FACTORS AFFECTING THE REHABILITATION OUTCOME (OF OUTPATIENT THERAPEUTIC PROGRAM) OF CHILDREN WITH SEVERE ACUTE MALNUTRITION IN DURAME, SOUTHERN ETHIOPIA,

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KEY WORDS

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Moderate acute malnutrition

Plumpy nut

Nutritional rehabilitation

Cure

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Non-cure

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DEFINITION OF TERMS

The definitions of key terms used in this study are:

- Acute malnutrition (wasting) – the sum of moderate and severe acute malnutrition (SAM). Wasting is an indicator of short-term growth failure or current acute malnutrition related to weight loss measured by weight-for-height. It is the most commonly used nutritional indicator in emergency nutrition surveys and a criteria for admission, follow up and discharge in therapeutic feeding program.
- Severe acute malnutrition (SAM) – a weight-for-height measurement of below 70% of the WHO or National Centre for Health Statistics (NCHS) median or <-3SD of the mean; or presence of bilateral pitting edema of nutritional origin (also called kwashiorkor); or a mid-upper-arm circumference (MUAC) of less than 110 mm (Marasmus) or both in children age 6 to 59 months
- Moderate acute malnutrition (MAM)– a weight-for-height measurement of 70% to 80% of the WHO or NCHS median; or ≥-3SD & <-2SD of the mean; or a MUAC of equal to or greater than 110 and less than 120 mm and no pitting edema or both in children age 6 to 59 months
- Underweight – is an indicator for both chronic and acute malnutrition measured by weight for age. It is useful for monitoring the growth of individual children in a non-emergency setting. The "road to health charts" which are used by the Ministry of Health (MOH) in Ethiopia are based on weight for age. Underweight is a weight-for-age measurement of <-2SD of the mean
- Stunting – is an indicator for long term or chronic malnutrition and is meaured by height for age. It is more useful for long-term planning and policy development rather than emergencies. Stunting is a weight-for-height measurement of <-2SD of the mean
- Rehabilitation outcome – the discharge decision criteria that will be made after the child stayed in the Outpatient Therapeutic Program (OTP) program. It can be cure,

death, defaulter or non-cure.

- Cure: For children with SAM admitted to OTP based on MUAC, MUAC > 110mm; a minimum stay of 8 weeks in the OTP or both. For children admitted based on edema cure is absence of pitting edema for two consecutive weighing and for weight-for-height admission a weight-for-height > 80% of the NCHS median is classified as cure.
- Death: when severely malnourished children die after registration in the OTP site
- Defaulter: when severely malnourished children become absent for three consecutive weekly visits to the OTP site
- Non-cure: when children with SAM could not meet discharge (cure) criteria after 3 months follow up or treatment and all investigations and transfer options have been carried out
- Length of stay: refers the number of days severely malnourished children stay in the OTP site before discharge
- Weight gain: refers the discharge weight in grams minus the minimum weight in grams divided by minimum weight in kilo grams times number of days between date of minimum weight and discharge day,
- Edema grading – edema is accumulation of fluid in the body due to nutritional origin. It is called grade + or mild when both feet/ankles are edematous, grade + + or moderate when both feet, plus lower legs, hands and lower arms are edematous and grade + + + severe where these is generalized edema including both feet, legs, hands, arms and face
- Other: a child that does not qualify the anthropometrical admission criteria but has clinical signs of malnutrition according to Integrated Management of Childhood Diseases (IMCI) definition. Second twin is also admitted with other criteria

ABSTRACT

Background: Malnutrition accounted high level of childhood morbidity and mortality in Ethiopia including Durame area. Durame area is one of the food insecure districts in Southern region. As a result of high prevlanece of acute malnutrtion, which is 8.3%, Ministry of Health partnering with World Vision Ethiopia started outpatient therapeutic program (OTP) in seven OTP sites to rehablitate severely malnourished children. Reports indicate that number of factors affect the rehabilitation outcome of children with severe acute malnutrtion in OTP programs. However, there are no studies conducted to assess their contribution in the rehablitaiton outcome. Hence, this study will attempt to investigate these factors and assess their public health significance in Durame area.

Aim: To assess the factors affecting the rehabilitation outcome of an OTP for children with severe acute malnutrition in Durame area, Southern Ethiopia

Method: the study used a descriptive study with an analytical component. Three-hundred and sixty (360) medical records were calculated during sampling and proportional numbers of medical records were sampled from the seven OTP sites. The medical records were reviewed using semi-structured questionnaires from September 1 to September 10, 2008. The data was entered and analyzed using EPI info version 3.3.2 software.

Results: three hundred fifty five (98.6%) of the total sample records were reviewed. Three hundred twenty nine (92.7%) children were cured, 11(3.8%) died, 7 (2%) defaulted and 8 (2.3%) were non-cure. Average weight gain on discharge was 3.4gm/kg/day and the mean length of stay was 55.6 days (SD$\pm$14 days). More than 60% of children were admitted in three of the seven OTP sites where Demboya OTP sites taking the larger share. Nearly half of the total children (49.8%) were between 6 to 12 months of age and the median age

of admission was 13 months. The male to female ratio in the study population was almost equal. Average family size was 6.3 and 58.3% of children came from households with 6 or more family members. Forty two (11.8%) children in the study had twin. The average walking distance to the OTP sites was 62.9 minutes and two hundred fifty six mothers travelled less than an hour.

Most of the children (92.1%) were referred from the community and most of the children were admitted with MUAC followed by pitting edema. One hundred seventy four (49%) of the total children were beneficiaries of GFR. On admission two hundred twenty six (63.7%) children were breastfeeding, 257 (72.4%) had no symptoms of sickness and 327 (92.1%) did not have abnormal physical examination findings. More than half (51.5%) of them did not receive any home visit and the larger share of the home visits (37.3%) were made when children got illnesses. One hundred sixteen (32.7%) children in the study had chronic medical conditions during follow up. Fever or hypothermia (0.6%), dehydration (0.8%), anemia (0.6%), skin infection (1.6%) and Plumpy nut refusal (2.0%) were the main abnormal medical findings during follow up.

Assessment of the influence of the socio-demographic and biological characteristics on the rehabilitation outcome indicated that the sites, family size, chronic medical conditions, absenteeism, weight loss, presence of fever or hypothermia, dehydration and anemia had significant association with the treatment outcome ($p<0.05$). Further analysis for significant variables using regression analysis indicated that absenteeism, chronic medical illness, fever or hypothermia and anemia are predictor variables contributing significant information for the prediction of the treatment outcome ($p<0.05$).

Conclusion: The program has high success rate in terms of increasing cure and decreasing death, default and non-cure rates but it did not meet the minimum international recommendations for average length of stay and average weight gain. The study identified the main socio-demographic and biological characteristics of children with SAM and factors that affect the rehabilitation outcome. Children under the age of 24 months were most affected with SAM and no gender variation. Larger proportions of malnourished children were living in families above the average family size, which had significant association with the outcome. OTP sites were accessible for majority children in the program but higher level of absenteeism which significantly associated with the outcome. The study identified socio-demographic and biological factors that influenced the rehabilitation outcome as well as the predictor variables contributing significant information for the prediction of the treatment outcome. It could assist the program implementers to design appropriate public health measures. The achievement in Durame OTP program indicates effectiveness of community based management of SAM and existing potential to integrate in routine health system in resource scarce setting like Durame.

Recommendations: to sustain the achievements and improve the growth areas necessary public health measures are prime importance.

DECLARATION

I declare that this study *on factors affecting the rehabilitation outcome (of outpatient therapeutic program) of children with severe acute malnutrition in Durame, Southern Ethiopia,* is my own personal work. The study report has not been submitted before for any degree or examination in any other university. All the sources that I have used or quoted in-text have been indicated and shown as a reference in the appendix section.

Sisay Sinamo Boltena

October 2008

Signed___Dr. Sisay Sinamo_____

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CHAPTER ONE

INTRODUCTION

Malnutrition is a broad range of clinical conditions in children and adults that result from deficiencies in one or a number of nutrients. Malnutrition is one of the major public health problems throughout the developing world. It manifests in different forms ranging from sub-clinical metabolic changes to full blown clinical conditions called acute and chronic malnutrition. Each of these forms reflects the nature and duration of the nutritional and/or disease related insults. Acute malnutrition, which manifests with wasting or bilateral nutritional pitting edema, is broadly classified into severe acute malnutrition (SAM) and moderate acute malnutrition (MAM) (Valid 2006, p.13). Severe acute malnutrition is defined as severe wasting (weight-for-height < - 3 z-scores of the mean or < 70% of the median National Center for Health Statistics/World Health Organization reference) or the presence of nutritional pitting edema or both. It is a life threatening condition requiring urgent treatment (Briend et.al. 2006, p.3). Acute malnutrition affects more than 73 million children in the world. It is an underlying factor in over fifty percent of children under five years who die from preventable diseases in developing countries (Collins et.al. 2005, p.7). In Ethiopia it is also a leading underlying cause of childhood deaths. About one in ten sub-Saharan African children are affected by severe acute malnutrition and half of the severely malnourished children in Africa admitted for inpatient care die from severe acute malnutrition. In Ethiopia among the total wasted children 2.2% are affected by severe acute malnutrition according to Central Statistical Agency (CSA) report (2005a, p.162). This figure indicates an emergency and suggests further investigation to determine if intervention is justified.

Durame area is located 352 km South of the Ethiopian capital, Addis Ababa, with a total population of about 182,846 (484.4 persons/km^2). Current restructuring of the same

geographic area sub-divided Durame district into three districts namely Durame, Damboya and Kedida. In this study Durame area refers to the three districts combined. Based on available information 40% of the population has access to health services and subsistence agriculture is the mainstay of households' income (WVE 2007, p.16). In June 2006, following a long standing erratic rain fall and hampered crop production, nutritional assessment was done in the district and the report showed 1.3% prevalence of SAM (WVE 2006b, p.12). A SAM more than 1% is considered higher than the lowest level to consider it normal and with presence of aggravating factors it requires interventions. In Durame area due to aggravating factors, such as lack of food and malaria outbreak, World Vision Ethiopia partnering with the local Ministry of Health launched SAM rehabilitation programs in November 2006 at seven government owned health facilities, OTP sites. In-patient admission of severely malnourished children with complications was made at Catholic Mission owned health center, which served as Stabilization Center (SC).

The morbidity and mortality rates associated with acute malnutrition are very high when children do not get timely appropriate treatment. An Outpatient Therapeutic Program (OTP) is currently used to manage children with SAM that have good appetite and no medical complication. In order to reduce the mortality and achieve rapid recovery the program provides weekly take home ready-to-eat food and medical follow up (Valid 2006, p.86). Reports indicated that 79% to 95% severely malnourished children in OTP programs recover successfully (Concern 2006, p.26). Though it is not studied well, diverse reasons could influence the rehabilitation outcome. After starting this intervention, reports of various factors which might affect nutritional rehabilitation outcome, such as Plumpy nut (ready-to-use therapeutic food for severely malnourished children) sharing among family members, the size of the family, maternal breast feeding, child health status and

household access to other services such as general food ration raised concern. However, there are no well studied documents that identify the influence of these factors on rehabilitation outcomes. Investigating all the social, economic, behavioral and biological factors on the nutritional outcome is not economical in terms of time and available resources. Hence, this study attempted to describe the socio-demographic and biological characteristics of children in the outpatient therapeutic program and investigated which of these factors contributed most to the rehabilitation outcome. An investigation of the rest of the factors requires further studies or research in the future.

Study aim and objectives

The aim of this study is therefore to assess factors affecting the rehabilitation outcome of an OTP for children with severe acute malnutrition in Durame area, southern Ethiopia.

The specific objectives of this project are to:

- Describe the rehabilitation outcome of children with severe acute malnutrition in the World Vision OTP in Durame area, southern Ethiopia
- Describe socio-demographic and biological characteristics of children in the World Vision OTP in Durame
- Assess the influence of the socio-demographic and biological characteristics on the rehabilitation outcome of children with severe acute malnutrition in the World Vision OTP in Durame
- Make recommendations based on the research findings and disseminate information to the organizations involved in this OTP (MoH officials, health workers and World Vision staff)

Report Structure

The study report is structured into seven chapters. The first three chapters provide an introduction, literature review and methodology. The following two chapters describe results and discussion. The last sections describe conclusions and recommendations. The study report ends with material referenced and cited in the report and appendices.

Value of the study

A total of 941 children participated in the Durame nutritional rehabilitation program between the program start date until October 2007. All severely malnourished children were managed according to the national protocol for the management of SAM. The admission, therapeutic diet and discharge criteria of the management protocol are annexed (annex 1). This study reports key findings on the rehabilitation outcome, influence of the socio-demographic and biological factors on the rehabilitation outcome and examined which of the factors has significance influence on the rehabilitation outcome and suggested public health measures.

