Analysis of Vulnerability and Comprehensive Food Security (CFSVA) done in Rwanda showed that 1, 7% of under five years are wasted which show an improvement compared to 3.6% in 2012. In 2015, the data from survey showed that 36.7% of under five children are stunted, down from 43% in 2012 and 8.1% of underweight compared to 12% in 2012.
According to the Kirehe District Development Plan (2013-2018), chronic malnutrition is at 50, 7% but the acute malnutrition is low and represent only 1%. The population of Kirehe District is served by the hospital of Kirehe, 15 Health Centers and 12 services of maternity in each health posts of Bukora, Nasho, Kabuye, Musaza and Gahara.

The treatment of acute malnutrition using supplement foods could help malnourished children recovering and could reduce the risk of becoming seek (Ramdath& Golden, 1989). In Rwanda, all under five children moderately wasted are receiving cow milk and Corn Soy Beans as treatment in health centers for a period of 3 months before being discharged from nutrition program. The socio-workers in charge of nutrition and community health workers are following the use of those food supplements in malnourished families during this period of treatment. Mainly the fortified foods mixed with sugar and oil are used as treatment of acute malnutrition especially in humanitarian emergencies (De Pee, S., & Bloem, M.W. 2009).

The present study will assess factors related to socio-economic, demographic, and environmental and food cultural practices how they influence cure of moderate wasted children treated in health centers of Kirehe.

1.2 Problem statement

Around 5% of children less than five years worldwide are suffering from moderate acute malnutrition (MAM), defined as having a weight compared to height in Z-score who is comprise between -2 and -3 (Blacker et al., 2013). Compared to well-nourished children, the mortality rate is 3 fold higher (Olofin et al., 2013), and survivors suffer deficit in cognitive development (Nassar et al., 2012). The program of distribution of food supplements still the place whose moderately wasted children are receiving nutrition care in ambulatory in
pastoral settings (Nikiema L et al., 2014) with the expectation of decreasing these unfavorable results (WFP, 2012).

The prevalence of stunting in the Eastern province of Rwanda stood at 43% in 2010. It is also suffering from the highest levels of anemia in the country. Although, Partners in Health (PIH) provided supplements foods (CSB, Sugar, Oil) to under five years suffering from moderate acute malnutrition (MAM) in all health centers of Kirehe District as treatment between 2005 to 2018 but Health Management Information Systems (HMIS) reports from health centers showed new and relapsed cases with MAM.

However, there is no research done in this District to evaluate factors corresponding with rehabilitation of malnourished children. The identification of these factors will help design of proper preventive interventions and treatment, hence improve children recovery. In contrast, the lack of the accurate information on these factors will cause poor planning for the proper strategies to mitigate the problem. The present study will provide the basic information by exploring factors influencing rehabilitation among wasted children treated at health centers of Kirehe District. It is for this reason we are motivate to do this research.

1.3.1 General objective

To determine factors influencing recovery among children with moderate acute malnutrition treated in health centers of Kirehe District.

1.3.2 Specific objectives

(i) To calculate the proportion of children who recovered from moderate acute malnutrition among moderately wasted children treated in health centers of Kirehe District.
(ii) To determine dietary pattern among moderately wasted children treated in health centers of Kirehe district.

(iii) To determine factors associated with recovery among moderate wasted children treated in health centers of Kirehe District.

1.4 Research questions

(i) What is the proportion of recovery for moderate wasted children among the children treated at health centers of Kirehe District?

(ii) What is dietary pattern among the children with moderately wasted treated in health centers of Kirehe District?

(iii) What are factors associated with cure among moderate wasted children treated in health centers of Kirehe District?

1.5 Significance of the study

This review gave knowledge that could be useful for the District Health Officers and Partners in Health in knowing factors that influencing recovery among children treated for MAM and make decision on how to adjust their nutrition interventions programs, designing new policies for better management of under five years with malnutrition.

1.6 Limitations of the study

This study realized a limitation linked to geographical scope. This study was conducted in one district so it could not be generalized to other districts of the country.

1.7 Scope of the study

The investigation considered all under five children who been treated for moderate wasted using supplement foods in health centers of Kirehe District because they are the most at risk
of malnutrition. The present study aimed at determining the factors that influencing cure among moderate wasted children treated at Kirehe District health centers.

The District of Kirehe is located in Eastern Province that is constituted by seven districts, twelve sectors, 60 cells and 612 villages. According to Rwanda Institute of Statistics (NISR), Kirehe District has in total 1.118.5Km2 with 164.012 male and 176.971 female inhabitants. This study was conducted for the period from 1 January to 31 March 2019.

1.8 Organization of the study

This research review has five sections. The section one comprise background, problem statement, research questions, general aims, specific aims, importance and the extent of the review. The Section two presented the theoretical study that contains the theoretical and empirical review, the research gaps identification, the theoretical framework, the conceptual framework and the summary. Chapter three is the methodology and it describes the methods that were used in the review. Session four comprise findings and discussions. The chapter five includes the summary of findings, the conclusion and recommendations.
CHAPTER TWO: REVIEW OF RELATED LITERATURE

2.0 Introduction

This chapter is composed by a theoretical study, empirical study, critical analysis and research questions identification, theoretical structure, conceptual framework and conclusion.

2.1 Theoretical literature

2.1.1 Definition of MAM

MAM is explained by the comparison between height and weight express in z-score and whose value is between -2 and -3 and the MUAC between 11.5 cm and 12.5 cm. In all the world, 32.8 million of children under five years are affected by moderate acute malnutrition whose 31.8 million are living in low income countries (Black et al., 2013). Recovery is when children get target weight-to-height over minus 2 Z-Score, MUAC over 12.5 cm and no pitting edema within 12 weeks (Matilsky et al., 2009).

2.1.2 Causes of MAM

The principal causes of MAM are low income in the family, poor maternal health, famine, lack of micronutrients, living in unhealthy environment, consumption of non-potable and low coverage of immunization (The Maharashtra Malnutrition Monitoring Committee, 2009). Among factors that could lead to wasting we could include morbidity, infection and illnesses. These factors are responsible of a continue cycle of malnutrition. Frequent episodes of diarrhea could cause wasting in under five children and they are more exposed to malnutrition than in well-nourished children. Poor feeding practices in Infant and Young Children Feeding (IYCF) for example improper introduction of breastfeeding, non-respect of exclusive breastfeeding, poor practices in introduction of complementary feeding, and lack of care during illness period could negatively impact to health status of the children. The
probability of becoming sick or died is high in under five with MAM when they are not receiving any treatment this could progress to severity wasted. This stage of severity has nine times greater risk of mortality than in normal children (WHO & UNICEF, 2009).

2.1.3 Treatment of MAM

Different approaches could be used in providing treatment for cases with MAM depending on the place where we are living. In the period of food security, when population and families had easy access to balanced diet, parents could be advised to promote use consumption of local foods for facilitating recover in children with acute malnutrition (Bhutta et al., 2013). This intervention should be associated to approaches such as health promotion to help reducing the underlying causes of that contribute to the process of developing malnutrition (health seeking behaviors and WASH).

In food insecurity populations during the period of emergency, food distribution programs are used as a strategy of reducing deaths and prevention of malnutrition. Foods distribution through Supplementary Programs Foods (SFPs) in families with one or more under five children could be done through target distribution for cases identified as MAM. The practice which meet standard is to distribute foods ration centered around basic food staffs such as Corn Soy Beans or CSB (GNC, 2012). For routine child health services, all less than five years, whether registered or not in supplementary feeding program should also receive their regular health and nutrition services scheduled. The services such as immunization, micronutrients, deworming as well as feedings and other health advice are available and are providing in health facilities (Manual of operations WFP, 2016).
2.1.4 Factors influencing recovery for MAM

2.1.4.1 Factors related to child

A child who has a normal appetite could easily eat food given compared to a child without appetite (Bhandari et al., 2001). Children appetite could be influenced by factors such the nutritional status, the living environment and illnesses (Bhutta et al., 2008). Even the under-five has appetite, it is not the same for young children who cannot eat a big quantity of food. For that reason, the food supplement need to be energetic and dense, that could allow the child to consume the total quantity of food (Kennedy & Alderman, 1987).

2.1.4.2 Factors related to caregivers

The purpose supplementary feeding program is depending on capacity of caregiver most of time she is a mother. Poor results from some supplementary feeding centers should be attributed to lack of engagement due to poverty and unhealthy environment. Food distribution programs had good results when mothers had enough time and resources to prepare and serve foods as expected by the program. Caregiver who prepare food in a home environment (Leroy et al., 2008) with sufficient space, potable water and less amusement found it simple compare to those who are cooking foods in demanding environment and entertainment (Paknawin-Mock et al., 2000).