The draft study report was shared with World Vision Ethiopia, Durame area and health workers for validation. To maintain, as well as improve program effectiveness, the data can be used for future design of similar programs and may serve as a reference for future studies. The final report will be shared following review by the research supervisors and feedback from the examiners. The research finding will also be shared with the international public health practitioners, community based severe acute malnutrition program managers and implementers through international publications following discussion with the research supervisor. It will contribute additional information on existing knowledge and provide areas for future research.

CHAPTER TWO

LITERATURE REVIEW

Classification of malnutrition

Malnutrition is a broad range of clinical conditions in children and adults that result from deficiencies in one or a number of nutrients leading to impaired physical functions to the point where the body can no longer maintain adequate bodily performance processes (MOH 2007, p.6). The same source broadly classified malnutrition into two categories, namely acute and chronic malnutrition. Chronic malnutrition causes stunting (i.e. children not achieving their height-for-age potential) whilst acute malnutrition results in wasting or thinness indicated by a low weight-for-height. Underweight (i.e. a child weighing less than 80% of expected weight-for-age or <-2SD of the mean z-score) can reflect both acute and chronic under nutrition, but it is not able to distinguish between acute and chronic malnutrition. The World Health Organization (WHO) further classifies acute malnutrition into two categories namely severe- and moderate acute malnutrition which is differentiated by pitting edema and or different cut-off points that indicate the level of wasting. Severe acute malnutrition (SAM) is defined as a weight-for-height <-3SD of the mean; or mid-upper arm circumference (MUAC) <110mm; or bilateral pitting edema or both whilst moderate acute malnutrition is defined as weight-for-height ≥-3SD and <-2SD of the mean; MUAC ≥ 110mm and <120mm with no edema or both (DPPA 2004, p.37, MOH 2007, p.7 & Valid 2006, p.13).

Magnitude of malnutrition in the world

In 2005, 20% of children younger than five years in low-income and middle-income countries had a weight-for-age Z score of less than -2 with highest prevalence in South-

central Asia and eastern Africa where 33% and 28% respectivelly were underweight (Black et al. 2008, p.245). Black et al. (2008, p.245) reported that, for all developing countries, an estimated 32% (178 million) of children younger than five years had a height-for-age Z score of less than -2 in the same year with the highest levels found in South Asia. Of the 40 countries with a childhood stunting of 40% or more, 23 of these countries are in Africa. In Sub-Saharan Africa 38 percent of children or 175 million are stunted (UNICEF 2008d). Ethiopia is one of these countries. Globally there are 60 million (9%) children with moderate acute malnutrition (MAM) and 13 million (2%) children with SAM (Caulfield, De Onis & Black 2002, p.194). About 9% of sub-Saharan African and 15% of South Asian children have MAM and about 2% of children in developing countries have SAM (UNICEF 2005).

Malnutrition in Ethiopia

Malnutrition is a major public health problem in Ethiopia. Among children under the age of five years, 47.9% children in rural and 29.8% in urban communities are stunted (i.e. height-for-age <-2SD) and 11% rural and 6% urban children are wasted (weight-for-height <-2SD) (CSA 2005a, p.162). According to the same report, 2.2% have severe acute malnutrition requiring intensive care. About 472,000 Ethiopian children die each year before their first birthday and all forms of malnutrition underline 57 percent of the 132/1000 under five deaths (MoH 2005, p.1). Nutritional survey report conducted in Durame, the study area, showed a prevalence of acute malnutrition as high as 8.5% with SAM at 1.3% (WVEb 2006, p.12). Moreover, more than half of under five children (54%) in the study area are stunted (WVE 2008, p.41).

Risk Factors for Malnutrition

Malnutrition is a broad range of clinical conditions resulting from multifaceted individual, family, socio-economic and political factors (Valid 2006, p.141). These complex interacting factors operate at three levels according to the UNICEF conceptual framework. These are the immediate causes, underlying causes and root causes (DPPA 2002, p.9). According to UNICEF acute malnutrition usually starts either with failure of an individual to acquire enough to eat or due to ill health. These are known as the immediate causes of acute malnutrition and they frequently occur together. The underlying causes are grouped by UNICEF into three clusters: household food security, basic health services combined with the health environment, and adequate care of women and children (DPPA, 2002, p.9). It also stated that in practice the three groups of underlying causes interact with one another.

Socio-economic factors, including the political and economic structure of a country or region, will in turn influence many of the factors described above, and these are called the basic causes of malnutrition. Genebo et al. (1999, p.56) and MOFED (2005, p.31) reports indicated that acute malnutrition is especially common among families practicing inappropriate feeding and caring practices, poor personal hygiene and sanitation, inadequate access to clean water, inadequate health access, lower maternal education and lower household income. Moreover, low maternal food intake, hard physical work, limited nutritional knowledge and infection during pregnancy also affects child growth (WHO, 2005b). Genebo et al. (1999, p.57) conducted a cross sectional analytical study to investigate the association of children's nutritional status to maternal education and reported that parity of the mother less or equal to four and household size less than five had a statistically significant ($p<0.05$) better nutritional status for literate mothers

compared to illiterate mothers. CSA (2005b, p.161) also reported that the highest proportion of children (13%) with birth order 4 and five are wasted in Ethiopia.

Consequences of malnutrition

Malnutrtion affects all age groups. Maternal and child undernutrition is the underlying cause of 3.5 million deaths, 35% of disease burden in children younger than five years and 11% of total global disability-adjusted life-years (DALYs) (Black et al. 2008,p.243). They also stated that the number of global deaths and DALYs in children less than five years old atrributed to stunting, severe acute malnutrition and interauterine growth restrictions constitutes the largest percentage of any risk factor in this age group. In the first two years of life the impact of malnutrition is most profound. During its acute stage malnutrition increases vulnerability to micro-nutrient deficiency and common childhood illnesses such as diarrhea, pneumonia, and death (Kebede & Willett 1997, p.326, & MOH 2005, p.17). In the developing world malnutrition is estimated to be a contributing factor in over 50% of the 10 million child deaths annually (Briend et.al. 2006, p.S3 & WHO 2005a). In Africa, 1 out of 2 children with SAM dies during hospital treatment due to inappropriate care (Collins et.al. 2006, p.4). The same report showed that globally moderate and severe acute malnutrition (also called moderate or severe wasting), excluding kwashiorkor, is associated with a mortality rate of 30-148/1000 children per year and 73 – 187/1000 children per year respectively. Moreover, at its chronic state malnutrition makes children vulnerable to growth retardation, impaired motor functioning, impaired mental development and poor school performance (CSA 2005a, p.143, WHO 2005a and UNICEF 2008c).

Victora et. al. (2008, p.340) also reported that poor fetal growth or stunting in the first two

years of life leads to irreversible damage, including shorter adult height, lower attained schooling, reduced adult income and decreased off spring birth weight. Malnutrtion has also long term educational and economic effects and is associated with adult chronic diseases, particularly as countries goes through the demographic epidemiological and nutritional transitions (Black et al. 2008,p.243). Victora et al. (2008, p.340) indicated that indices of maternal and child undernutrition (maternal height, birth weight, interauterine growth restrictions, and weight, height and body mass index at 2 years according to the new WHO growth standard) were related to adult outcomes (height, schooling, income or asset, offspring birthweight, body-mass index, glucose concentration and blood pressure).

Rehabilitation of children with acute malnutrition

In OTP rehabilitation outcome data are recorded as cure, death, defaulter and non-cure. Length of stay in the program and average weight gain are also additional outcome measurements. Cure is defined as discharge from the outpatient therapeutic feeding program after nutritional rehabilitation for children with severe acute malnutrition and when discharge criteria for OTP program is fulfilled (Collins and Sadler, p.1826). Children discharged from OTP program will be transferred to a supplementary feeding program (SFP).

Children with MAM are managed in supplementary feeding programs (SFP) whilst those with SAM are rehabilitated in an inpatient stabilization centers (SC)/hospital or in outpatient therapeutic programs (OTP) depending on their appetite and medical conditions (See Table 1). The supplementary feeding component of a CTC program aims to support moderate acutely malnourished children without medical complications by providing a supplement of energy and/or nutrients in a dry take-home ration. The purpose of the

program is to prevent deterioration to severe acute malnutrition; reduce excess mortality by catching children before they are at high risk of dying (Valid 2006, p.60). Pregnant and lactating mothers are also targets for SFP program to prevent deterioration of maternal nutritional status and subsequent poor birth weight (DPPA 2004, p.16). The SFP program covers the larger proportion of malnourished children in the community. In Durame area context out of the 8.5% malnourished children in the community 6.2% are beneficiaries of SFP program.

Table 1: Community based therapeutic care of acute malnutrition

Acute malnutrition		
Acute malnutrition with medical complications	Severe acute malnutrition without complications	Moderate acute malnutrition without complications
<80% of median weight-for-height, **OR** bilateral pitting edema grade 3 **OR** MUAC <110mm **AND** one of the following	<70% of median weight-for-height (<-3SD) , **OR** bilateral pitting edema grade 1 or 2 **OR** MUAC <110mm **AND**	70-80% of median weight-for-height (≥-3SD, <-2SD) **AND** no bilateral pitting edema **OR** MUAC 110-120mm **AND**
Anorexia	Appetite	Appetite
Lower respiratory tract infection High fever Severe dehydration Severe anemia Not alert	Clinically well Alert	Clinically well Alert
Inpatient care WHO/IMCI protocols	Outpatient Therapeutic care OTP protocols	Supplementary feeding

(Source: Valid Intl., 2006)

Eighty to ninety percent of children with severe acute malnutrition who still have good appetite and no major medical complications can be rehabilitated in an OTP, which

provides weekly medical check up and ready-to-use therapeutic foods until the child complete the treatment (Valid 2006, p.86). Children attend the OTP every week for a medical check up, to receive additional medical treatments if required and to be given their one-week supply of ready-to-use therapeutic foods. "Ready-to-use therapeutic foods" (RUTFs) is an energy dense mineral / vitamin enriched palatable, soft or crushable ready-to-eat food that is microbiologically safe, requires low-tech production methods and will keep for several months in simple packaging (Khara & Collins, 2004). Initially, RUTFs has been made from peanuts, milk powder, sugar, oil and a mineral / vitamin mix, according to a recipe called "Plumpy nut", developed by Nutriset (Briend *et al.*, 1999). Since, 2003 large scale production of RUTF has been facilitated in some African countries (Khara & Collins, 2004) by international non-governmental organizations. In addition to Plumpy nut, other therapeutic food products such as BP100 can also be used as an OTP ration. Plumpy nut has many properties which make it useful for home based rehabilitation of children with SAM (Manary 2005, p.1). It can be stored in local temperature, doesn't require cooking and mothers can take home and feed their children themselves. It has a very high energy density to ensure sufficient nutrient intake for complete recovery of severely malnourished children (Valid 2006, p.146).

Normally around 10%-15% of severely acutely malnourished children admitted into the program require intensive inpatient care in the SC. Children with severe acute malnutrition, complicated by severe medical complications and/or poor appetite or severe edema will be temporarily admitted to SC/hospitals for in-patient rehabilitation and they return back to OTPs whenever they have good appetite and no major medical complications (MOH 2007, p.9). These children are at the highest risk of death and receive 24-hour care until their condition is stabilized and appetite returns. SCs are therefore small

(a maximum of thirty children) and operate with few staff and infrastructural requirements (Valid 2006, p.89).

Stunting, which is also called chronic malnutrition, is caused by long term insufficient nutrient intake and frequent infections. There are no guidelines for management of chronic malnutrition. However, available literatures indicates that early detection and treatment of acute malnutrition, prevention of children from frequent attack of illnesses, improving dietary intake including micro-nutrient supplementation such as Zinc can reduce risk of development of chronic malnutrition and stunting (Hotz & Brown 2004, p.101).

Outcome of outpatient therapeutic rehabilitation programs for SAM

Reports of OTPs implemented in different settings showed that the rehabilitation outcome ranges from 79-95% for cure, 0.7% - 5.3% for death, 0%-17% defaulters and 0%-9.4% non-cure as indicated in the Table 2 below. Although sharing of the ready-to-eat supplement and selling thereof was reported in all the studies, the outcomes were not affected much. In Niger Defourny et.al. (2006, p.3) showed a direct relationship between increased market price and cases of admission & high relapse rate and poor child caring practices in families. According to Deconinck (2004, p.31) the success of the rehablitation program in Hulla, Arbegona and Bensa is attributed to intensive outreach monitoring of children of affected communities and health education (table 2).

Table 2: Outcomes of outpatient therapeutic programs for severe acute malnutrition

Outcome	Location				
	Badewacho, Ethiopia	Ethiopia, Sudan and Malawi	Niger	Hulla, Arbegona and Bensa, Ethiopia	Different NGOs, Ethiopia
Cure	85%	79%	91.4%	86.6%	79-95%
Death	4%	4.1%	3.2%	0.6%	0.7-5.3%
Defaulter	5%	11%	4.7%	4.4%	0-17%
Transfer	6%				
Non-cure					0-9.4%
Sources	Collins and Sadler (2002, p.1824)	(Collins et. al. 2006, p.5).	Defourny et.al. (2006, p.3)	(Deconinck 2004, p.31).	(Concern 2006, p.26).