2.1.4.3 Factors related to program delivery

During selection type and quantity of food supplement to distribute, the program has to take account that higher calorie ingested without taking account of the daily need by the body and could be remunerate by the food supplement redistribute in the family. Programs had to consider that food supplement have to be balanced as the child is growing. The Corn Soy Beans (CSB) was made by cereals and legumes, rich in proteins, low in fat, poor in animal
protein that is suggested to promote recovery in malnourished children (De Pee S and Bloem M.W (2009).

2.1.4.4 Socio-economic factors

Factors related to economic and socio in many limited resources countries are important determinants of health outcomes. The scientific publication has documented the link between undernutrition, poverty and maternal unemployment (Silveira et al., 2010, Abuya et al., 2012). Families with low income are exposed to famine and limited power of buying foods.

2.1.4.5 Socio-demographic factors

The National Family Survey (NFHS-3) reported that there is a link between sociodemographic risk factors and malnutrition in India (Mishra & Shukla, 2014).

2.1.4.6 Socio-cultural factors

Illiteracy and prohibited foods could result in poor introduction of complementary foods among young mothers in poorest countries. The nutritional value of weaning foods could not be improved only by excluding the problem of poor weaning practices among mothers in low income countries. Only conducting training and nutrition education sessions could help changing some practices related to feeding and improve the quality of diet for children. Proper food habits and adopting good behaviors from parents could influence positively the growth and nutrition status in children (Saha et al., 2008).

2.1.5 Burden for MAM

Undernutrition is a vital overall problem of public health. Depending on the report of World statistics, a total number of 52 million of less than five children are classified as having acute malnutrition in 2012, of which 33 million have MAM (WHO, 2013). Consequently, MAM affect violently one in ten children less than five years in poorest countries (UNICEF, 2014).
Regionally, there are significant variations in the prevalence of MAM. Approximately one in 6 children under five years in South Asia suffering from MAM in 2013 (17%) followed by West and Central Africa (11%) and Middle East and North Africa (8%). The prevalence of MAM is 10% or higher in 19 out of 80 countries with recent estimates. These children are at high risk of developing Severe Acute Malnutrition (SAM), and even the cases of MAM have a roughly three-time higher risk of mortality from common communicable diseases than if they were well-nourished (Black et al., 2008 & Fernandez et al., 2001). Definitely, MAM and SAM contribute at 11.5% of total death of less than five years (Black et al., 2013).

2.1.6 Magnitude of recovery in the world

A new examination calculates that 32 out of 134 countries with available data had a rate of acute malnutrition of 10% or more, a charge usually recognized that as a “public health emergency demanding a quick action” (UNICEF et al., 2012). Overall, these calculations identified around 33 million children suffering from moderate acute malnutrition and additionally 19 million from severe acute malnutrition (SAM, WHZ<-3 and/or presence of edema). In emergency regions, this prevalence of acute malnutrition could be increased considerably and rich a high level of severely malnutrition and increased child mortality. For example, during the period of famine which occurred in Somalia in 2011, the global acute malnutrition (GAM) go up around 40% where an estimated of 258,000 deaths happened and more of the half where children (Checchi & Robinson, 2013).

2.1.7 Situation of recovery regionally

The regions from Africa and South-East regions of Asia have documented a high rate of malnutrition, for about 39.4% of chronical malnutrition, 24.9% with low weight compared to age, and 10.3% of acutely malnourished children under five years (WHO, 2010). Corresponding from 2015 Millennium Development Goal (MDG), sub-Saharan Africa (SSA)...
account one third of all cases with malnutrition generally, call attention that malnutrition remained a big health issue in children less than five years in many regions and require a support of intervention (United Nations, 2015).

2.1.8 Panorama of malnutrition in Rwanda

The data collected on weight and height during the Rwanda Demographic and Health Survey were important to establish the nutrition status and to measure children’s health and growth (RDH, 2014-2015).

This survey at national level showed that 38 out of 100 under five children are always stunted and 14 out 100 are chronically undernourished with severity. The survey showed 11% of children less than 6 months were stunted and it increased by the factor of age of child, growing in interval of age from 6 to 8 months from 18% to 49 % and for the interval of 18 to 23 months of age reducing to 37 percent between children from 48 to 59 months. The percentage of wasting in under five is 2% and less than 1% are wasted at level of severity. The survey demonstrated that 9% under five years are underweight and 2% are severely underweight.

2.2 Empirical literature

2.2.1 Socio-economic factors that influence recovery

In 2006 during food crisis in Malawi, the supplementation of children with MAM used Corn Soy Blend showed a recovery rate of 35 to 67% (ACF, 2006). They realized that the high recovery rate could be caused the increase of attention from mothers and clinical staffs who delivered care. The health care professionals had always sensitized on importance of feeding in rehabilitation of wasted children. A study conducted in Ethiopia at Hidabu Abote District, North Shewa, Oromia, September 2012 (n=820) among children age 6 to 59 months shown
that purification of water at household was the unique variable linked with undernutrition by evaluating wasting. The same study conducted in Ethiopia shown that child age, the economic situation of the family, the use of contraceptive methods and the pre-lacteal alimentation were linked to chronic malnutrition. The research also showed that the children aged from 13 to 24 months had 7 times high risk of becoming stunted than children age from 6 to 11 months (AOR=7.15; 95% CI=2.33, 21, 90). An additional relationship found that families whose monthly earnings varied between 750-1000 birr were unlikely to become chronically malnourished than under five children whose families had a monthly earnings lower than than 750 birr (AOR=0.24; 95% CI=0.11, 0.51). The income of family was linked with the growth of young children. According to the study done in Nigeria by Sebanjo et al. (2019) on how socio and economic factors could influence the growth of children. He observed a significant percentage of mothers whose cases aged were under 25 years (28%) in comparison to 18% of the mothers in control groups. Most of cases in mother’s groups were non educated (35% versus 26%, OR 3.6 95% CI 2.0-6.4) also most of them were partially qualified (68% versus 50.5%, 1.26 95% CI 2.92-16.27). Children who come from low economic category were exposed to malnutrition compared to those who came from families with high income. In rural regions, the difference in economic situation seem to be silent and is the important determinant of children nutritional status. Low level of income in poor countries limit the variety and the total quantity of meal to consumed. Low economic status increases the probability of developing infections through mechanism as non-adequate personal or unhealthy environment (Edris, 2006).
2.2.2 Factors associated with recovery among children with MAM

2.2.2.1 Administration of food supplements

A research study done in Malawi by LaGrone LG et al. (2012), mentioned an average in number of days of receiving treatment till discharging was 23 days in the cohort but among them those who consumed corn soy took two supplementary days to recovery from malnutrition (ANOVA, P<0.003). Also, more than 50% recovered during few weeks by receiving nutrition care. Nackers (2010), specified a require median range needed to be recovering from malnutrition. It was lower for children who took lipid-based nutrient supplement group this means the median was for 4 weeks and the range varied between two and sixteen weeks. Matilsky (2009), demonstrated that the duration of staying in the nutrition program for treatment was between 25th and 75 centiles. The duration was low in the group of lipids which average was 14 days and by comparing with the group of corn-soy blend which average was 28 days. For children receiving Corn Soy the food supplementation took in average 4 weeks but for those who received Soy/Peanut Fortified Spread the supplementation took 3.3 weeks. The study conducted by Vanelli (2014), documented that in the intervention group children who received combination of WFP supplementation and lipid-based nutrient got a quick cure (5.54 weeks) compared to the group of regimen only by food supplementation (8.16 weeks).

2.2.2.2 Primary caretaker is mother

According to the study done in Brazil by Rita Maria Monteiro Goulart et al., (2009) on identifying factors influencing nutritional recuperation in children on treatment in ICCN (Incentive Program to Combat Malnutrition) for 570 followed in the program, results from this research demonstrated that children whose mothers were unemployed developed worse when compared to malnourished children whose mothers were employed. After doing some
adjustment, it was observed that mothers who didn’t have an employment their children took long time to get recovering. 35.6% (-0.18 to -0.24). Results for the study showed that the cure rate of children who attend the treatment program had a higher result. The outcome of children who received treatment in ICCN was interesting if considering other factors evaluated in the study review.

2.2.2.3 Presence of co-morbidities

Lacey N LaGrone et al., (2012) carry out an analysis using the binary logistic regression for evaluating the impact of different elements which could influence the rehabilitation of children in two different groups of treatment. Children HIV positive took less time to recovery and developing acute malnutrition had high risk in children with HIV (61%) and the probability of developing Kwashiorkor was rare in children HIV-positive (13%). Children who received the antiretroviral treatment had a higher cure rate (79.2). The recovery rate was not influencing by the variety of food taken by children. Co-morbidity of some infections such as HIV, malaria and diarrhea when diagnosed at beginning of the study were associated with lack recovery rate and low weight gain. For example, in three studies done in children living with HIV, the recovery rates were low with high mortality rate compared to international sphere standards (Kerac et al., 2009). The existence of some clinical signs such as diarrhea, vomiting was a reason of not gaining weight for a total of three consecutive weeks, absence of appetite when taking RUTF and medicines that could presage the rehabilitation for severely wasted children. The duration in recovering for severely wasted children have a relation with prescription of usually medicines and the management of complications. The delay of staying in Outpatient Therapeutic Program has consequences related to psycho-social and economic. Generally, 75% of children will recovery for severe acute malnutrition for a period of less than 4 to 6 weeks (Gebremichael et al., 2014).
2.2.2.4 Administration of micronutrients

Acute diarrhea has a strong association weight loss and the supplementation in high energy and protein could promote quick recovery between infections (Hoares et al., 1996). Advanced research in the process of the immune system in general, and the role play by some particular micronutrient deficiencies, for example the diminution of immunity due to deficiency in vitamin A and Zinc. Additional studies were concentrated on how some micronutrients prevent diseases, or decrease morbidity and mortality (Pnasziou P & Meackerias DE, 1993; Aggarwal, R., Sentz, J & Miller, MA. 2007). It is known that many micronutrients participate in reinforcement of the immune system but we could have some limiting factor due to the deficit in nutrients. Hence, the fortification with different micronutrients was tested, but the effect on infections such as diarrhea and other were varied (Sharieff et al., 2006) and (Soofis et al., 2013). Furthermore, many micronutrients and macronutrients administrated after 24 months could have a better effect on growth mainly for population with poor growth (Joseph L Roberts and Aryeh D Stein, 2017).

2.2.2.5 Deworming

Multiple research studies done on the influence of WASH intervention on child well-being (Pruss-Ustun A et al., 2014) and parasites infections (Strunz EC et al., 2014), fewer and not so much meticulous reviews conducted concerning outcomes treatment demonstrated few evidence. A new Cochrane study put in place five RCT with objective of measuring the effect of WASH interventions and find that there was no evidence and no impact of that program on weight compared to age neither weight compared height but showed a small impact when compared height to age in Z-Score (Dangour, AD., Watson, L., Cumming, O., et al., 2013). This means that the intervention had a short time and no review had examined the impact of WASH interventions neither the effect of relapsing cases after recovering from
MAM. Others studies seems important to evaluate how WASH implementation programs could facilitate clinical improvement of children treated from MAM. This comprise also biological exams concerning parasite intestinal infections, diarrhea diseases and environmental gastrointestinal pathology during the course treatment of MAM.

2.3 Critical review and research gap identification

The second consultation hosted by WHO in collaboration with UNICEF, WFP and UNHCR from 24\textsuperscript{th} to 26\textsuperscript{th} February 2010 with the purpose of discussing the programmatic aspects of managing cases with MAM among children under five years showed that there was no conclusive understanding on the better method of treating moderately wasted children and most of research in nutrition are on severe acute malnutrition. Few studies demonstrated the association between administration of food supplements and recovery from MAM (Vanelli et al., 2014), reported quick rehabilitation from the children who used food supplements and lipid-based nutrient from World Food Program than those who received only supplement foods program. Most of studies were conducted on SAM and few were done on MAM. Furthermore, those studies were conducted in communities and were longitudinal studies in nature. Also, there is a lack of attention in managing MAM compared to SAM despite is large number of cases with malnutrition associated with mortality risk. Most of those studies were interested in treatments of malnutrition and overlooked the factors influencing recovery. This absence is due partly to the fact that the current methods in managing MAM include articles which are very expensive, programs with low coverage most of time focused on prevalence rate than incidence rate and high prevalence of defaulting.
2.4 Theoretical framework

The transactional model of development stipulated by Arnold Sameroff in 1975 been used in this study. Sameroff was convinced that the interaction of nature and nurture is fundamental by predicting the positive and negative outcomes for children.

The transactional model concentrates on development as outcomes of a many sides which are interchanging among the child characteristics, the experience of family and the resources linked to the socio, the economy and resources. The influences are categorized in proximal and distal.

Proximal influences include that influence of child’s growth and development such as the close relation between parent and family. For instance, parents with children affected by malnutrition, they have to interact actively with those children in order to energize the emotional and cognitive development of the children hence to facilitate quick recovery from malnutrition.

Distal influences include those factors influencing the child indirectly. Some of those factors include factors like family income. Most of time, children passed the maximum of their time with parents that the reason they are dependent on their proximal influences. Distal factors influence parent’s capacity to give to their children. These comprise negative factors, such as unemployment, low level of education, absence of clean water, inaccessibility to health care, food insecurity, etc. which could be due to supplementary risk of child’s growth. Poor families have hardships to satisfy the basic need of their children. Those family could not be able to buy health insurance for family members nor properly feeding their children. This may lead to both moderate or severe malnutrition to their children. This model guided researcher to elaborate the predictor and outcomes variables of the review and interpret results (Arnold Sameroff, 1975).
2.5 Conceptual framework

Independent variables

<table>
<thead>
<tr>
<th>Demographic characteristics:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Participant’s age, sex, residence, marital status</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Socio-Economic factors:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Level of education</td>
</tr>
<tr>
<td>Income and Occupation</td>
</tr>
<tr>
<td>Family size, Alcoholism</td>
</tr>
<tr>
<td>Breastfeeding practices</td>
</tr>
<tr>
<td>Complementary feeding</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Environmental factors:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Water availability</td>
</tr>
<tr>
<td>Characteristics of water</td>
</tr>
<tr>
<td>Hygiene</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Health factors:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Presence of comorbidities</td>
</tr>
<tr>
<td>Administration of micronutrients</td>
</tr>
<tr>
<td>Deworming</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Food cultural practices:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Food habits</td>
</tr>
</tbody>
</table>

Dependent variables

- Recovery

Intervening Variables

- Health education and promotion
- Government policies
- Community perception and culture issues

Figure 2.1 Conceptual framework

Source: Researcher, 2020

Figure 2.1 on page 18 demonstrates the relation between predictor and outcomes variables and intervening variables. The review conducted in Sri Lanks in 1993 showed that malnutrition in under five children still a health issue who is linked with poor conditions of hygiene and sanitation, socio-economic factors, congested places and low level of education of parents (De Silva et al., 1993). A Demographic and Health Survey conducted in Ethiopia in 2011, selected the centers of treatment of cases with MAM in area without food insecurity and where there wasn’t a supplementary food program but with current programs such as micronutrients supplementation, deworming, nutrition, water and sanitation had a better outcome in recovering children with malnutrition.
2.6 Summary

Determining the rate of children who were cured for moderate wasted among the children with MAM treated is a central key for proper planning for the intervention needed to solve the problem. The review articles documented a considerable numbers of proportion for MAM recovery.

Also recognition of diet pattern indicates the need of nutrition education on type of food which constitute a balanced diet. Animal protein source was missing in most review studies.

In addition, it is of important to demonstrate the influencing factors for the malnutrition in community in order to establish the preventives measures. Family income, age and parents’ education were commonly found to be associated with malnutrition. However, it was reviewed that there is lack of studies conducted on moderate acute malnutrition. Most of the studies were conducted on treatment of severe acute malnutrition and very few looked at the influencing factors.
CHAPTER THREE: RESEARCH METHODOLOGY

3.0 Introduction

This section three narrate the research method, population group, sample design and technique of sampling, data gathering methods and procedures, analysis techniques and procedures, testing validity, reliability and considerations values of ethics.

3.1 Research Design

Prospective study was conducted in this research. This is a type of cohort study, where participants are registered in the study before developing any disease. This was a prospective study that included all 6-59 months’ children newly diagnosed with MAM and were enrolled in the nutrition program at all health centers in Kirehe district between 1st January and 31st March 2019. Then, these new cases of MAM were followed-up for a period of 3 months to estimate the proportion of children who were or were not recover. A prospective study design with quantitative research methods was used in this study to obtain information on factors associated with recovery among children treated for MAM in Kirehe District health centers.

Data on socio-economic and clinical characteristics of these children were collected at enrollment. Anthropometric measurements (Weight, Height) were collected on each visit at the clinic when children came for follow-up consultation and food supplements distribution (ideally twice a month).