Golden & Khara (2004, p.14) reported that in OTPs run by Concern in Northern Ethiopia, lack of access to OTP sites particularly during rainy season become the main cause of default, irrespective of the efforts made by the field staff and trained community volunteers to reduce defaulting. The same report has shown that chronic diseases, such as TB and HIV/AIDS, could have a likely effect on the length of stay and the number of days severely malnourished children stay in the OTP before discharge. Personal conversation with Abel, Valid Nutrition Advisor, suggested that Plumpy Nut sharing in the family and congenital malformations can affect the outcome of SAM (H Abel, 2007, pers.comm. 9 March). In addition, Walker (2004, p.28) reported that the pressure on a mother to share food within the families resulted in slow weight gain in northern Bahr el Ghazal, Southern Sudan. Feleke (2007, p.16), reported that provision of supplementary food ration as a protection would have reduced potential RUTF sharing among families. He also stated that given the common practice of food sharing, supplementary food is also consumed by all siblings, if not by all household members. Other factors that could affect the rehabilitation outcome could be the size of their families, maternal breast feeding, child health status and household access to other services such as general food ration. Hence, this research attempted to study the influence of these different factors on the rehabilitation outcome of severely malnourished children in OTP sites, Durame.

CHAPTER THREE

METHODOLOGY

Study Design

This is a descriptive study with an analytical component. The study design will describe the outcome and various social, demographic and biological factors. The analytic component of the study design helps to assess the influence of different factors on the outcome.

Study Population

The study population is composed of all medical records of children with severe acute malnutrition treated at the seven World Vision OTP sites in Durame area, Southern Ethiopia between November 2006 and October 2007.

Sample Size

The following assumptions were considered to determine the sample size. 8.5% prevalence of acute malnutrition or wasting among children under five years in the study area, a 95% confidence interval and a sample precision within 3% range. Out of the total 941 medical records of children seen in the program, for the period of November 2006 to October 2007, 360 (38%) medical records were calculated for review during the study with a proportionate representation of each OTP site (annex 2).

Sampling Procedure

The serial number of the medical records served as a sampling unit. The number of medical records from each of the OTP sites was selected proportional to the total number

of records in the study population. Once the total number of medical records required from each OTP site was known, each of the medical records were selected using systematic random sampling. A random number was selected within the first sampling interval to determine the random starting point and each *nth* medical record after the starting point was then selected systematically each time adding the sampling interval to the previous number (Katzenellenbogen, Joubert and Abdool 1997, p.78).

Data Collection

Medical record review was conducted using a pre-tested semi-structured questionnaire from September 1 to September 10, 2008. The questionnaires consisted of questions on socio-demographic and biological characteristics, access to general food distribution, admission & follow-up history and physical examination findings and rehabilitation outcome including average weight gain and length of stay (annex 3). Two nurses knowledgeable of the program and experienced on health data collection were selected from the study area to conduct the data collection. A day long orientation was given before the data collection began. The contents included during orientation were information on medical record review, the aim and objectives of the study, study methodology emphasizing on sampling methods. Information was also given on the content of the questionnaire and how to complete it. The questionnaire was pre-tested with field practice. The questionnaire was piloted on 10 non-sample medical records and adjustments were made before duplicating the final questionnaire for actual data collection. During data collection the researcher conducted duplicate record review of 10% randomly selected medical records to check agreement with data collectors and to ensure the quality of data. On the start up the investigator found few documents which

were inconsistent but later as the data collectors understand there was no disagreement.

Errors that occurred during data collection, coding and entry were corrected to minimize the effect. Data completeness was checked every day and few questionnaires that did not have information were re-checked with the medical records and corrective action was taken. To reduce non-compliance during the medical records review from the data collection team especially while listing some of the questions that need specifying the findings qualitatively, responses were standardized to ensure consistency of the responses. Potential measurement bias would have occurred while calculating the average weight gain and length stay in the program. This was minimized by re-orientation and researcher close supervision as the data collection continues. To avoid selection bias medical records were cross-checked with the registration number using their serial number and the team tried to look for availability of all medical records in the health facilities. However, in few health facilities the records were not obtained.

Validity, Reliability and Generalisability

Selection bias was avoided by selecting medical records randomly using the full list of medical records. The employment of nurses trained in the management of SAM should ensure quality data records, but the quality of the records might influence validity of the information. Adequate orientation, practical field testing and the 10% duplicate record review provided a control for reliability. Care was taken to avoid participation of the same or sampled records during pre-testing. Some of the confounding factors were the period between identification and admission to the program, and other interventions in Durame that might improve SAM. The findings can be generalized to the study population but the limitations need to be considered when generalizing to other areas or programs.

Data Analysis

Data from the pre-coded quantitative study questionnaire was entered into Epi Info version 3.3.2 software and analysis was made after data cleaning (Mendenhall, Beaver and Beaver 2003, p.120). Frequency distribution analysis was conducted to describe socio-demographic and biological factors such as age, sex, presence of twins, distance from the OTP sites, breast feeding, access to general food ration, family size, admission and follow up clinical and anthropometrical findings and the rehabilitation outcome. Tables, pie chart, frequency and proportion were used to present the data. Comparison of the rehabilitation outcome was made with the SPHERE minimum standard. The SPHERE minimum standard is measured with key indicators, which can be qualitative or quantitative, which function as a tool to measure the impact of processes used as well as programs implemented (The SPHERE Project 2004, p.19). It also stated that the minimum standards were set based on agencies experience of providing humanitarian assistance. Though the achievements of the standards depends on a range of factors, it provides guidance for agencies to be committed to attempt consistently to achieve them, to be held accountable and to adopt the standards as accepted norms. Further analysis was made to determine the association between dependent and independent variables using chi-square and 95% confidence interval. Regression analysis was also performed to find out which of the independent factors make a difference on the outcome using linear regression analysis model (Mendenhall, Beaver and Beaver 2003, p.498).

In regression analysis model building is the general process of finding a regression equation that will provide a good fit to a particular set of data. A valid model will provide good estimates of Y_1 and good predications of Y for given values of X. choosing an appropriate model is the key to successful implementation of regression analysis. If a

model is constructed that hypothesizes an exact relationship between variables, it is called a functional or deterministic model. For instance, consider the relationship between dollar sales (y) of a particular book and number of units sold (x). If the selling price is $8per book, the relationship is y = 0 + 8x. This equation represents a functional relationship between the variables dollar sales (y) and price per unit (x). A perfect relationship exits.

Based on the recognition that most real world variables can not be predicted exactly, a model is constructed that hypothesizes a relationship between variables allowing for random error. This model is called a statistical or probabilistic model. $y = \beta_0 + \beta_1 x_1 + \beta_2 x_2 + \beta_3 x_3 + \ldots\ldots \beta_k x_k + \varepsilon$. $Y = B_0 + \beta_1 X + E$ where B_0 = Y intercept, β_1 = slope of the line and E = the error of the estimates. Statistical models acknowledge that relationships between variables are complex.

During regression analysis, examination of the table of residuals or a residual plot can help an analyst determine whether or not a particular regression equation fits the sample data properly. The residuals should satisfy the residual model assumptions: they should be normally distributed, uncorrelated, and have the same variance. The types of alternative models that will be chosen if the regression equation does not fit well includes population multiple regression model ($y = \beta_0 + \beta_1 x_1 + \beta_2 x_2 + \beta_3 x_3 + \ldots\ldots \beta_k x_k + \varepsilon$), sample multiple regression model $y = \beta_0 + \beta_1 x_1 + \beta_2 x_2 + \beta_3 x_3 + \ldots\ldots \beta_k x_k$, curvilinear model $y = \beta_0 + \beta_2 x_2 + \beta_3 x^2 + \varepsilon$. and quadratic model $y = \beta_0 + \beta_2 x^2 + \varepsilon$.

In this study analysis was performed using multiple linear regression analysis model using several independent variables (predictor variables) x_i to explain in the variation in

dependent variable *y* using the model $y = \beta_0 + \beta_1 x_1 + \beta_2 x_2 + \beta_3 x_3 + ... \beta_k x_k + \varepsilon$. Where y is the response variable that we want to predict, $\beta_0, \beta_1, \beta_2, ...\beta_k$ are unknown constants, $x_1, x_2, ...x_k$ are independent predictor variables that are measured without error, ε is the random error, which allows each response to deviate from the average values of y by the amount $\tilde{\varepsilon}$. It is assumed that the value of ε (1) are independent (2) have a mean of 0 and a common variance α^2 for any set of $x_1, x_2, ...x_k$ and (3) are normally distributed. Assuming the assumptions are met, the average value of y for a given set of values of $x_1, x_2, ...x_k$, is equal to the deterministic part of the model $E(y) = \beta_0 + \beta_1 x_1 + \beta_2 x_2 + \beta_3 x_3 + ... \beta_k x_k$.

A step wise regression analysis was used to locate some independent variables that contribute information for predicting the treatment outcome. The analysis add and delete variables as their significance in the presence of the other variables is significant or non significant, respectively. Number of interactions were performed using the computer program and no more variables are significant when added to the model, and non of the independent variables in the model are non significant when removed, the procedure stops.

LOGISTICS

During the study one vehicle was used, given from World Vision Ethiopia with permission, to collect the data from the study site. The researcher prepared pencil, eraser and sharpeners for data collectors. Questionnaires were duplicated after piloting. The investigator prepared the amount of money required for the study. Moreover, World Vision Durame ADP also reserved their guest house for the duration of the study.

RESOURCES

Two ministry of health staff, clinical nurses in background and knowledgeable about the program were trained to conduct the data collection. The nurses collected the data from different OTP sites. The investigator used his personal Laptop computer for data entry. A hired data entry clerk entered the data. The investigator supervised the data collection team, checked sampled data for completeness at the field and reviewed the entered data.

ETHICAL CONSIDERATIONS

Permission was obtained from Durame area MoH office, World Vision Ethiopia and Durame area office to conduct medical records review. The research protocol was approved by the University of the Western Cape (UWC) Higher Degree Committee and ethical clearance was granted by the UWC Senate Health Research Committee. Moreover, the objectives of the study were explained to OTP site nurses who are in charge of the health facilities before starting the medical records review. Data from the record reviews were recorded by record number only (anonymously) to ensure confidentiality of the patients. The draft study finding was shared anonymously with the health workers, local MoH and World Vision Ethiopia. The final report will be shared following the review process.

CHAPTER FOUR

RESULTS

Medical record review

Overall, the data was collected from three hundred fifty five (98.6%) medical records using semi-structured questionnaire and interval sampling procedure. Five (1.4%) of the sampled records could not be traced irrespective of the efforts made to find them in the health facilities.

Treatment/rehabilitation outcome

About 93% of children in the OTP program were successfully cured and discharged from the program fulfilling the discharge criteria. The proportion of cure, death, defaulter and non-cure rates in the OTP program are indicated in figure 1.

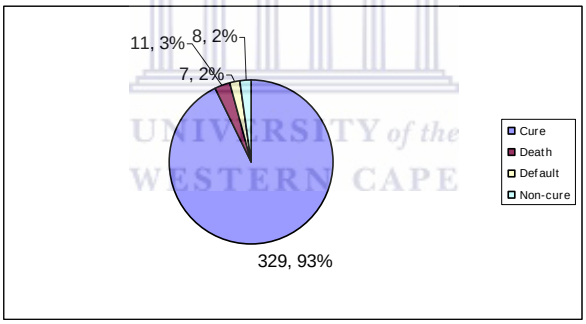

Figure 1: Rehabilitation Outcome of Children in OTP Program (n=255)

Figure 2 shows cure, death, default and non-cure rates compared with the minimum international standard for therapeutic feeding program called the SPHERE standard indicators (The SPHERE Project 2004, p.148). The findings showed that cure, death and default rates are better than the cut-off for the minimum SPHERE standard indicators.

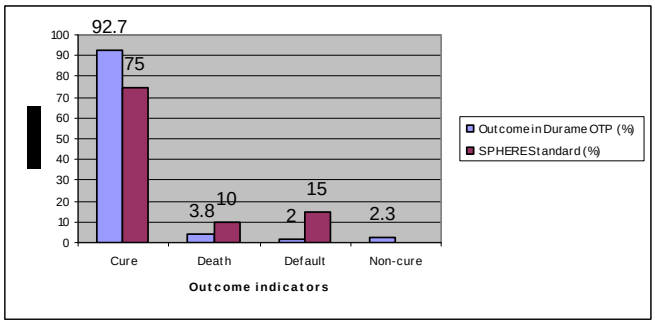

Figure 2: Rehabilitation Outcome Compared with SPHERE Standard (n=255)

Analysis was also carried out to investigate the length of stay in the program and average weight gain. The findings are summarized in table 3.