3.2 Target population

This study population considered all under five years aged from 6 to 59 months screened as moderately wasted and were enrolled in nutrition program in 16 health centers of Kirehe District.
3.3 Sample design

3.3.1 Sample size

This study considered as sample size all children from 6 to 59 months diagnosed as new cases with MAM in 16 health centers of Kirehe District from 1st January to 31st March 2019. It aims to estimate the percentage of under five children who recovered from malnutrition after 3 months of follow-up with 95% CI and a level of precision of +/- 10%. Using the most conservative estimate of children who were recovered from MAM of 0.5, this study required a minimum of 97 children (Equation 1). With the historical records on monthly enrollments of MAM children in Kirehe district, we estimated the sample size for this study to be around 200, so we had a sufficient number of children to do so.

The Cochran’s sample size formula permit to determine an ideal sample size considering a desire level of precision and confidence, and the estimate proportion of the characteristic present in population. This equation been discovered in 1977.

\[ n = \frac{z^2 \cdot p(1-p)}{\varepsilon^2} \]  
(Equation 1)

\( n \)= sample size  
\( z \) for 95% CI= 1.96  
\( p \)= 50%, the estimated proportion of children who will recover  
\( \varepsilon \) is the desired level of precision (margin of error)

Number of children followed-up= 200

3.3.2 Sampling technique

This research used a total enumerative sampling, also known as sampling consecutive. It is a technique of sampling where each element who meet inclusion criteria is selected until the
require sample size is reached. This study included all children with MAM who were actively enrolled in the Supplementary Feeding Program (SFP) at all 16 health centers in the Kirehe District Hospital catchment during the period 1\textsuperscript{st} January to 31\textsuperscript{st} March 2019. The primary caregivers of these children were interviewed as they brought their children for anthropometrics measurement, physical exams, medical follow-up and treatment.

A total of 200 participants from the study who respond to inclusion criteria and their caregivers accepted to voluntary participate by signing a written consent form and were recruited in the research. Therefore, this study had a sufficient sample of under five children to determine the percentage of children who was cured from Moderate Acute Malnutrition after 3 months of follow-up.

3.4 Data collection methods

These data were captured from Supplementary Feeding Program (SFP) registers. Data of the first day of admission of child to the program served as baseline information. Some variable data were collected considering three months of food supplement treatment as the assessment or end line information.

3.4.1 Data collection instruments

A semi-structured and researcher administrated form used in gathering information concerning some characteristics such as demographic and socio-economic of the participants. Also the caregivers were asked the information regarding on clinical signs and symptoms, diagnostics and medications received at admission, program of enrolment at admission, types of foods received and their duration in the program. At last anthropometrics (weight, height, and weight/height) were taken for children and recorded.
3.4.2 Administration of data collection instruments

During the data collection, researcher-administered questionnaire method was used for mothers or caregivers while for health care professionals, self-administered questionnaire method was used because they were capable to read and write. A separate questionnaire was used for health care professionals and it had information such as lab test results and routine medicine administered at the day of admission in nutrition program as recommended by the national protocol of management of malnutrition in under five years. Data collection was conducted on the respective days of food supplement distribution one health center at the time.

3.4.3 Validity of the instrument

It’s the expand in where clarification of the test results is justified and based on the specific utilization of the test in which is expected to assist (Kimberlin & Winterstein, 2008). In other words, validity refers to the expand that the method used in data collection what it supposed to measure accurately. Before stating data collection, a pilot study was conducted in 5 Health Centers (Kirehe, Rusumo, Kigarama, Mahama, Musaza) and a questionnaire was administrated to 10 mothers with malnourished children and 5 health providers and corrections were done accordingly to respondent answers.

3.4.4 Reliability of the instrument

This is the expand to which an experiment or procedure of data yields similar results under the same conditions at all times. Reliability assess the stability of measures, internal consistency of measurement instruments (Kimberlin & Winterstein, 2008). The reliability of the instrument was verified by test re-testing technique to measure the consistence of the instrument. The questionnaires were administered to the same 5 individuals at two different
point of time of one week. The test-re-test coefficient was computed and it was 0.78 which indicated good consistency of the instrument.

3.5 Data analysis procedures

A database was constructed in excel to serve as platform for data entry. After cleaning, data were imported into STATA version 15.1.

Descriptive statistics for continuous variables were calculated. For categorical variables frequency and percentages were computed. A test of chi square was conducted to measure the association and p-value was set at 5%. For determining factors associated with recovery logistic regression was used also odds ratios were calculated.

3.6 Ethical considerations

A letter of permission to do the study was obtained by Mount Kenya University and Kirehe District Health Unit. Before beginning the study, the clear explanation and the aim of the study were given to mothers/caregivers and received their written informed consent. They were also being ensured their full conscience to leave from the research at any moment they wish to do so without any inconvenience. The respondents were also assured that their responses will be kept secret and will serve for the objective of the review. The children were also informed for the study and to assent and their mother provided a written consent to access the recorded anthropometrics data for their children.
CHAPTER FOUR: RESEARCH FINDINGS, DISCUSSIONS AND RECOMMENDATIONS

4.0. Introduction

Session four contains outcomes presentation, interpretation plus discussion. The chapter presents the findings of the study done from 1\textsuperscript{st} January 2019 to 31 March 2019 on factors influencing rehabilitation among moderate wasted children in Kirehe District health centers. The results of this study are presented in this chapter in four principal sections which are demographic, socio-economic and health characteristics of the study participants, the estimate proportion of under-five recovered from MAM after three months of follow-up and treatment, the socio-economic, demographic and health factors affecting children’s recovery and the multivariate analysis of associate factors to MAM recovery of children suffering from MAM among the children in health centers of Kirehe District.

4.1 Socio-demographic characteristics of the Study Participants.

Overall, 200 children were approached and anthropometrics data were collected on height for weight of the children. All children with $-3 \leq WFH \leq -2$ were enrolled in the program for three months and included in data analysis.
Table 4.1 Socio-demographic characteristics of the study participants

<table>
<thead>
<tr>
<th>Variable</th>
<th>Category</th>
<th>Frequencies</th>
<th>Percentage (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Children’s sex</td>
<td>Male</td>
<td>94</td>
<td>47</td>
</tr>
<tr>
<td></td>
<td>Female</td>
<td>106</td>
<td>53</td>
</tr>
<tr>
<td>Children’s age (months)</td>
<td>6-11</td>
<td>60</td>
<td>30</td>
</tr>
<tr>
<td></td>
<td>12-23</td>
<td>96</td>
<td>48</td>
</tr>
<tr>
<td></td>
<td>24-35</td>
<td>27</td>
<td>13.5</td>
</tr>
<tr>
<td></td>
<td>36-47</td>
<td>10</td>
<td>5</td>
</tr>
<tr>
<td></td>
<td>48-59</td>
<td>7</td>
<td>3.5</td>
</tr>
<tr>
<td>Parenting</td>
<td>Orphans</td>
<td>53</td>
<td>26.5</td>
</tr>
<tr>
<td></td>
<td>Live parents</td>
<td>147</td>
<td>73.5</td>
</tr>
<tr>
<td>Insurance</td>
<td>Yes</td>
<td>124</td>
<td>68</td>
</tr>
<tr>
<td></td>
<td>No</td>
<td>76</td>
<td>32</td>
</tr>
<tr>
<td>Caregiver’s levels of education</td>
<td>No formal education</td>
<td>74</td>
<td>37</td>
</tr>
<tr>
<td></td>
<td>Primary education</td>
<td>110</td>
<td>55</td>
</tr>
<tr>
<td></td>
<td>Secondary education</td>
<td>16</td>
<td>8</td>
</tr>
<tr>
<td>Care giver’s Occupations</td>
<td>Out of job</td>
<td>2</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>Self employed</td>
<td>36</td>
<td>18</td>
</tr>
<tr>
<td></td>
<td>Permanent job</td>
<td>11</td>
<td>5.5</td>
</tr>
<tr>
<td></td>
<td>Temporary</td>
<td>17</td>
<td>8.5</td>
</tr>
<tr>
<td></td>
<td>Unemployed</td>
<td>134</td>
<td>67.5</td>
</tr>
<tr>
<td>Household Size</td>
<td>1-2 children</td>
<td>124</td>
<td>62</td>
</tr>
<tr>
<td></td>
<td>3-4-children</td>
<td>43</td>
<td>21.5</td>
</tr>
<tr>
<td></td>
<td>More than 4 children</td>
<td>33</td>
<td>16.5</td>
</tr>
</tbody>
</table>

Source: Primary data.
The table 4.1 on page 26 shows that 96(48%) of study participants were age group of 12-23 months whereas in age of 48-59 months were only 7(3.5%), out of the total 94 children (47%) were male and 106 children (53%) were female. 73.5% of them are living with both parents and 26.5% live with one parent. Around 68% have insurance while only 32% didn’t have a mutual (health insurance). 134(67.5%) of the caregivers were unemployed, and 110(55%) has only primary education while 16(8%) has secondary education. For the size of the households; 124(62%) of the households has 1-2 children, 43(21.5) of the households has 3-4 children, and 33(16.5%) of the households has more than 4 children.

4.2 Presentation of findings

This part presents the outcomes of the study review and are presented by considering the objectives. The findings showed in this section are the percentage of under five children who recovered from MAM after the intervention, dietary pattern and factors associated with recovery from MAM.

4.2.1 Estimate proportion of children who recovered from MAM after three months

Follow-up and treatments

The first month at first day of admission, the in charge of nutrition at health center took weight, height, height/weight and calculated Z-Scored to diagnose the type of malnutrition if the children was classified as MAM (-3≤WFH<-2 Z-Score), he is immediately enrolled in nutrition program for 3 months of follow-up and treatment and all anthropometrics measurement are documented in nutrition register. But after being assessed by the nutritionist, the child was referred to the nurse for physical exams, assessment of danger signs and lab exams to see if the malnourished children have any infection who need treatment. Each month the children with MAM is coming twice for anthropometrics
measurement, nurse consultation, nutrition education and food distribution till the month 3, when the children was benefit the last evaluation and when they saw his WFH in Z-Score > -2, has appetite, no infection, he is considered as recovered and discharged from nutrition program.

Table 4.2 The Proportion of children who recovered from MAM among the children with MAM treated in health centers of Kirehe District

<table>
<thead>
<tr>
<th>Variable</th>
<th>Category</th>
<th>Recovery status</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Recovered n=155(77.5%)</td>
</tr>
<tr>
<td>Age</td>
<td>Less than or equal 23 months</td>
<td>112 (76.7)</td>
</tr>
<tr>
<td></td>
<td>24 – 35 months</td>
<td>25 (73.5)</td>
</tr>
<tr>
<td></td>
<td>Greater than 36</td>
<td>18 (90)</td>
</tr>
<tr>
<td>Gender</td>
<td>Female</td>
<td>65 (61.3)</td>
</tr>
<tr>
<td></td>
<td>Male</td>
<td>90 (95.7)</td>
</tr>
<tr>
<td>Number of children</td>
<td>1-2 children</td>
<td>96 (77.42)</td>
</tr>
<tr>
<td></td>
<td>3-4 children</td>
<td>30 (69.8)</td>
</tr>
<tr>
<td></td>
<td>More than 4 children</td>
<td>29 (87.9)</td>
</tr>
<tr>
<td>Education level of parents or</td>
<td>Not educated</td>
<td>56 (75.7)</td>
</tr>
<tr>
<td>caregiver</td>
<td>Educated</td>
<td>99 (78.6)</td>
</tr>
<tr>
<td>Daily intake</td>
<td>Once a day</td>
<td>11 (78.6)</td>
</tr>
<tr>
<td></td>
<td>Twice a day</td>
<td>124 (79)</td>
</tr>
<tr>
<td></td>
<td>More than 2 times</td>
<td>20 (69)</td>
</tr>
<tr>
<td>Source of foods</td>
<td>Through income</td>
<td>41 (78.9)</td>
</tr>
<tr>
<td></td>
<td>Working for foods</td>
<td>19 (65.5)</td>
</tr>
<tr>
<td></td>
<td>Supports</td>
<td>95 (79.8)</td>
</tr>
<tr>
<td>Micronutrients and deworming</td>
<td>No</td>
<td>98 (72.1)</td>
</tr>
<tr>
<td></td>
<td>Yes</td>
<td>57 (89.1)</td>
</tr>
<tr>
<td>Monthly income</td>
<td>Less than or equal 5k</td>
<td>100 (72.5)</td>
</tr>
<tr>
<td></td>
<td>Greater than 5k</td>
<td>55 (88.7)</td>
</tr>
<tr>
<td>Alcohol abuse</td>
<td>No</td>
<td>77 (72.6)</td>
</tr>
<tr>
<td></td>
<td>Yes</td>
<td>78 (83)</td>
</tr>
<tr>
<td>Breastfeeding</td>
<td>Up to 6 months</td>
<td>2 (100)</td>
</tr>
<tr>
<td></td>
<td>6 plus</td>
<td>153 (77.3)</td>
</tr>
<tr>
<td>Foods share</td>
<td>No</td>
<td>97 (77)</td>
</tr>
<tr>
<td></td>
<td>Yes</td>
<td>58 (78.4)</td>
</tr>
<tr>
<td>Use of latrine</td>
<td>Community latrine</td>
<td>93 (80.2)</td>
</tr>
<tr>
<td></td>
<td>Neighbor’s latrine</td>
<td>2 (100)</td>
</tr>
<tr>
<td></td>
<td>Private latrine</td>
<td>60 (73.2)</td>
</tr>
</tbody>
</table>

Source: Primary Data, STATA output.

Weight compared to Height in Z-Score was used to measure recovery rate and it is recommended by WHO as a golden standard to measure nutrition status among under five
children. The table 4.2 on page 29 shows the percentage of children who recovered from MAM after three months on interventions provided in health centers of Kirehe District. The intervention received was Corn Soy Beans (CSB), nurse consultation, lab exams and treatment of infections if existing. Pre and post anthropometric measurement were collected from health centers and Weight compared to Height in Z-score (WFH) was used to determine children who recovered from MAM. According to WHO, children were classified to be recovered from MAM since their WFH in Z-score > -2. In this study it shows that an overall proportion of recovery was 77.5 % and only 22.5% were not.

![Bar Chart](image)

**Figure 4.1 Overall proportion of recovery among children treated from MAM.**

Within the age group, children aged above 36 to 59 months were recovered at 90% whereas children aged 24-35 months were recovered at 73.5%. Male participants were highly recovered that female at 95.7% and 61.3% respectively. Recovery rate among children whom their caregivers are educated was high compared to not educate at 78.6% and 75.7% respectively. Micronutrients and deworming provided at health facility was contributed to the recovery as children who received them were recovered at 89.1% and for those who didn’t,
were recovered at 72.1%. The family whose monthly income was varying above 5 thousand, their children was recovered from MAM at 88.7%.

4.2.2 Dietary pattern among children with MAM treated in health centers of Kirehe District

The respondents were asked the type of diet they had taken on the past 24 hours before the beginning of data collection and the majority 81 (40.5%) reported that they had cereals meals (corn flour porridge, cornmeal).

Table 4. 3 Dietary pattern among children with MAM treated in health centers of Kirehe District.

<table>
<thead>
<tr>
<th>Type of foods</th>
<th>Frequency</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cereals meals (corn flour porridge, cornmeal)</td>
<td>81</td>
<td>40.5</td>
</tr>
<tr>
<td>Animal protein source</td>
<td>9</td>
<td>4.5</td>
</tr>
<tr>
<td>Legumes</td>
<td>79</td>
<td>39.5</td>
</tr>
<tr>
<td>Porridge</td>
<td>2</td>
<td>1</td>
</tr>
<tr>
<td>Porridge and legumes</td>
<td>15</td>
<td>7.5</td>
</tr>
<tr>
<td>Porridge, legumes &amp; fruits</td>
<td>6</td>
<td>3</td>
</tr>
<tr>
<td>Tubers</td>
<td>8</td>
<td>4</td>
</tr>
</tbody>
</table>

Of the total of 200 respondents, 79 (39.5%) said that they ate legumes while 15 (7.5%) reported that they had porridge and legumes. Only 8 (4%) respondents ate the tubers and 6 (3%) ate porridge, legumes and fruits. A small proportion of 9 (4.5%) reported that they had animal protein (milk, meat, eggs) on the day before data collection.
Figure 4.2 Pie chart of the dietary pattern of the respondents.

A small number of the respondents 3 (1.5%) and 2 (1%) reported that they had animal proteins (meat, eggs) and combination porridge and legumes respectively.