Table 3: Length of stay and weight gain for children in OTP program, Durame, n=355

	Mean	± SD	Median	1st quartile	3rd quartile	Mode
Length of stay (days)	55.6	14	56	50	63	50
Average weight gain	3.4	2	2.9	2	4.4	2.3

The mean length of stay in the program was 55.6 days (±SD 14 days) which was nearly equals to the median. The cut-off in SPHERE standard for length of stay and weight gain is 30 to 40 days and 8 gm/kg/day respectively (The SPHERE Project 2004, p.148). Accordingly, the average length of stay in the study area was longer than the minimum SPHERE standard indicators and the average weight gain was twice lower than the minimum cut-off point. The finding indicated that most children stayed in the program more than the minimum SPHERE standard and their average weight gain was lower.

Socio-demographic characteristics

The OTP sites were proportionately represented as depicted in Figure 3. Demboya health center admitted the majority of cases followed by Funto and Yebo health posts.

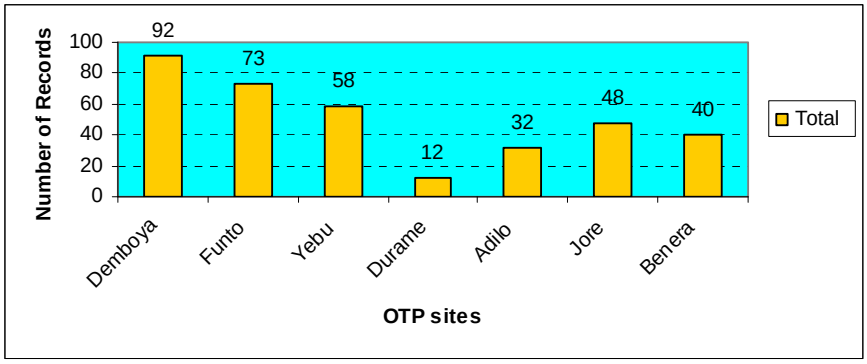

Figure 3: Distribution of medical records by OTP sites (n=255)

Further analysis showed the outcome is associated with the sites of admission ($p<0.05$). The proportion of deaths is higher at Adillo health center irrespective of lower proportion cases rehabilitated in this site. Defaulting and non-cure were high at Demboya health center (table 4).

Table 4: Rehabilitation outcome of children in the study by OTP sites, Durame, n=355

OTP site	Outcome, n (%)					
	Cure	Death	Default	Non -cure	Total	Chi-square & p-value
Demboya Health Center	84(91.3)	1(1.1)	4(4.3)	3 (3.3)	92(100)	$x^2=34$ p=0.0125
Funto Health Post	70(95.9)	1(1.4)	0(0)	2(2.7)	73(100)	
Yebu Health post	56(96.6)	1(1.7)	0(0)	1(1.7)	58(100)	
Durame Health Center	11(91.9)	0(0)	0(0)	1(8.3)	12(100)	
Adillo Health Center	25(78.1)	5(15.6)	2(6.3)	0(0)	48(100)	
Jore Health Post	46(95.5)	1(2.1)	0(0)	1(2.1)	40(100)	
Benera Health Post	37 (92.5)	2(5.0)	1(2.5)	0(0)	355(100)	

Nearly half of the total children (176) admitted were between 6 to 12 months of age. The number of children admitted to the program was declining as the age increases. Figure 4

indicated the age distribution of severely malnourished children in Durame OTP program.

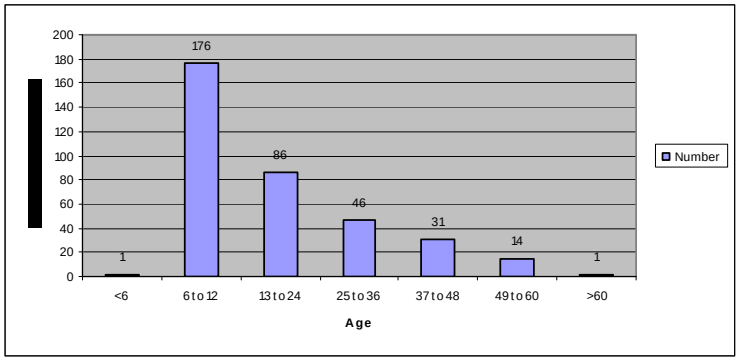

Figure 4: Age distribution of severely malnourished children, Durame, Ethiopia (n=355)

The median age of admission to the program was 13 months and the most frequent admission age was 12 months (Table 5).

Table 5: Age of children in OTPs, Durame, (n=355)

	Mean	± SD	Median	Q1	Q3	Mode
Age (months)	20.2	14.2	13	10	29	12

Analysis of age of admission with treatment outcomes indicates the cure rate was high among all age groups ranging from 87% to 95.3% (p=0.056 and x^2= 159) (table 6).

Table 6: Distribution of age of children in OTPs by outcome, Durame, (n=355)

	Outcome, n (%)				
Aged (in months)	Cured	Non-cured	Died	defaulted	Total
0-6	7(87.5)	1(12.5)	0(0)	0(0)	8 (100)
7-12	161(95.3)	2(1.2)	2(1.2)	4(2.4)	169(100)
13-18	39(88.6)	1(2.3)	0(0)	4(9.1)	44(100)
19-24	40(95.2)	0 (0)	2(4.8)	0 (0)	42(100)
25-36	42(91.3)	3(6.5)	1 (2.2)	0 (0)	46(100)
37 and above	40(87)	4(8.7)	2(4.6)	0 (0)	46(100)

Nearly equal proportion of males and females were admitted to the program. There was no statistical significant gender difference in treatment outcome (Table 7).

Table 7: Distribution of children by sex in OTP by outcome, Durame, (n=355)

Gender	Outcome, n (%)					Chi-square & p-value
	Cured	Non-cured	Died	defaulted	Total	
Male	165(50.2)	6(54.6)	3(42.9)	4(50.0)	178(50.1)	x^2=6.7
Female	164(49.8)	5(45.4)	4(57.1)	4(50.0)	177(49.9)	p=0.3494

The average family size in the study was 6.3 (SD $\pm$5.3) and 58.3% of children were from households with 6 or more family members. The proportions of deaths, defaults and non-cures were much higher with average and above average family size households compared with households' less than average family size. Households family size was significantly associated with the treatment outcome ($p<0.05$) (table 8).

Table 8: Distribution of family size of children in OTPs by outcome, Durame, (n=355)

Number of family members	Outcome, n (%)					Chi-square & p-value
	Cure	Death	default	Non -cure	Total	
2	7(100)	0(0.0)	0(0.0)	0(0.0)	7 100)	x^2=17
3	18(85.7)	2(9.5)	1(4.8)	0(0.0)	21 (100)	p=0.0191
4	43(91.5)	2(4.3)	0(0.0)	2(4.3)	47 (100)	
5	72(98.6)	0(0.0)	1(1.4)	0(0.0)	73 (100)	
6	79(94)	3(3.6)	1(1.2)	1(1.2)	84 (100)	
7	38(86.4)	4(9.1)	1(2.3)	1(2.3)	44 (100)	
8	40(95.2)	0(0.0)	1(2.4)	1(2.4)	42 (100)	
9 and above	31 (86.1)	0(0.0)	2(5.6)	3(8.3)	36 (100)	

Children who have twin were admitted to the program with their siblings if either or all were malnourished. Out of the total children in the study forty two (11.8%) of them were part of twins. Being part of a twin or no twin has no significant association with the rehabilitation outcome ($p>0.05$). Contrary to one can expect higher proportionate death, default and non-cure were observed among the non-twin than children with twin siblings (table 9).

Table 9: Presence of twin and treatment outcome, Durame, (n=355)

Characteristic	Outcome, n (%)					
	Cure	Died	Defaulted	Non cure	Total	Chi-square & p-value
Twin present	38 (11.5)	2 (18.2)	0 (0.0)	2 (25.0)	42(11.8)	$x^2 = 4.6$
No twin	291 (88.5)	9 (81.8)	7 (100.0)	6 (75.0)	313(88.2)	0.8642

Mothers or care takers traveled an average walking distance of 62.9 minutes (SD±30) to reach the OTP sites (Table 10).

Table 10: Distance traveled by mothers or caretakers in OTPs, Durame (n=255)

	Mean	± SD	Median	Q1	Q3	Mode
Distance (in minutes)	62.9	30	50	50	260	60

Further analysis of distance traveled indicated 121 mothers and care takers traveled less than 30 minutes and 135 traveled between 30 minutes and an hour. This suggests most mothers traveled less than an hour (figure 5).

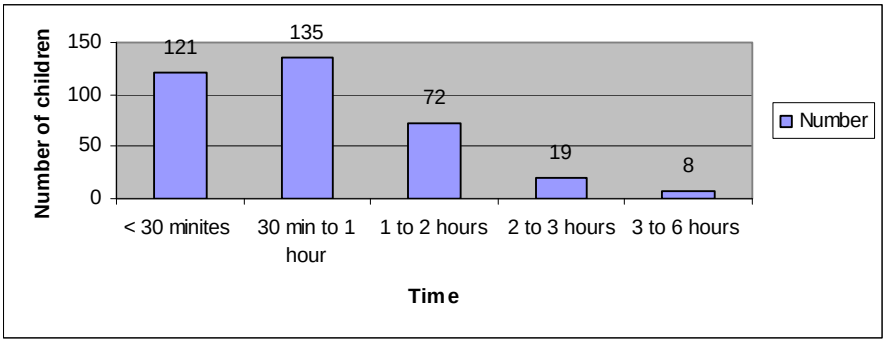

Figure 5: Distance traveled to the OTP sites, Durame, (n=355)

Admission criteria and anthropometry

Referral analysis of children in the study indicated three hundred twenty seven (92.1%) children were referred from the community. The referred children re-assessed for their nutritional status using anthropometrical measurements and 227 (63.9%) of them were admitted with MUAC <11 cm. Three children were re-admitted and only one child refused SC referral (table 11).

Table 11: Proportion of admission anthropometry by referral criteria, Durame, n=355

Admission anthropometry	Child referral, n (%)					
	From the community	From SFP	From SC	Re-admission	SC refusal	Total
MUAC < 11 cm	212 (93.4)	6(2.6)	1(0.4)	0(0.0)	1(0.4)	227 (100)
WFH < 70%	12 (85.7)	1(7.1)	0(0.0)	0(0.0)	0(0.0)	14 (100)
Pitting edema	52(91.2)	2(3.5)	1(1.8)	2(3.5)	0(0.0)	57(100)
Other	49(90.7)	3(5.6)	0(0.0)	1(1.9)	0(0.0)	54(100)

Analysis of admission anthropometry with the rehabilitation outcome indicated that there was no proportionate difference in the rate of deaths among children admitted with MUAC < 11 cm and pitting edema. However, there was higher rate of death among the total cases admitted with edema. Most non-cures were admitted with MUAC criteria (table 12).

Table 12: Distribution of admission anthropometry by outcome, Durame (n=355)

Admission Criteria	Treatment outcome, n (%)				
	Cured	Died	Defaulted	Non-cured	Total
MUAC <11cm	211(93)	6(2.6)	3(1.3)	7(3.1)	227(100)
Weight-for-height <70%	12(85.7)	0(0)	2(14.3)	0(0.0)	14(100)
Pitting edema	49(86)	5(8.4)	2(3.5)	1(1.8)	57(100)
Others	54(100)	0(0)	0(0)	0(0)	54(100)

One hundred seventy four (49%) of the total children in the OTP program were beneficiaries of general food ration which provides a monthly ration of cereals, pulses and edible oil provided for selected food insecure families including families with moderately malnourished children in the community. Further descriptions on admission and discharge criteria and ration amount to the general food ration program are provided in annex 4. Whether families of children in the OTP program were beneficiary of the general food ration or not, it did not have significance association with the treatment outcome (p=0.5809).

Admission history and physical examination findings

On admission two hundred twenty six (63.7%) children were still being breastfed. Breastfeeding status of the children does not affect the treatment outcome (p=0.1802). However, the proportion of children who died was more among non-breast fed than those on breast feeding. Almost all children that are non-cure were breast fed (table 13).

Table 13: Breast feeding status of children in OTPs by outcome, Durame (n=355)

Breast feeding Status	Outcome, n (%)					Chi-square & p-value
	Cured	Died	Defaulted	Non-cured	Total	
Yes	212(93.8)	3(1.3)	3(1.3)	8(3.5)	226(100)	x^2=12.6
No	115(90.6)	8(6.3)	4(3.1)	0(0.0)	127(100)	=p=0.1802

On admission two hundred fifty seven (72.4%) children were not symptomatic and three hundred twenty seven (92.1%) did not have abnormal physical examination findings. The most frequent symptom and sign was coughing (n=52% - 14.7%) and skin discharge (n=8; 2.3%) respectively (Table 14).