4.2.3 Factors associated with recovery among children with MAM.

At 5% level of confidence, the chi-square test showed that gender, monthly income and micronutrients and deworming provided were significantly associated with children’s recovery from MAM (p values were <0.001, 0.007, and 0.011 respectively).
Table 4.4 Bivariate analysis of factors associated with MAM recovery

<table>
<thead>
<tr>
<th>Variable</th>
<th>Category</th>
<th>Recovered n=155 (77.5%)</th>
<th>Not n=55 (22.5%)</th>
<th>X²</th>
<th>P value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age</td>
<td>&lt;= 23 months</td>
<td>112 (76.7)</td>
<td>34 (23.3)</td>
<td>2.152</td>
<td>0.34</td>
</tr>
<tr>
<td></td>
<td>24 – 35 months</td>
<td>25 (73.5)</td>
<td>9 (26.5)</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Greater than 36</td>
<td>18 (90)</td>
<td>2 (10.0)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Gender</td>
<td>Female</td>
<td>65 (61.3)</td>
<td>41 (38.7)</td>
<td>33.86</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td></td>
<td>Male</td>
<td>90 (95.7)</td>
<td>4 (4.3)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Parenting</td>
<td>Orphans</td>
<td>43 (81.13)</td>
<td>10 (18.9)</td>
<td>0.55</td>
<td>0.46</td>
</tr>
<tr>
<td></td>
<td>Live parents</td>
<td>112 (76.19)</td>
<td>35 (23.81)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Insurance</td>
<td>Yes</td>
<td>93 (75)</td>
<td>31 (25)</td>
<td>1.169</td>
<td>0.279</td>
</tr>
<tr>
<td></td>
<td>No</td>
<td>62 (81.58)</td>
<td>14 (18.42)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Household size</td>
<td>1-3 children</td>
<td>96 (77.42)</td>
<td>28 (22.58)</td>
<td>3.514</td>
<td>0.173</td>
</tr>
<tr>
<td></td>
<td>3-4 children</td>
<td>30 (69.79)</td>
<td>13 (30.23)</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>More than 4 children</td>
<td>29 (87.88)</td>
<td>4 (12.12)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Number of children</td>
<td>1-3 Children</td>
<td>96 (77.42)</td>
<td>28 (22.6)</td>
<td>3.514</td>
<td>0.173</td>
</tr>
<tr>
<td></td>
<td>4 children</td>
<td>30 (69.8)</td>
<td>13 (30.2)</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>More than 4 children</td>
<td>29 (87.9)</td>
<td>4 (12.1)</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Not educated</td>
<td>56 (75.7)</td>
<td>18 (24.3)</td>
<td>0.224</td>
<td>0.64</td>
</tr>
<tr>
<td>Education level of parents or caregiver</td>
<td>Educated</td>
<td>99 (78.6)</td>
<td>27 (21.4)</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Once a day</td>
<td>11 (78.6)</td>
<td>3 (21.4)</td>
<td>1.42</td>
<td>0.492</td>
</tr>
<tr>
<td></td>
<td>Twice a day</td>
<td>124 (79)</td>
<td>33 (21)</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>More than 2 times</td>
<td>20 (69)</td>
<td>9 (31)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Source of foods</td>
<td>Through income</td>
<td>41 (78.9)</td>
<td>11 (21.1)</td>
<td>2.813</td>
<td>0.245</td>
</tr>
<tr>
<td></td>
<td>Working for foods</td>
<td>19 (65.5)</td>
<td>10 (34.5)</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Supports</td>
<td>95 (79.8)</td>
<td>24 (20.1)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Micronutrients &amp; deworming</td>
<td>Yes</td>
<td>57 (89.1)</td>
<td>7 (10.9)</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Less than or equal 5K</td>
<td>100 (72.5)</td>
<td>38 (27.5)</td>
<td>6.475</td>
<td>0.011</td>
</tr>
<tr>
<td></td>
<td>Greater than 5K</td>
<td>55 (88.7)</td>
<td>7 (11.3)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Alcohol abuse</td>
<td>No</td>
<td>77 (72.6)</td>
<td>29 (27.4)</td>
<td>3.035</td>
<td>0.081</td>
</tr>
<tr>
<td></td>
<td>Yes</td>
<td>78 (83)</td>
<td>16 (17)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Breastfeeding</td>
<td>Up to 6 months</td>
<td>2 (100)</td>
<td>0</td>
<td>0.586</td>
<td>0.444</td>
</tr>
<tr>
<td></td>
<td>6 plus</td>
<td>153 (77.3)</td>
<td>45 (22.7)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Foods share</td>
<td>No</td>
<td>97 (77)</td>
<td>29 (23)</td>
<td>0.052</td>
<td>0.820</td>
</tr>
<tr>
<td></td>
<td>Yes</td>
<td>58 (78.4)</td>
<td>16 (21.6)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Use of latrine</td>
<td>Community latrine</td>
<td>93 (80.2)</td>
<td>23 (19.8)</td>
<td>1.937</td>
<td>0.380</td>
</tr>
<tr>
<td></td>
<td>Neighbor’s latrine</td>
<td>2 (100)</td>
<td>0</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Private latrine</td>
<td>60 (73.2)</td>
<td>22 (26.5)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Source: Primary Data.  

Table 4.4 above presents an interesting factor to recovery, where it shows that children who did not receive any treatment at health facility were significantly associated with recovery.
This is to mean that since children who doesn’t experience any infections or other comorbidity lead to quick recovery from MAM. Bivariate analysis reveal that there was an association between monthly income and children’s recovery. The percentage of recovered in under five years was higher among those whose income were greater than 5 thousand ($x^2=6.475, p=0.011$).

The variables with less than 5% in the bivariate analysis were considered for logistic regression. In the final multivariate analysis adjusted mode, social-demographic variables which are gender and family monthly income were found to be associated with children’ recovery.

**Table 4. 5 Multivariate analysis on factors associated with MAM recovery among children treated**

<table>
<thead>
<tr>
<th>Variable</th>
<th>Category</th>
<th>AOR</th>
<th>95% CI</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Gender</strong></td>
<td>Female</td>
<td>Reference</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Male</td>
<td>16.19</td>
<td>&lt; 0.001 5.39 – 48.63</td>
</tr>
<tr>
<td><strong>Micronutrients</strong></td>
<td>Yes</td>
<td>2.9</td>
<td>0.027 1.13 - 7.58</td>
</tr>
<tr>
<td><strong>&amp; deworming</strong></td>
<td>No</td>
<td>Reference</td>
<td></td>
</tr>
<tr>
<td><strong>Monthly income</strong></td>
<td>$\leq$ RWF 5000</td>
<td>Reference</td>
<td></td>
</tr>
<tr>
<td></td>
<td>&gt; RWF 5000</td>
<td>2.8</td>
<td>0.029 1.11 – 7.51</td>
</tr>
</tbody>
</table>

Table 4.5 above shows that being male, other treatments not provided at health facilities (micronutrients and deworming) and monthly income greater than RWF 5000 are the contributing factors of children recovery from MAM. The findings demonstrated that boys were 16.19 more likely to recovery from MAM in three months of intervention than their counterpart girls (AOR=16.19, p<0.001, 95%CI: 5.39 48.63). Regarding monthly income, family whose income is greater than five thousand were 2.8 more likely to recover than those whose income is less or equal to five thousand (AOR=2.8, p=0.029, 95%CI: 1.11- 7.51).
The present study showed that also other factor that was associated to the children’s recovery was other treatments (micronutrients and deworming) provided at health facility. For other treatment, those who receive micronutrients and deworming were 2.9 more probably to cure than those who didn’t receive micronutrients and deworming (AOR=2.9, p=0.027, 95%CI: 1.13 – 7.58).

4.3 Discussion

By referring on weight for height (WFH) measurements, children who achieved nutrition recovery was 77.5%. By running the bivariate and multivariate analysis, it was documented that factors identified to influence MAM recovery were being male; earning monthly greater than RWF 5000 and micronutrients and deworming provided apart from foods supplements at health facilities were associated to the recovery of children from MAM.

A recent study conducted in Malawi (Matilsky et al., 2009) demonstrated that children with moderately wasted had significantly higher cure rate after only 8 weeks using RUF treatment (80%) than did those receiving CSB (72%) this could be due to sharing practices more pronounced in CSB than RUF who was a recent product with specific guides. If we compared those results with our findings in Kirehe District where the recovery rate was 77.5% using WFH, this higher recovery rate could due by home visits which were conducted on weekly basis by social workers in charge of nutrition and community health workers based in each village went to see how food supplements were using at each family with malnutrition and advised them on better use. The percentage of recovery met the nutrition standards (sphere goals) which recommended the proportion of recovery equal or over to 75%.

A randomized controlled trial done in Malawi between children with moderate acute malnutrition establish that 58% of children were cured when consuming RUTF, although
only 22% were cured when receiving CSB (Patel et al., 2005). But another study conducted in Niger by Medecins Sans Frontieres (MSF) showed that of 59,698 had moderate acute malnutrition and were treated by therapeutic food and the cure rate was at 95% and clinical services were given for some diseases such as HIV, malaria, endemic illnesses, whereas the Malawi trial didn’t do it (Defourny et al., 2007). There are differences between the studies conducted in Malawi and Niger but the percentage of cure was high in Niger. This result from the study conducted in Niger reinforces what we find in Kirehe District where treatment got at health facilities contributed in recovery rate at 89.1%.

A study conducted in Nigeria by Obatolu VA (2003) has shown that children who came from unemployed mothers had hard evolution compared to mothers who were employed. This study had evidence that mothers whose children suffering from malnutrition complete paid jobs but when they had a job, the income is increasing and living conditions at home were improved. The findings of this review demonstrated the link between not having jobs and malnutrition and this impact on child rehabilitation when mother is unemployed. This could due to lack of resources for child healthcare, before and after treatment, explaining the effect of mother absence of jobs on nutrition rehabilitation. The results are similar to our research in Kirehe District where the monthly income of parents was associated with recovered of children with MAM at 77.5%. This might be explained by the transactional model where the lack of income lead to negative impact the development of child. Parents with less monthly income might not be able to provide balanced diet to their children or pay health insurance for family.

A research study done by (Christine M McDonald et al., 2013) in South of Asia documented how gendered effects of sibling’s impact on child under nutrition. For wasted cases, the malnutrition is frequently due to result birth with low spacing. A recent published production
from the medical journal of Lancet on maternal and child nutrition hypothesizes that improving women’s empowerment is an important point of intervention for improving nutrition. The series explain that women’s empowerment is the mechanism through which increase in income and yield for agricultural inputs affect intra household resource allocation and children’s nutrition (Ruel, & Alderman 2013). Also transactional model stipulated that employment which is one of the means to empowerment and income brings to positives aspects in children development.

This published series from Lancet have an association with our research conducted in Kirehe where the increase of monthly income for parents most of time in women was associated with higher recovery for children affected by MAM.
CHAPTER FIVE: SUMMARY OF FINDINGS, CONCLUSION AND RECOMMENDATIONS

5.1 Summary Findings

As summary, malnutrition was found still to be a health issue in Kirehe, Rwanda. It was observed that after that the children were enrolled in the three months’ program an overall proportion of recovery was 77.5% using WFH measurements.

The study also observed that a big number of the caregivers (81, 40.5%) feed their children cereals meals and very few fed their children animal proteins such as milk, eggs, and meat (9, 4.5%) and porridge (2, 1%).

The findings of this study showed that factors such as male gender, monthly income greater than RWF 5000 and micronutrients and deworming interventions received in health facilities were associated with children’s recovery from MAM.

5.2 Conclusions

The aim of this study was to assess factors that influence rehabilitation among under 5 years’ children treated for MAM at Kirehe district health centers. The findings showed the proportion of 77.5% of recovery from MAM.

It was revealed that small proportion of respondents feed on animal protein source (4.5%); and factors associated with MAM recovery was documented. Male gender (AOR=16.19, p<0.001, 95%CI: 5.39 – 48.63), provision of medical treatment (AOR= 2.9, p=0.027, 95%CI: 1.13 – 7.58) and monthly income greater than RWF 5000 (AOR= 2.8, p=0.029, 95%CI: 1.11 – 7.51) were found to be associated with MAM recovery.

5.3 Recommendations

At completion of this research study, the successive recommendations were formulated:
• **To Ministry of Health**

We recommend to Ministry of Health to provide at regular basis micronutrients and deworming for children under five years with malnutrition during the period of treatment in health centers to enhance quick recovery.

• **To Health centers community health supervisors**

Results from the study revealed that small proportion of study participants feed animal protein source to their children. Therefore, there is a need to educate parents on benefit of feeding a balanced meal to their children on daily basis. Also program and interventions related to malnutrition should prioritize education of parents on malnutrition co-morbidities prevention.

• **To Non-Government Organizations**

For Non-Government Organizations working in health and nutrition to support poor families with malnourished children by paying insurance card to allow them benefiting consultation, lab exams and treatment in case of any infection.

• **To District Officers**

Priority should be given on empowering vulnerable families with malnutrition through existing poverty reduction programs like Ubudehe, VUP, GIRINKA among others.

**5.4 Suggestion for future study**

As the researcher found that there are rare of literatures and studies done on MAM treatments, the researcher recommend furthers studies regarding Moderate acute malnutrition in other regions of Rwanda.
REFERENCES


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Edris (2006). Low economic status increases the probability of developing infections through mechanism as non-adequate personal or unhealthy environment
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Lacey N LaGrone, Indi Trehan, Gus J Meuli, Richard J Wang, Chrissie Thakwalakwa, Kenneth Maleta, & Mark J Manary (2012). A novel fortified blended flour, Corn-Soy Blend ‘‘plus plus’’, is not inferior to lipid-based ready-to-use not inferior to
lipid-based ready-to-use supplementary foods for the treatment of moderate acute malnutrition in Malawi children


Matilsky, DK., Maleka, K., Castleman, T., & Manary, MJ. (2009). Supplementary feeding with fortified spreads results in higher recovery rates than with Corn/Soy Blend in moderately wasted children

Mengesha MM, Deyessa N, Tegegne BS, & Dessie Y (2016). Treatment outcome and factors affecting time to recovery in children with severe acute malnutrition treated at outpatient therapeutic care program


Fabienne Nackers, France Broillet, Diakite Oumarou, Ali Djibo, Valerie Gaboulaud, Philippe J. Guerin, Barbara Rusch, Rebecca F. Grais, & Valerie Capier (2010). Effectiveness of ready-to-use therapeutic food compared to a corn/soy-blend-based pre-mix for the treatment of childhood moderate acute malnutrition in Niger


APPENDICES
APPENDIX I: AUTHORIZATION LETTERS

Mount Kenya University
(MKUR)
INSTITUTE OF POST GRADUATE STUDIES & RESEARCH

INTRODUCTION LETTER

REF: MKU64/PGS&R/023/2019
19th February, 2019

TO WHOM IT MAY CONCERN

Dear Sir/Madam,

RE: BIBHINDI KABUNDI YIANNEY - MKU REGISTRATION NUMBER: MPH/2015/24922

This is to confirm that the above named person is a beneficile student of Mount Kenya University, Rwanda.

He is currently carrying out research work to enable him complete his Master of Public Health (Epidemiology Option) Degree Program. The title of his research is:

FACTORs INFLUENCING RECOVERY AMONG CHILDREN WITH MODERATE ACUTE MALNUTRITION TREATED AT KIREHE DISTRICT HEALTH CENTERS

The information received will be confidential and for academic purpose only.

Any assistance accorded him to complete this study will be highly appreciated.

Thank you.

[Signature]

For Alice Kinyi Kwaite, PhD
Ag. DIRECTOR INSTITUTE OF POST GRADUATE STUDIES & RESEARCH
REPUBLICA Y'U RWANDA

INTARA Y'UBURASIRAZUWA
AKARERE KA KIREHE

Kirehe, ku wa 14/01/2019
Ref: ...

Bwana BIHIBINDI KABUNDI Vianney
Nutritionist Program Coordinator PIH
Tel: 0788 685 098

Impamvu: Kw'ameterwa gukorera ubushakashtsi mu Karece ka Kirehe

Bwana,
Yishingye ku iburwa y'ye yo ku wa 06/03/2019 wanyendi byo usabo aburenganzina bwo gukorera ubushakashtsi mu Bigo Nderabuzima by'Karece ka Kirche wegeyehe n'ibamuna ya Mabana kugerina go ubime Dipolome ya Masters in Public Health.

Kibera byungwa n'amahoro by'ibyenyiwa ku bashakashtsi bwa Bigo by'umuvunuko mu Karece ka Kirche cyane cyane mu gukasa gohanganana n'ikibazo cy'imabere nabi y'ubariye hamwe mu bana bari mu asi y'umukama mu 5.


Mugire akazi keza.

MUZUNGU Gerald
Umuyobozi w'Akarece ka Kirche

Himyveshehe:
- Mubaduru Umuyobozi w'Akarece wa umuganga yezi yezira y'ibamuna
- Umunyamabanga Yishingwahoro wa'Amakere ka Kirche
- Umuyobozi w'Imakere Rustange mu Karere ka Kirehe

Po Box 51
KIBUNGO

Teli Fone: 4777
Web Site www.kirehe.gov.rw
E-mail: kirehedistrict@kirehe.gov.rw

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APPENDIX II: INFORMED CONSENT FORM

Title of the study

Factors influencing recovery among children with moderate acute malnutrition treated in Health Centers of Kirehe District.