Table 14: Admission history and physical examination findings, Durame, 2008 (n=355)

Symptoms on admission	**N (%)**	**Physical examination findings**	**N (%)**
No Symptom	257 (72.4)	No abnormality	327 (92.1)
Diarrhea	36 (10.2)	Eye problem	6 (1.7)
Vomiting	20 (5.6)	Ear discharge	2 (0.6)
Inability to pass urine	2 (0.6)	Mouth (sore or Candida)	0 (0)
Cough	52 (14.7)	Lymph node enlargement	0 (0)
Poor or no appetite	32 (9)	disability	5 (1.4)
Others	1(0.3)	Skin discharge	8(2.3)
		Cold extremity	3(0.8)
		Other	1(3)

Follow up history and medical findings

Follow up records indicated that 116 (32.7%) children had chronic medical conditions which significantly associated with the treatment outcome as shown in table 15 ($p<0.05$). Review of the specific feedback given indicated that in most of medical records the conditions were not documented except few cases of diarrhea, cough and suspicion of congenital abnormality like the Down Syndrome.

Table 15: Chronic medical condition of children in OTPs by outcome, Durame (n=355)

Chronic Medical conditions	Outcome, n (%)					Chi-square & p-value
	Cured	Died	Defaulted	Non-cured	Total	
Yes	99(85.3)	7(6.0)	3(2.6)	7(6.0)	116(100)	$x^2 = 17$
No	230(96.2)	4(1.7)	4(1.7)	0(0.0)	239(100)	p=0.0007

Home visit follow up findings indicated that no home visit was made for 183 (51.5%) children (table 16). Among reasons of home visit only absenteeism and weight loss had significant association with rehabilitation outcome than all other reasons of home visit ($p<0.05$).

Table 16: Reasons for home visit of children in OTPs by outcome, Durame, (n =355)

Reason for home follow up visit		Outcome, n (%)					Chi-square & p-value
		Cured	Died	Defaulted	Non -cured	Total	
Not visited	Yes	176 (96.2)	3 (1.6)	2 (1.1)	2 (1.1)	183(100)	x^2 =6.8
	No	153(89)	8(4.7)	5(2.9)	6(3.5)	172(100)	0.0774
Absent	Yes	49 (81.7)	4(6.7)	5(8.3)	2(3.3)	60(100)	x^2 =19
	No	280 (94.9)	7 (2.4)	2(0.7)	6(2.0)	295(100)	0.0003
Below admission weight in 2nd week	Yes	9 (81.8)	1 (9.1)	0(0)	1(9.1)	11 (100)	x^2 =4
	No	320(93)	10(2.9)	7(2)	7(2)	344(100)	0.2573
Weight loss for 2 weeks	Yes	38 (95)	0(0)	0(0)	2 (5)	40 (100)	x^2 =34
	No	291 (92.7)	10(3.2)	7(2.2)	6(1.9)	314(100)	0.000
Static weight	Yes	19(82.6)	2(8.8)	0(0)	2(8.7)	23(100)	x^2 =7.8
	No	310 (93.4)	9(2.7)	7(2.1)	6(1.8)	332(100)	0.051
Illness	Yes	118(89.4)	7(5.3)	2(1.5)	5(3.8)	132(100)	x^2 =5.9
	No	210(92.7)	11(3.1)	7(2)	8(2.3)	354(100)	0.1161

Three hundred thirty seven children (94.9%) did not have any abnormal medical finding during follow up and nineteen (5.6%) children had abnormal physical examination finding. It includes fever or hypothermia, dehydration, anemia, skin infections and Plumpy nut refusal. Further analysis indicated that fever or hypothermia, dehydration and anemia were significantly associated with the outcome ($p<0.05$).

Table 17: Follow up abnormal medical examination findings, Durame, (n =355)

Follow up abnormal medical finding	N (%)
No	337 (94.9%)
Yes	19 (5.6%)

Rehabilitation outcome determinant variables

Findings of the test statistics analysis of the regression performed using Epi Info program are shown in table 18 and 19. Review of the p-value done to see the significance of variables contributing to the outcome. It showed that variables including program absenteeism, chronic medical illness, fever or hypothermia and anemia add very significant information for predicting the rehabilitation outcome ($p<0.05$), even all the other variables already in the model (table 18). The other variables dehydration and presence of twin ($p>0.05$) could be removed or refit with a new set of data if the model could be any better.

The test statistics in table 20 indicated that F = 12.284 which has F distribution with df1 = k = 9 and df2 = (n – k – 1) = 345. Since P = 0.000, we can declare the regression to be highly significant. That is at least one of the predictor variables is contributing significant information for the prediction of treatment outcome.

Table 18: Test statistics for regression analysis

Variable	Coefficient	Std Error	F-test	p-value
Absent	-0.184	0.068	7.3155	0.007176
Weight loss	0.156	0.082	3.5948	0.058800
Chronic illness	-0.183	0.058	9.8651	0.001830
OTP site	-0.004	0.013	0.1159	0.733752
Age on admission	0.001	0.002	0.1979	0.656720
Fever/hypothermia	-2.765	0.343	64.9490	0.000000
Dehydration	-0.393	0.279	1.9765	0.160666
Anemia	-1.446	0.340	18.0953	0.000027
Family size	0.003	0.005	0.3848	0.535430
CONSTANT	10.646	1.116	91.0449	0.000000

Correlation Coefficient: r^2= 0.25

Table 19: Test statistics indicating regression and residual analysis

Source	Degree of freedom	Sum of Squares	Mean Square	F-statistic	p-value
Regression	9	26.016	2.891	12.749	0.000
Residuals	345	78.221	0.227		
Total	354	104.237			

Review of the coefficient of determination, $R^{2,}$ was done to indicate how well the regression model fits. The regression table above provided a statistical measure of the strength of the model in the R^2, the proportion of the total variation that is explained by the regression of treatment outcome on independent variables – which is 0.25. The finding indicated that that 24% of the total variation has been explained by the regression model. The model does not appear to fit very well.

Finding on the residual plots, which indicate the validity of the regression analysis assumptions, showed 0.227 mean square (> 0) demonstrating either the chosen model is not correct or there might be variables (observations) that do not fit the general pattern. Hence, use of quadratic or other model may provide more accurate estimation and prediction than a linear model used in this report.

CHAPTER FIVE

DISCUSSION

Severe acute malnutrition is an extreme condition that requires special care for better rehabilitation outcome. However, different factors affect the rehabilitation outcome in the management of severe acute malnutrition. Socio-demographic and biological factors are among the major once. This study described these factors and assessed their influence on the rehabilitation outcome of children at seven OTP sites in Durame area.

Most children were successfully cured and the achievement is well above the minimum international standard. This is comparable with other Community Based Therapeutic Care (CTC) programs, which consists of both in-patient, out-patient rehabilitation for severely malnourished children and supplementary food for moderately malnourished children, in the country and which are implemented with better logistics and staffing (Deconinck 2004, p.31). The high cure rate is an incentive for mothers and care takers. Sadler and Khara (2004, p.21) reported that positive feedback associated with recovery from severe acute malnutrition provides a potent force to generate enthusiasm and motivate individuals at the community level to get involved in the program. Moreover, the high cure rate in Durame OTP sites could indicate the effectiveness of community based management of severe acute malnutrition in the routine health system. Golden and Khara (2004, p.19) reported, from Dowa district in Malawi, comparable outcome achievements for a CTC program which operated in an existing health system structure. This small scale program success at Durame might be a potential for large scale programming and success in the area as Prudhon et al. reported (2006, p.102).

In management of severe acute malnutrition using OTP sites, poor access to OTP sites is one of the reasons for higher default rate. In this study there was a low default rate compared with the minimum international standard. This could either indicate better acceptance of the out patient treatment by the program beneficiaries or good community based case follow up or due to better access of the OTP sites to the beneficiaries. Khara, Martin and Walker (2004, p.25) reported high default rate due to extremely difficult context and access problem, as a result of heavy rain, in south Sudan Bahr-el-Ghazal region. Golden and Khara (2004, p.17) reported on the reasons for high default rate in south Sudan and found the reasons to be mother or child sickness, movement of caretaker or mother out of the program area or lack of access to sites particularly during the rainy season. Moreover, Khara, Martin and Walker (2004, p.27) reported that there was high a rate in south Sudan due to missed distributions, community confusion due to change in the schedule, closure of few OTP sites and increased travel time or perilous journeys for the beneficiaries caused by site changes as a result of an extremely challenging access problem. Feleke (2007, p. 25) suggested that program beneficiaries may compare the cost of attending with the cost and/or benefit of other household or livelihood activities and where travel times are longer beneficiaries may default or fail to attend in the first place.

The proportion of death in the study area is also much lower than the minimum SPHERE standard. Moreover, the study finding is better than other CTC programs reports in Ethiopia. The rate of death in other CTC programs ranges from 0.6 to 5.3% (Deconinck 2004, p.31).

The average length of stay in the Durame OTP was longer than the cut-off for the minimum SPHERE standard. This could suggest protracted recovery process. Collins et al.

(2000, p.1826), commented that in outpatient program, severely malnourished patients are not moved from home environments and congregated, thus, exposure to foreign pathogens and the dangers of acquired infection are lower than in inpatient treatment, and therefore the rate of recovery is a less important determinant of success. However, in another publication the same authors (Collins and Sadler 2002, p.1828) indicated that rapid recovery and a high rate of weight gain are important features of successful outpatient treatment program since severely malnourished children, who are immune-compromised, are more vulnerable to infection. The aforementioned report is not in agreement with this study which has high cure rate and slow recover period. Health workers' understanding of admission and discharge criterions' could also affect the length of stay in the program. Binns (2008, p.4), in his final evaluation report indicated the need for practical support in clinical decision making and discharge procedure to deliver a more cost effective service and minimize caseloads and length of stay. These factors could be taken as contributors for the protracted recovery process and longer average length of stay. Further investigation is needed in Durame context to understand the causes better.

The overall average weight gain in the study area is lower than the minimum SPHERE recommendation although it is comparable to other study reports from Malawi (Ashworth 2006, p.24). Golden and Khara 2004, p.16 suggested that longer length of stay and low weight gain in OTP is a reflection of some of the challenges faced by these home based programs (e.g. poor water source, endemic malaria, poor quality of family foods and sub-optimal caring practices). Sadler and Taylor (2004, p.23) suggested that it is necessary to introduce a new protocol to identify children with severe acute malnutrition that gain weight poorly. These children should then be transferred to a stabilization center in order to treat any underlying infection and improve the weight gain. Such kind of case

identification and transfer trial could have been made in the study area to improve the average weight gain.

There appears to be agreement between the proportion of children admitted to the OTP sites and the level of food insecurity in the areas where children reside. This result is in line with the CTC programs assessment report during the OTP set up which indicated that presence of high vulnerability of children to develop severe acute malnutrition in areas where there is chronic food insecurity (WVE 2006b, p.4). Moreover, high proportion cases in OTP sites is an indicator for allocating the larger share of supervisory and technical support for health facilities staff to bring about better rehabilitation outcome. Sadler and Khara (2004, p.21) also reported that in Malawi at the health center level where the OTP sites were located, the need for support was variable according to each center's staff capacity, case load and motivation. This could not be supported by a report from Adillo where there was low proportion of cases and high death rate. The observed association of rehabilitation outcome with the site of rehabilitating health facilities could indicate the need for good staff capacity building, ensuring their commitment, adequate allocation of resources and negotiation with local partners to address the capacity needs during OTP sites set up.

It is well recognized that the period from birth to two years of age is the 'critical window' for child growth, health and development. Insufficient quantities and inadequate quality of complementary foods, poor child feeding practices and high rate of infections have a detrimental impact on the health and growth of children in these important years (UNICEF, 2008b). This study report found children aged 6 – 12 months as well as 13 - 24 months to form the highest proportion of beneficiaries in Durame OTP – similar to reports

from Bangladesh (Gatchell, Forsythe and Thomas, 2006, p.90). UNICEF also reported that globally just over half of 6 – 9 months old children were breastfed and given complementary foods. In Ethiopia there is delay in complementary food introduction in more than 50% of infants aged six to nine months with low (20%) frequency and density of feeding compared with the dietary intake recommendations (MoH 2004a, p.2). These practices could have contributed to the exposure of children to malnutrition in Durame. The significance association between age of admission and treatment outcome in this study should serve as a motivation to investigate the causes of the high prevalence of severe acute malnutrition among these age groups in Durame context in order to save the lives children from the short as well as long term consequences of malnutrition.

Similar to other children in the community and the breast feeding practice in Ethiopia nearly all children under the age of 24 months in the study area were on breast feeding. However, how optimal the breast feeding was, is not known. UNICEF (2008a) reported that breast feeding, if implemented optimally, provides half or more of the child's nutritional need at the age of 6 to 12 months and at least one third of their nutritional needs from 12 to 24 months. One can assume that poor breast feeding practice could contribute to high levels of malnutrition in the community. Contrary to universally accepted principles of contribution of breastfeeding to child health status, this study showed a lack of association between breast feeding and rehabilitation outcome. Further investigation is needed to understand the contribution of optimal breast feeding and complementary feeding with breast feeding on rehabilitation outcome better.