Principal Investigator

BIHIBINDI KABUNDI Vianney

Purpose

The purpose of this review is to investigate factors that determine recovery among children with MAM treated in health centers of Kirehe District.

Procedure

If I agree to accord my authorization to my child to attend this research study:

I have an obligation to respond to all questions related to his nutrition, food intake and medical history.

He or She will have to accept to take anthropometrics measurement such as to measure weight for height/length, MUAC.

Benefits

There will be a benefit to my child to participate in this research by knowing his nutrition status also the importance of attending nutrition education session, medical consultation and
food supplement distribution by helping my child recovering from malnutrition and to know how to prevent it.

Confidentiality

The collection of information in this study with participation of your child will be kept confidentially and will be used only for the research objective.

Right to refuse or withdraw

The participation of your child in this review is voluntary and he is free to withdraw at any time without any consequence to her clinical care.

Consent

After listening carefully to the clarification from…………… I give my free consent to participate in this review study.

Signature: ………………………Date:…………………………

Thanks
APPENDIX III: QUESTIONNAIRE

I. CHILD INFORMATIONS

1. ID of malnourished child:

2. Date of birth:

3. Age (months):

4. Sex: 1. Male □ 2. Female □

5. Life parents or not both parents: 1. Live parents □ 2. Orphans □

6. Anthropometrics measurement

<table>
<thead>
<tr>
<th>Anthropometrics Measurement taken</th>
<th>Month 1</th>
<th>Month 2</th>
<th>Month 3</th>
</tr>
</thead>
<tbody>
<tr>
<td>MUAC (cm)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Weight (Kg)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Height (m)</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

7. Is the child with malnutrition received nurse consultation at first visit of admission?
   Yes □ No □

8. Is the child with malnutrition received nurse consultation in others follow-up visits?
   Yes □ No □
9. Is the child with malnutrition received the test of HIV at admission?

   Yes □    No □

   If yes, what was the result (positive or negative)?

10. Is the child with malnutrition received the test of TB at admission?

    Yes □    No □

    If yes, what was the result (positive or negative)?

11. Is the child with malnutrition received these micronutrients at admission?

    Vitamin A    Yes □    No □

    Iron/Folic Acid    Yes □    No □

12. Is the child with malnutrition received deworming (Mebendazole) at admission?

    Yes □    No □

13. Food supplements received

<table>
<thead>
<tr>
<th>Foods</th>
<th>Month1</th>
<th>Month 2</th>
<th>Month3</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sosoma2 Fortified(6Kg)</td>
<td>Yes □</td>
<td>Yes □</td>
<td>Yes □</td>
</tr>
<tr>
<td></td>
<td>No □</td>
<td>No □</td>
<td>No □</td>
</tr>
<tr>
<td>Sugar (1Kg)</td>
<td>Yes□</td>
<td>Yes□</td>
<td>Yes□</td>
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<tr>
<td></td>
<td>No□</td>
<td>No□</td>
<td>No□</td>
</tr>
<tr>
<td>Oil (1l)</td>
<td>Yes□</td>
<td>Yes□</td>
<td>Yes□</td>
</tr>
<tr>
<td></td>
<td>No□</td>
<td>No□</td>
<td>No□</td>
</tr>
</tbody>
</table>
II. CAREGIVERS INFORMATION

SECTION 1. MOTHER/CAREGIVER

2.1 What is respondent relationship with the children?

1=mother □

2=Care taker (Blood relative) □

3= Care taker (Non Blood relative) □

2.2 What is the level of education the mother?

1=Not educate □

2=Primary school □

3= Secondary school □

4=Tertiary □

2.3 What is the present job status of the head of household?

Out of job= 1 □

Temporally employment= 2 □

Permanent jobs=3 □

Working for oneself= 4 □

Stop to work= 5 □
2.4 What is your actual legal status?

Not married=1 □

Live as man and wife=2 □

2.5 Is the mother ever drink alcohol?

Yes=1 □ No=2 □

2.6 How often do you have a drink containing alcohol?

Never=1 □

1 time a week =2 □

2 to 3 times per week=3 □

4 or more times per week=4 □

Almost daily =5 □

2.7 Number of children and by sex for this mother  No □  Sex: M □  F □

2.8 Has your child received the following drugs during national campaign?

(Verify on the immunization card of the child)

Deworming  Yes=1 □  No=2
Vitamin A  Yes=1 □  No=2

2.9 Breastfeeding duration

1. Never
2. 0-3 months
3. 3-6 months
4. 6+

2.10 At what age did you start introduction to solid foods?

1= Less than a month  2= One month
3= Two months  4= Three months
5= Four months  6= Five months
7= Six months  8= Don’t Know

2.11 What foods were given to the child yesterday? (Multiple answer is allowed)

1. Cereal meal □
2. Legumes □
3. Fish □
4. Milk, Eggs or meat □
5. Tubers □
6. Fruits □
7. Vegetables □  8. Others □
2.12 How many meals did the child eat yesterday?

1. Individual plate
2. Common plate
3. Common plate with adults
4. Individual plate assisted by adult

2.13 Did your child with malnutrition receive food supplements at each visit at Health Center?

   Yes=1
   No= 2

2.14 If no, is there any stock out in supplement foods from Partners In Health happening the following months?

   Month 1 of treatment Yes=1 No=2
   Month 2 of treatment Yes=1 No=2
   Month 3 of treatment Yes=1 No=2

2.15 How many times do you prepare porridge per day when supplement food is available?

   One time=1 □
   Two times=2 □
   More than two=3 □
2.16 Did your child share supplement foods with other children at home?

Yes=1 □

No=2 □

2.17 Does your child have a card of mutuel de sante or insurance card?

Yes=1 □

No=2

2.18 Did your child have one of the following symptoms two weeks before the diagnostic of malnutrition? (Fever, cough, diarrhea)

Yes=1

No=2

Not sure=3

SECTION 2. HOUSEHOLD HEALTH

2.19 What is the main source of drinking water in your household?

Pump=1

Swamp=4

Other=7

River=2

Lake=5

Rain=3

Tap=6

2.20 Does your household treat its drinking water?

Yes=1

No=2
2.21 How do you treat drinking water?

Boil it = 1
Sur Eau= 2
Filter = 3
Other= 4

2.22 How do you dispose of feces?

1=Private latrine
2=Community latrine
3=Bush (open air)
4= Neighbors latrine
5= Others

1.23 Where do you dispose rubbish?

1. Compost pit
2. In the garden
3. Bush
4. Others

1.24 What times do you take bath for your child?

1. Once a day
2. Twice a day
3. Never
4. When told

1.25 Where do you dry your household clothes after washing?
1. Use clothing line
2. Hang on trees
3. Lay on ground
4. Dry on grass
5. Dry on roots
SECTION 3. SOURCE OF INCOME

1.26 What is your family categorization in UBUDEHE?
1. Ubudehe 1
2. Ubudehe 2
3. Ubudehe 3

1.27 What are your sources of food?
1. Through income
2. In-kind (working for food, food given)
3. Sales of agricultural produce from the land
4. Gifts

1.28 What is approximately the amount in Frw of your income by month?
1. 0-1000 Frw
2. 1000-2000 Frw
3. 2000-3000 Frw
4. 3000-4000 Frw
5. 4000-5000 Frw
6. > 5000 Frw
### ANTHROPOMETRICS

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<tr>
<th>Did the provider correctly and completely assess</th>
<th>Yes</th>
<th>No</th>
<th>Not applicable</th>
<th>Comments</th>
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<tbody>
<tr>
<td>Weight</td>
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<td>Height/Length</td>
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<td>MUAC</td>
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### HISTORY

<table>
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<tr>
<th>Food or Fluid intake in past few days</th>
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<tbody>
<tr>
<td>Usual diet</td>
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<tr>
<td>Diarrhea</td>
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<tr>
<td>Vomiting</td>
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<tr>
<td>History of fever</td>
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<tr>
<td>Frequency of breastfeeding(&lt;2years)</td>
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<tr>
<td>Duration of breastfeeding(&lt;2 years)</td>
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<tr>
<td>Eye signs of Vitamin A deficiency</td>
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### DANGER SIGNS

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<tr>
<td>Cough</td>
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<td>Poor appetite/anorexia</td>
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<td>LABORATORY</td>
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<td>Oil</td>
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<td>Remind caregiver about appointment date?</td>
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