In the study area males and females were equally affected by the level of severe acute malnutrition. This finding is not in agreement with other reports. The government of

Ethiopia reported that in rural areas male children were slightly more malnourished on average than female children (GoE 2007, p.31). Moreover, the demographic and health survey report indicated that the level of severe acute malnutrition was higher among males than females (CSA 2005a, p.160). However, contradictory to the above, in rural part of Ethiopia male children are better preferred and cared for; their basic needs including foods and clothing are better met than girls (WVE 2006a, p.30). It is as a result of community belief that the responsibility to take over family responsibility in future, rests on males at an older age. There is no significant difference on the outcome among males and females, in this community where culturally males get higher priority and are better preferred and cared for than females is very promising in terms of reducing gender inequality in the risk of severe acute malnutrition.

This study found a significant association between family size and treatment outcome. High population pressure is one of the major aggravating factors for food insecurity (WVE 2006c, p.2). Sharing of Plumpy nut is a common practice in a number of OTP programs especially among large family beneficiaries and it is assumed that this could affect the rehabilitation outcome as well as maintenance of nutritional status after discharge from the OTP. Golden and Khara (2004, p.16) also reported high vulnerability of children due to family size. They also indicated that lack of knowledge on caring practices created resource scarcity and sharing. Contrary to this, in South Sudan where sharing of Plumpy nut was reported to be widespread through out the programs, the recovery and death rates were within the minimum international standard (Khara, Martin and Walker 2004, p.27). However, in this study there was an increasing trend in proportion of deaths and non-cures as the family size increases. It could also be a potential risk factor to maintain the nutritional status once the child is discharged from the OTP programs. In families where

there were twins, the study indicated that there was no association with the treatment outcome even though the opposite was expected. This could be as a result of direct enrolment of the second twin to the program even though he/she was not malnourished. However, there was higher proportion of death and non-cure among children with twin than children with any twin siblings.

Decentralization of OTP program sites provides better physical access to the program beneficiaries and results in good outcome (Collins 2004, p.11). In the study area the majority of cases traveled less than an hour distance to the OTP sites. It is within the standard of CTC programs which aims to provide services within 3 hours walking distance for the caretakers (Golden and Khara 2004, p.15). The program coverage survey report in Durame (Feleke 2007, p.15) indicated a high period coverage (67%) compared with the 50% minimum SPHERE Standard. Feleke (2007, p.15) also reported that both period and point coverage rates were lowest among inaccessible OTP sites in Durame suggesting a clear correlation between distance and poor coverage. When OTP program sites have reasonable access it creates community acceptance of the program since it reduces concern of caring mothers or caretakers for their families, loss of family earning , risk of accident and injury due to long hours travel. This could have contributed to good program outcome.

In order to identify cases with severe acute malnutrition before they develop complications, the CTC program guidelines recommend the use of MUAC criteria for admission as it is a sensitive mortality indicator and an easy to use and handy tool for community based cases identification and referral and to make decisions on admission (Valid 2006, p.9). In this study larger numbers of children were admitted to the OTP program according to MUAC criteria. This could indicate the negative impact and low

acceptability of weight and height measurement due to logistics requirement and unpleasantness for younger children and their care takers (Myatt, Khara, and Collins 2005, p.8). Personal discussion with Cyprian, World Vision Africa Region CTC Advisor, indicated that the proportion of children admitted with MUAC to OTP program is higher in Ethiopia than his personal experience in South Sudan and Kenya. This could be as a result of low rejection rate compared with the use of MUAC for both village level referral and admission compared to the use of MUAC for community referral and making admission decision with WFH.

Very low proportions of children in the study area were admitted to the program according to WFH criteria. It could be either due to unfamiliarity of the health workers with this measurement or poor suitability for mothers. Moreover, it could indicate low sensitivity of WFH to detect severely malnourished children to admit at an earlier stage. Further research may be needed to investigate whether less than 70% median WFH may deny admitting children with severe acute malnutrition and associated risk of death. It is well recognized that delayed identification of severely malnourished cases in rehabilitation program may affect the outcomes due to higher risk of medical complications that follow lowered immunity. Collins et al. (2006, p.52) reported that early identification and treatment, before the metabolic and immunologic aspects become marked, is a determinant of success. If only WFH was used as an admission criterion about six in ten children admitted with MUAC would have gone undetected in the community leading to medical complication. Although there was no association between admission anthropometry and treatment outcome the reasons for low rate of WFH admission in Durame needs further study.

Because of very low immunity and the subsequent reduced ability to respond to infections, the death rate is proportionally higher among edematous cases than in children admitted with other admission criteria. Collins and Sadler (2002, p.1827) reported higher death rate among children admitted with edema in their Badewacho OTP program study report.

The CTC program model always sees outreach and community mobilization as vital elements for successful programming (Mandalazi 2007, p.5). Case detection at community level and the definition of appropriate referral and admission criteria are important factors in achieving adequate level of coverage for treatment of SAM (Myatt, Khara and Collins 2005, p.1). Moreover, Golden and Khara (2004, p.15) also reported that maximum access to OTP services would be achieved by focusing the activities of outreach workers on mobilizing communities through local outreaches as well as active case finding. It could be due to these factors that large numbers of children were admitted to the OTP sites from the community referrals in this study. Moreover, it could demonstrate the functionality of the community based cases identification and referral systems or increased need based demands for the OTP and self referral of children to health facilities. On the other side, Feleke (2007, p.16) during Durame OTP program coverage survey reported that in the presence of large number of volunteers in very small geographic areas, many new malnourished cases were identified. This might be as a result of passive case-finding and referral activity by volunteers. Cases identification and referral require good rigor and functional communication systems to follow up children referred between the community and health centers. Caution has to be taken to find a balance between high workload and expectation among community volunteers and different players in the district to use volunteers effectively with out compromising their daily activities (Sadler and Taylor 2004, p.21).

The study findings indicated that there was low re-admission rate in the OTP sites. This could indicate low recurrence rate. Understanding the reasons why there was low re-admission in the study community is beyond the scope of this study. However, one can assume it could be due to improved food availability and consumption in the community. From my practical observation during data collection it was not the case as the community was still receiving supplementary feeding and general food ration. Hence, to understand this closer follow up of children from the program need to made.

The proportion of SC refusal rate was almost insignificant in this study. This could be due to mothers' agreement to take the child to inpatient care on first consultation as reported from North Darfur CTC program implementation (Sadler and Taylor 2004, p.23). Moreover, the study result found low admission from the SFP program. This could be as a result of either children medical or nutritional conditions was not deteriorating once discharged from OTP program and admitted to the SFP program or effectiveness of the SFP program. But it was not so according to Binns (2007, p.12) who commented that the SFP program in the area was weak in terms of timing of SFP distribution and efficacy. He also reported that there was insufficient evidence to conclude that the SFP program was having a positive impact on the nutritional status of children enrolled in the program. In the absence of strong SFP program in the study area or without enough assistance for the continued recovery of children discharged from OTP program, deterioration of children malnutrition status and higher re-admission to the OTP program would have happened.

About twenty three percent of Ethiopian population lives with a daily income of less that one US dollar a day (HDR, 2007). It could be worse in food insecure rural areas such as

Durame. Though analysis of households food availability was beyond the scope of this study, enrolment of half of the families in general food ration could indicate high vulnerability of children to acute malnutrition due to lack of food in the study area. The program set-up report indicated that due to presence of large numbers of households that are chronically food insecurity, the likelihood of children to develop acute malnutrition is higher even during normal harvest time (WVE 2006b, p.4). Other manifestations of chronic food insecurity on the child health in the study community as well as the reasons for the very high dependency on external assistance needs further study, even though it has no significant association with the outcome of this study.

Optimal breastfeeding of infants under two years of age has the greatest potential impact on child survival of all preventive interventions (UNICEF 2008a). Overall larger proportions of children in the study area were on breast feeding and children under the age of 24 months constitute the highest proportion. This is comparable with the national figures (DHS 2005, p.143). This report did find a lower mortality and non-cure rate amongst breast fed than non-breast fed. On the contrary, all non-cure children in the study area were on breast feeding. This finding requires additional information from the beneficiaries to make a rational judgment on confounding risk factors. According to UNICEF (2008b) breast milk constitute only half to one quarter of the daily nutritional requirements for children between 6 to 24 months. Optimal breast feeding can therefore still result in malnourished children as optimal complementary feeding and better child care practices in addition to optimal breast feeding is required to improve the child health and nutritional outcomes in these important age groups (ECSA-HC, 2008, P.24). As indicated in the previous section, the peck admission rate after the age of 6 months could be due to insufficient quantities of complementary feeding practice in addition to breast

milk. Sub-optimal complementary practices may provide a challenge for the sustainability of the OTP achievements.

On admission, large proportion of children did not have symptoms and sign of illnesses. This might not mean that such a large number of children with severe acute malnutrition in the study area were healthy on admission. According to Collins et al. (2006, p.1) the absence of symptoms or signs is a result of the limited ability of the body of acutely malnourished children to respond to stresses such as infection. The finding a third of the children who were found ill during home visit might indicate the development of their immune system to fight infection.

About one third of the children in the study had chronic medical illnesses, which was significantly associated with the treatment outcome. The presence of chronic diseases such as tuberculosis and HIV may lead to slower recovery (Collins et. al. 2006, p.1), a longer length of stay (Golden and Khara 2004, p.14) as well as possible further deterioration of the nutritional status due to malabsorption of nutrients, altered metabolism, loss of appetite (DPPA 2002, p.9). Due to lack of proper documentation this study did not identify the types of chronic illnesses on the medical records well. This point to the needs for capacity development of health workers, especially in rural settings, in record keeping and diagnosis and treatment of medical complications.

Though all children in OTP program needs regular home visits, the study finding indicated that more than half of the children in the program did not receive any visit. A high level of program absentees was suggestive of potential low level of home visit during follow up.

Absence of care takers or mothers from the program either from lack of motivation or inability to resolve issues during child feeding and care at home could result in weight loss and poor treatment outcome. Reports from North Darfur region (Sadler and Taylor 2004, p.23) as well as a CTC program in South Sudan (Khara, Martin and Walker 2004, p.26) indicated low prevalence of home visits and case follow up due to due to inaccessibility of the areas, incoherent case finding strategies, inadequate follow up and tracking systems and lack of prioritization of these aspects.

According to Binns (2007, p.14) for those children who were home visited MUAC screening was not done as part of routine visits to households in Durame OTP program. This might create missed opportunities to follow up progress of children progress during their stay in the program and to identify new cases in the villages (Feleke 2007, p.18). Reported consecutive weight loss of children could be as a result of poor follow of children in the community. Though absenteeism and weight loss has significant association with the rehabilitation outcome this study did not investigate barriers to presentation for treatment or why mothers or care takers were absent during follow up or why health workers did not conduct home visits regularly or causes of those children who were found losing weight.

LIMITATIONS

The most important limitations of this study are high cure rate and less frequency of other variables made statistics less valuable especially the chi-square and p-value. Because of this the study was limited to be descriptive. Moreover, the study could not provide meanings and interpretation for factors since it did not have qualitative component.

CHAPTER SIX

CONCLUSIONS

The OTP program in Durame exceeded the minimum international standard for cure, death and default rate. However, lengths of stay in the program were longer and the average weight gain was lower than international recommendations. For an OTP program which used existing Ministry of Health staffing and structure, such level of achievement is an indicator for effectiveness of community based management of severe acute malnutrition and its potential to integrate in routine health system in resource scarce settings like Durame.

In the Durame OTP, males and females were equally affected by SAM, the majority of children younger than 24 months, were admitted from the above average sized food insecure households living in food insecure areas of the district that might not provide them adequate quality and quantity of complementary foods. Sustainability of the high program achievement after children are discharged from the program is a concern as all these beneficiaries characteristics may be potential risk factors for future recurrence of SAM.

Access to OTP sites was generally good. The relative high level of defaulting/absenteeism and weight loss of children while in the program could be the result of an imbalance between high level of community cases identification and referral and lower quality and frequency of home visits during follow up.

Additional factors that significantly contributed to the treatment outcome were medical conditions such as fever/hypothermia, dehydration and anemia. This might require closer follow up but in this study due to poor documentation it was not possible to identify the specific types of chronic medical conditions that would have helped case identification and plan for better case management in the future.

To sustain the achievements and prevent malnutrition in this area strengthening of the existing health system as well as additional action through comprehensive interventions that will address the main socio-demographic and behavioral factors that significantly contribute to prevent malnutrition, is required.

Generalization of the study findings to other programs needs to consider the study limitations.

CHAPTER SEVEN

RECOMMENDATIONS

To address the key findings, the following actions are recommended:

- Strengthening the frequency and quality of cases follow up (home visits) in the community and improve health workers' skill in early identification of cases with poor progress to improve the weight gain and reduce the length of stay,
- Maintain the achievements in the management of SAM;
- Design interventions (such as nutrition education) to improve infant and young child feeding practices and supporting systems in-terms of nutrition education to be designed to reduce risk developing acute malnutrition, recurrence and long term cognitive and physical impairment of children especially under 24 months,
- Considered outreach support such as mother to mother notification and mobilization to reduce absenteeism, early detection of children losing weight and increase program uptake;
- Monitor the quality of medical records. This is essential to identify the type of chronic medical conditions and to plan corrective measures;
- Scale up other public health interventions such as family planning which might reduce food insecurity and therefore reduce the risk of malnutrition
- Develop relevant food security interventions to improve food availability at household level and reduce the proportion of families dependent on general food ration and prevent future recurrence,
- Ensure integrated management of SAM and extend entry criteria to include referral from other child health focused interventions.
- Future studies to consider the limitations of this study,

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APPENDICES

Annex I - MoH SAM Management Protocol

ADMISSION CRITERIA

All patients that fulfill any of the criteria in the following table have severe acute malnutrition (SAM).They should be offered therapeutic feeding in one of the available settings.

Summary of Criteria for admission to in-patient or out-patient care

Factor	In-patient care	Out-patient care
Anthropometry	6 months to 18 years W/H or W/L < 70% **or** MUAC < 110 mm with a Length > 65 cm Adults: MUAC < 180 mm with recent weight loss or underlying chronic illness **or** MUAC < 170 mm **or** BMI < 16	
Bilateral pitting edema	Bilateral pitting edema Grade 3 (+++) Marasmus-Kwashiorkor	Bilateral pitting edema Grade 1 to 2 (+ and ++)
Appetite	Failed or equivocal Appetite test	Passes Appetite test
Choice of career (at any stage of management – the career is often the best judge of severity)	Career chooses to start, continue or transfer to in-patient treatment. No suitable or willing career.	Career chooses to start, continue or transfer to out-patient treatment Reasonable home circumstances and a willing career
Skin	Open skin lesions	No open skin lesions
Medical complications	- Severe vomiting/ intractable vomiting - Hypothermia: axillary's temperature <35°C or rectal <35.5°C - Fever > 39°C - Number of breaths per minute: - 60 resps/ min for under 2 months - 50 resps/ minute from 2 to 12 months - >40 resps/minute from 1 to 5 years - 30 resps/minute for over 5 year-olds or - Any chest in-drawing - Extensive skin lesions/ infection - Very weak, lethargic, unconscious - Fitting/convulsions - Severe dehydration based on history & clinical signs - Any condition that requires an infusion or NG tube feeding. - Very pale (severe anemia), jaundice, bleeding tendencies	Alert with no medical complications

Summary table of systematic treatment of patients

	Direct admission to in-patient (Phase 1)	**Direct admission to out-patient (Phase 2)**
Vitamin A	- 1 dose at admission (conditional) - 1 dose on discharge - do not give when transferred to OTP management - it will be given in OTP	- 1 dose on the 4th week (4th visit)
Folic Acid	- 1 dose at admission if signs of anemia	- 1 dose at admission if signs of anemia
Amoxicillin	- Every day in Phase 1 + 4 more days in Transition	- 1 dose at admission + give treatment for 7 days at home
Malaria	- According to national protocol	- According to national protocol
Measles (from 9 months old)	- 1 vaccine at admission if no card - 1 vaccine at discharge	- 1 vaccine on the 4th week (4th visit)
Iron	- Add to F100 in Phase 2	- No - iron is already in all RUTF
De-worming	- 1 dose at the start of Phase 2	- 1 dose on the 2nd week (2nd visit)

Amounts of F75 to give during Phase 1

Class of Weight (kg)	8 feeds per day ml for each feed	**6 feeds per day ml for each feed**	5 feeds per day ml for each feed
2.0 to 2.1 kg	40 ml per feed **50 ml per feed** 65 ml per feed		
2.2 - 2.4	45	**60**	70
2.5 - 2.7	50	**65**	75
2.8 – 2.9	55	**70**	80
3.0 - 3.4	60	**75**	85
3.5 – 3.9	65	**80**	95
4.0 – 4.4	70	**85**	110
4.5 – 4.9	80	**95**	120
5.0 – 5.4	90	**110**	130
5.5 – 5.9	100	**120**	150
6 – 6.9	110	**140**	175
7 – 7.9	125	**160**	200
8 – 8.9	140	**180**	225
9 – 9.9	155	**190**	250
10 – 10.9	170	**200**	275
11 – 11.9	190	**230**	275
12 – 12.9	205	**250**	300
13 – 13.9	230	**275**	350
14 – 14.9	250	**290**	375
15 – 19.9	260	**300**	400
20 – 24.9	290	**320**	450
25 – 29.9	300	**350**	450
30 – 39.9	320	**370**	500
40 – 60	350	**400**	500

Transition Phase: amounts of F100 to give

Class of Weight (kg)	8 feeds per day	6 feeds per day	5 feeds per day
Less than 3kg	F100 full strength should not be given – Only F100 diluted should be given		
3.0 - 3.4	60 ml per feed	**75 ml per feed**	85 ml per feed
3.5 – 3.9	65	**80**	**95**
4.0 – 4.4	70	**85**	**110**
4.5 – 4.9	80	**95**	**120**
5.0 – 5.4	90	**110**	**130**
5.5 – 5.9	100	**120**	**150**
6 – 6.9	110	**140**	**175**
7 – 7.9	125	**160**	**200**
8 – 8.9	140	**180**	**225**
9 – 9.9	155	**190**	**250**
10 – 10.9	170	**200**	**275**
11 – 11.9	190	**230**	**275**
12 – 12.9	205	**250**	**300**
13 – 13.9	230	**275**	**350**
14 – 14.9	250	**290**	**375**
15 – 19.9	260	**300**	**400**
20 – 24.9	290	**320**	**450**
25 – 29.9	300	**350**	**450**
30 – 39.9	320	**370**	**500**
40 – 60	350	**400**	**500**

Phase 2 (out-patients): amounts of RUTF to give

Class of weight(kg)	RUTF Paste		PLUMPY'NUT®		BP100®	
	Grams per **day**	Grams per **week**	sachet per **day**	sachet per **week**	bars per **day**	bars per **week**
3.0 - 3.4	105	750	1 ¼	8	2	14
3.5 - 4.9	130	900	1 ½	10	2 ½	17 ½
5.0 – 6.9	200	1400	2	15	4	28
7.0 – 9.9	260	1800	3	20	5	35
10.0 - 14.9	400	2800	4	30	7	49
15.0 – 19.9	450	3200	5	35	9	63
20.0 – 29.9	500	3500	6	40	10	70
30.0 - 39.9	650	4500	7	50	12	84
40 - 60	700	5000	8	55	14	98

DISCHARGE CRITERIA

AGE	DISCHARGE CRITERIA
Option 1	
6 months to 18 years	□ W/L>=85% or W/H>=85% on more than one occasion. (Two days for in-patients, two weeks for out-patients). **And** □ no edema for 10 days (In-patient) or 14 days (out-patient)
Option 2	
6 months to adulthood	□ Target weight gain reached (see table in annex 6) **And** □ no edema for 10 days (In-patient) or 14 days (out-patient)

Option 1 is the preferred option. It is used where the facility has the capacity to measure the height of the children.
Option 2 is used particularly for adults and also for children being treated by mobile teams and admitted on MUAC criteria to peripheral OTP sites without the facilities or staff skills to measure height. See table in annex 6.
All the patients should be discharged to supplementary feeding program (SFP) for follow up where this is available. If the SFP is well run and the numbers of children in the Therapeutic feeding program the discharge criteria can be changed to 80% weight for height on at least two occasions.

Follow-up after discharge
The patients should be enrolled in a Supplementary Feeding Program and given nutritional support for another 4 months. The ration should be the same as the standard SFP ration. There should be a separate category in the SFP registration book for these patients for their follow up. The registration book should always record the UNIQUE SAM number of the patients that have been severely malnourished.
If there is no SFP near to the beneficiaries' home, then the follow up should be organized at the nearest MCH or health centre monthly for two months.
Where the outreach services are operational, linkages can be made so that children discharged from the program can be followed up by the outreach workers/ community health workers.

TARGET WEIGHT FOR DISCHARGE

This table gives the **target weight for discharge** for patients admitted with various admission weights when no height is available- used for patients admitted on MUAC alone.

Admission weight	Discharge weight		Admission weight	Discharge weight		Admission weight	Discharge weight
3.0	3.6		8.1	9.8		18.5	22.5
3.1	3.8		8.2	10.0		19	23
3.2	3.9		8.3	10.1		19.5	23.5
3.3	4.0		8.4	10.2		20	24
3.4	4.1		8.5	10.3		21	26
3.5	4.3		8.6	10.4		22	27
3.6	4.4		8.7	10.6		23	28
3.7	4.5		8.8	10.7		24	29
3.8	4.6		8.9	10.8		25	30
3.9	4.7		9.0	10.9		26	32
4.0	4.9		9.1	11.1		27	33
4.1	5.0		9.2	11.2		28	34
4.2	5.1		9.3	11.3		29	35
4.3	5.2		9.4	11.4		30	36
4.4	5.3		9.5	11.5		31	38
4.5	5.5		9.6	11.7		32	39
4.6	5.6		9.7	11.8		33	40
4.7	5.7		9.8	11.9		34	41
4.8	5.8		9.9	12.0		35	43
4.9	6.0		10.0	12.1		36	44
5.0	6.1		10.2	12.4		37	45
5.1	6.2		10.4	12.6		38	46
5.2	6.3		10.6	12.9		39	47
5.3	6.4		10.8	13.1		40	49
5.4	6.6		11.0	13.4		41	50
5.5	6.7		11.2	13.6		42	51
5.6	6.8		11.4	13.8		43	52
5.7	6.9		11.6	14.1		44	53
5.8	7.0		11.8	14.3		45	55
5.9	7.2		12.0	14.6		46	56
6.0	7.3		12.2	14.8		47	57
6.1	7.4		12.4	15.1		48	58
6.2	7.5		12.6	15.3		49	60
6.3	7.7		12.8	15.5		50	61
6.4	7.8		13.0	15.8		51	62
6.5	7.9		13.2	16.0		52	63
6.6	8.0		13.4	16.3		53	64
6.7	8.1		13.6	16.5		54	66
6.8	8.3		13.8	16.8		55	67
6.9	8.4		14.0	17.0		56	68
7.0	8.5		14.2	17.2		57	69
7.1	8.6		14.4	17.5		58	70
7.2	8.7		14.6	17.7		59	72
7.3	8.9		14.8	18.0		60	73
7.4	9.0		15.0	18.2			
7.5	9.1		15.5	19.0			
7.6	9.2		16.0	19.5			
7.7	9.4		16.5	20.0			
7.8	9.5		17.0	20.5			
7.9	9.6		17.5	21.5			
8.0	9.7		18.0	22.0			

The table is constructed so that a person admitted with a weight-for-height of 70% (NCHS median) will be discharged when they reach 85% weight-for-height (NCHS Median). Those admitted at 65% weight-for-height will reach 79%weight-for-height at the target weight. Most patients below 65% will be treated as in-patients and will have their height measured and an individual target weight calculated.

Annex II

Sample Size determination

The following formula was used to calculate the sample size for the study.

$$n = \frac{Z^2 \times p \times q}{d^2}$$

Z = the level of confidence choice which is 95% confidence = 1.96
d = precision (0.03%)
p = prevalence of malnutrition in the area = 8.5%
q = 1 – p

Hence,

$$n = \frac{(1.96)^2 \times (0.085) \times (1-0.085)}{(0.03)^2}$$

$$n = (3.8416)\ (0.085)\ (0.915)/\ (0.0009)$$

$$n = 327$$

Considering an additional 10% of the sample size for medical records that might be found damage or missing, the total sample size for the study will be 360.

Annex III

DATA COLLECTION QUESTIONNAIRE FOR ASSESSING THE FACTORS AFFECTING THE REHABILITATION OUTCOME (OF OUT PATIENT TERAPEUTIC PROGRAM) OF CHILDREN WITH SEVERE ACUTE MALNUTRITION IN DURAME AREA, SOUTHERN ETHIOPIA

Please use 9 for all missing information & 99 for incorrect information

Registration number		|____|____||____|		
Sampled card number available		**Yes** **No (mention the reason)**		
General Background				
Q1	OTP site (health post = HP and health center = HC)	*1 = Demboya HC, 2= funto HP, 3=Yebu HP 4= Durame HC 5= Adilo HC* *6= Jore HP 7 = Benera HP*		
Q2	Age on admission	*Write in months*		
Q3	Sex	1 = Male 2 = female		
Q4	How was the child referred to the OTP site	1= from the community 2 = from SFP 3 = from SC 4= re-admission 5= SC refusal		
Q5	Family size	***Write in number***		
Q6	Does the child have a twin?	1 = Yes 2 = No		
Q7	Was the family registered for general food ration (GFR) on admission	1 = Yes 2 = No		
Q8	Distance of OTP sites from the child home	Write in minutes		
Admission Anthropometry, history and physical examination findings				
Q9	Weight on admission	Write in kilograms		
Q10	Admission Anthropometry	1 = MUAC 2 = WFH 3 = edema 4. other 9= other (specify)		
Q11	Recorded symptoms on admission write more than one answer	1 = None 2 = diarrhea 3 = vomiting 4 = inability to pass urine 5 = cough 6 = poor or no appetite 9 = other specify_____		
Q12	Was the child on breast feeding?	1 = Yes 2 = No		

Q13	Physical examination abnormal finding on admission Write more than one answer	1 = None 2 = Eye (sunken, discharge) 3 = Ear (discharge) 4 = Mouth (sore, candida) 5 = Lymph node 6 = Disability 7 = Skin change (scabies, peeling or abscess/ulcer) 8 = Cold extremities 9 = other specify_____		
Follow up anthropometry, History and physical examination findings				
Q 14	Does the child have record of suspected chronic medical conditions like TB, HIV, congenital abnormalities etc?	1= Yes 2 = No *If yes please specify*_____		
Q15	List the reasons for home visit Write more than one answer	1 = none 2= absent 3 = Below admission in 2 wk 4 = Weight loss for 2 wk 5 = Static eight for 3 weeks 6= illness 9 = other specify		
Q16	Recorded abnormal physical findings during follow up Write more than one answer	1=none 2=fever/hypotermia, 3=dehydration, 4=anemia 5=skin infection 6 = Plumpy nut refusal		
Rehabilitation outcomes				
Q17	Weight gain	Write in g/kg/day		
Q18	Length of stay	Write in days		
Q19	Treatment outcome	1= Recovered (discharged cured), 2=died, 3=defaulted, 4=non-cured		

Annex IV

GENERAL FOOD DISTRIBUTION

Introduction

In basic terms, a **General Food Distribution (GFD) program** provides food to an affected population in order to sustain life by ensuring that food is indeed available to, and accessible by, all persons experiencing food crises and famines. The aim of GFD is to cover the immediate basic food needs of a population in order to eliminate the need for survival strategies which may result in long-term negative consequences to human dignity, household viability, livelihood security and the environment.33 GFD is required when a given population is experiencing a serious food shortage and is unable to access sufficient food to meet its nutritional needs. Ideally a standard general ration is provided in order to satisfy the full nutritional needs of the affected population. In a population affected by an emergency, the general ration should be calculated in such a manner as to meet the population's minimum energy, protein, fat and micronutrient requirements for light physical activity. The aim of GFD programs is not only to cover the immediate basic food needs of a population but also to prevent deterioration of nutritional status leading to malnutrition, famine and death. This type of program is also important for maintaining and restoring regular livelihood and ensuring food security. Adequate General Food Distribution is the key intervention for ensuring the health and survival of a population experiencing food crises and famines. The modes of food distribution include Employment Generation Schemes (EGS), Gratuitous Relief (GR) and General [Free] Food Distribution (GFD). Due to the fact that food aid dependency is a major concern in Ethiopia, 80% of the food aid is distributed through EGS, especially in areas that are chronically food insecure. Although the provision of food is the first relief priority in nutritional emergencies, it is also crucial to organize programs for the prevention and treatment of the most prevalent diseases. Disease prevention, including prompt attention to immunization and to the various aspects of environmental health (e.g. safe water supply, sanitation facilities, etc.), should be a priority.

During a prolonged food shortage, when a population must depend entirely on food relief for more than 2 months, there is an increased risk in the development of other nutritional deficiencies such as scurvy (due to a lack of vitamin C) and pellagra (due to a lack of niacin). In practice, the prevention of these micronutrient deficiencies involves providing the relevant micronutrients in appropriate quantities, ideally by improving the diet and increasing the consumption of micronutrient-rich foods. Unless and until this can be done, the alternative is to provide micronutrient supplements and foods fortified with micronutrients. In most cases, the most effective strategy is to combine dietary approaches, including supplementation and food fortification. The ration may include blended food that is micronutrient-fortified with a complete vitamin/mineral premix, iodized salt and vitamin A and D-enriched vegetable oil. Currently the GFD in Ethiopia is based on cereals, pulses and vegetable oil and lacks some of the essential micronutrients. The GFD must include sufficient levels of these micronutrients in order to safeguard adequate micronutrient levels to help prevent diseases and disabilities due to micronutrient deficiency. Therefore the inclusion of micronutrient-rich foods such as fortified blended foods, iodized salt, etc. on a regular basis is highly recommended.

When to Establish General Food Distribution (GFD)

GFD should be initiated when one or more of the following conditions are present:

- there is an unusual severe decline in food availability or affordability
- when coping mechanisms are, or will be, insufficient
- When there is a high prevalence of malnutrition (causes must be analyzed)

As a rule, the prevalence of malnutrition should not be considered a key determinant due to the fact that the decision to implement GFD should be organized before nutritional status deteriorates. A timely GFD should prevent or at least reduce the health and nutritional consequences of insufficient food, and thus the need to initiate other medical or nutritional
interventions.37
The Early Warning (EW) system of the DPPC in Ethiopia is designed to provide assessments of food prospects within the country and to detect (as early as possible) the likelihood of deterioration in food security or, in worse case scenarios, impending disaster. The EW system should also formulate contingency plans and develop trigger mechanisms to identify when to address these problems before they reach unmanageable levels. The aim of the EW system in Ethiopia is to target assistance (including GFD) in a timely and systematic manner.

The purpose of targeting is to assist community leaders, government and non-government organizations and food aid monitors in the fulfillment of their responsibility to assure that the most needy households are selected for assistance using criteria developed at the community level and that only those households selected are provided with food. Targeting should be carried out before food aid arrives in the Regions or Distribution sites. In order to target households for general food distribution, it is useful to rank all households based on the following information:

- How much they are entitled to the ration
- How much they need to meet their monthly food gap
- Assets (e.g. livestock, land) they own
- How much food the household has in stock or other earnings (including "gifts" from

relatives)
- The number of people in the household
- Type of household (female, male, elderly or child head of household)
- Number of disabled/elderly/chronically ill (> 6 months) and able-bodied persons
- Length of time (in months) food assistance (general ration) is required
- The presence and number of malnourished children in the household

This information must be monitored and updated on a regular basis and the community members informed of the changes related to the ranking and subsequent selection of households.

General Ration Development

The basic commodities in general rations should include a nutritionally balanced combination of cereals, pulses and edible oil.

Cereals: Cereal grains are the staple foods, the main source of energy and often of protein in most cultures, including Ethiopia. They contain considerable amounts of protein (8-12%), B vitamins, iron and calcium; with maize providing useful amounts of provitamin A. Unfortunately many of the vitamins are lost in the milling process or during cooking. It is important to provide a cereal that is traditionally used by the population concerned and to distribute it in a form (whole grain or milled) that is familiar and can be easily used. The most commonly consumed grains in Ethiopia are wheat, teff (good source of calcium and has the most iron41), maize and sorghum.

Pulses: Dried pulses generally contain about 20% protein (with soy beans containing over 30%) and are rich in B vitamins, folic acid, and calcium and iron (although the iron is poorly absorbed). If the legume is bright red or yellow, like lentils, some vitamin A is present. Pulses represent a concentrated form of energy and are especially nutritious when they are eaten with cereals.
The amino acids in each of the two groups complement each other to provide a protein that is more similar to what is known as the reference protein. This reference protein contains a pattern of essential amino acids that is considered most suitable for building human body protein and is found in milk and egg protein.42 As with cereals, every effort should be made to provide the most culturally acceptable variety, although local preferences should be weighed against the method of preparation, especially when water and fuel are limited. The most commonly consumed pulses in Ethiopia are peas and lentils (which take less time to cook) as well as some dried beans and chickpeas.

Edible Oil: Oils and fats are concentrated sources of calories (adding to the energy value of the ration without increasing bulk) and also enhance the palatability and consistency of a food. All oils
used in emergency distribution must be appropriately fortified with vitamin A.

Energy Requirement

In the first stages of an emergency situation, the average estimated per capita energy requirement of 2,100 kilocalories43 will be used to expedite decisions about the immediate initial provision of food. Once demographic, food security, health and nutrition, and contextual information has been collected (including information listed on page 26 for ranking households), the calculation for the amount of food aid required should be adjusted accordingly.44 For relief work in Ethiopia, the general ration will most likely remain at 2,100 kcal based on the average increased energy needs for maintaining the capacity to walk long distances and to perform agricultural work. It must be noted that although the planning figure of 2,100 kcal per person per day is the minimum average energy requirement in emergency situations, it is common to find rations that provide a lesser amount of kcal based on confirmed access to other food sources. In particular in emergency situations people have different mechanisms through which they obtain food. People's access to alternative food sources may include the obtaining of food through their own activities, receipt of loans or gifts, participation in social networks, etc.

Upward adjustments may be needed when the demographic (age/sex) structure among beneficiaries is unusual and is mainly dominated by large numbers of people with high energy requirements.45 There may also be critical situations when malnutrition is high and extra food is needed for recovery and rehabilitation, e.g. in emergency shelters or relief camps. Extra food needs for vulnerable and malnourished groups of children and adults should be met through "selective supplementary feeding programs".

Downward adjustments may be justifiable in the case of populations that remain in their villages and have access to alternative food/income sources (e.g. from their own agricultural production, from local market purchases, from cash interventions, etc.). Such adjustments may be necessary in order to prevent the flooding of markets with relief foods, giving rise to a drop in market prices which may have serious economic effects for the agricultural producers. The decision to reduce the ration level should always be based on the following:

1) Reliable survey data demonstrating that the nutritional status of children 6 to 59 months in the area concerned is "satisfactory"/"good" – defined as weight-for-height > 85% of the median and
2) A parallel assessment of the amount of food available from other sources in order to confirm that the total food available for consumption provides no less than 2,100 kcal per person per day.

Nutrient Composition

In the determination of the nutrient composition of the general ration, both fat and protein content should be related to total energy content. The expression of fat and protein content in grams as well as percentage of total energy content provides a means of assessing the nutrient quantities and the nutritional quality of the ration.

 In General Food Distribution Programs the daily general ration should include the following proportion of nutrients:

2,100 kcal **10-12% kcal from PROTEIN [52-63g]** **17% kcal from FAT (minimum) [40g]** **PER PERSON PER DAY**

 Based on this nutrient composition, the recommendation in Ethiopia is for the complete ration/full basket:

15kg cereal + 0.6 - 0.9kg oil + 1.5kg pulses **PER PERSON PER MONTH**

 The protein foods most often used in general food ration distributions are pulses but when these are not available and there is a surplus of blended foods such as CSB, Famix or Unimix – over and above what is needed for use in supplementary feeding - they are sometimes included in the general ration. Although pulses are preferable over blended foods in the general ration as they are commonly consumed in Ethiopia (e.g. shiro wat) and more easily stored, the inclusion of blended food will enhance the micronutrient content of the general ration.

 In principle, for food aid beneficiaries to receive a balanced diet, daily requirements
of not only macro but also micronutrients must be covered. Ideally the general food ration should be fortified with the required micronutrients, including as a minimum: vitamin A, iodine, iron and if possible vitamin C in order to avoid the most prevalent Micronutrient Deficiency
Disorders (MDD) in Ethiopia [vitamin A deficiency → Bitot's spots; iron deficiency → anemia; iodine deficiency → cretinism and goiter]. The following food items for food relief are fortified based on WFP fortification specifications: vegetable oil with vitamins A and D, salt with iodine, blended foods with vitamin/mineral mix, wheat and maize flour with thiamin, riboflavin, niacin, folic acid and iron. When fortification is not possible or is not complete, as in the example of wheat and maize flour included in the general ration distributed in Ethiopia, implementing partners should assess for micronutrient deficiency and consider filling such gaps in the most feasible manner.

 It is of utmost importance for implementing partners to consider the expiration dates of relief commodities prior to distribution.

Summary

In basic terms, a **General Food Distribution (GFD) program** provides food to an affected population in order to ensure that food is indeed available to, and accessible by, all persons experiencing food crises and famines. The aim of a GFD is to cover the immediate basic food needs of a population and is required when a given population is experiencing a serious food shortage and is unable to access sufficient food to meet its nutritional needs.

♦ **GFD should be initiated when one or more of the following conditions are met:**
- There is an unusual severe decline in food availability or affordability
- When coping mechanisms are, or will be, insufficient **AND/OR**
- When there is a higher than usual prevalence of malnutrition

♦ **Target group**
- Affected population as a whole

♦ **General Food Ration Composition**

2,100 kcal **10-15% kcal from PROTEIN [52-63g]** **17% kcal from FAT (minimum) [40g]** **PER PERSON PER DAY**

COMPLETE RATION **15 kg *CEREAL* +0.6-0.9 kg *OIL* + 1.5 kg *PULSES* PER PERSON PER MONTH**