RESEARCH REPORT

PERFORMANCE OF COMMUNITY-BASED MANAGEMENT OF CHILDREN WITH SEVERE ACUTE MALNUTRITION IN A PASTORAL AREA OF ETHIOPIA

by

Bekele Negussie Demisse

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Supervisor: Dr M M Mokgatle-Nthabu

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DEDICATION

This study is dedicated to my mother Birtukan Endeshaw, my brother Yazew Negussie, my sister Zewditu Negussie, and my grandfather Endeshaw Jemma.

DECLARATION

I declare that the study titled "**Performance of community-based management of children with severe acute malnutrition in a pastoral area of Ethiopia**" is my own work and that all the sources that I have used or quoted have been indicated and acknowledged by means of complete references, and that this work has not been submitted before for any other degree at any other institution.

Bekele Negussie Demisse **Date: 25/6/2013**

Student number: 43661114

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STUDENT NUMBER: **43661114**
STUDENT: **Bekele Negussie Demisse**
DEGREE: **Master of Public Health**
DEPARTMENT: **Health Studies, University of South Africa**
SUPERVISOR: **Dr M M Mokgatle-Nthabu**

ABSTRACT

Key terms: community-based management, severe acute malnutrition, nutrition programme coverage, effectiveness of management of malnutrition, malnutrition treatment in pastoralist area.

The purpose of the study was to assess the coverage and effectiveness of the management of severe acute malnutrition project implemented in Dhas district of Borena zone, Ethiopia, from July 2010 to December 2010.

Quantitative, descriptive study was conducted to assess the comparability of the outcome of community-based management of acute malnutrition in a pastoralist area to International Sphere standards using performance indicators. Data collection was done using data capturing sheet. Outpatient therapeutic programme (OPT) registers in all health facilities were the sources of data. Clinical records of children admitted to the programme (n=163) were analysed. Standard nutrition survey result was used to estimate the malnutrition prevalence and programme coverage.

International Sphere standard was achieved for mortality rate but not for recovery rate, defaulter rate, length of stay and weight gain.

ABBREVIATIONS/ACRONYMS

CMAM	Community-Based Management of Acute Malnutrition
CSA	Central Statistical Agency
CTC	Community-Based Therapeutic Care
DHS	Demography and Health Survey
FANTA	Food and Nutrition Technical Assistance Project
MDG	Millennium Development Goals
MoH	Ministry of Health
MUAC	Mid-Upper Arm Circumference
NGO	Non-Governmental Organisation
OTP	Outpatient Therapeutic Programme
RUTF	Ready to Use Therapeutic Food
SAM	Severe Acute Malnutrition
SC	Stabilisation Centre
SFP	Supplementary Feeding Programme
TFC	Therapeutic Feeding Centre
WHO	World Health Organization

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CHAPTER 1: ORIENTATION TO THE STUDY

1.1 INTRODUCTION

Globally, it is estimated that there are nearly 20 million children who are severely acutely malnourished, and most of them live in South Asia and sub-Saharan Africa. These children have a greater than nine fold increased risk of dying compared to a well-nourished child (UNICEF and Valid International 2011:4). Severe acute malnutrition (SAM) remains a major killer of children under the age of five years and contributes to one million child deaths in the world each year (World Health Organization/World Food Programme/United Nations System Standing Committee on Nutrition (UNSSCN)/United Nation Children's Fund 2007:1-3).

Malnutrition is one of the main causes of morbidity and mortality in Ethiopia and is considered as a public health problem that needs to be addressed to impact on the Millennium Development Goals (MDGs) (Deconink, Swindale, Grant & Navarro-Colorado 2008:1-4; Emergency Nutrition Network and Food and Nutrition Technical Assistance 2008:12). More than half of all deaths in children in Ethiopia have stunting (short for their age) and wasting (thin for their height) as an underlying cause (Ethiopia Federal Ministry of Health 2007:6). According to Ethiopian demographic and health survey (DHS 2011:158-160), 44% of children under-five years of age are stunted, 10% are wasted, and 29% are underweight.

Until recently, the management of severe acute malnutrition has been restricted to centre-based care with limited coverage and impact. Community-based management of acute malnutrition (CMAM), also referred to as community-based therapeutic care before it was endorsed by the UN in 2007, involves timely detection of severe acute malnutrition in the community, and treatment of those without medical complications with ready-to-use therapeutic foods (RUTF) such as BP-100 and Plumpynut at home. CMAM was piloted in Ethiopia in 2000, and has been shown to be effective and to exceed Sphere minimum standards for recovery, case-fatality and coverage rates. At the end of the nutrition emergency in 2004, with support from UNICEF and non-governmental aid organisations, the Ethiopian Ministry of Health (MoH) started scaling up of the expansion and integration of CMAM in to existing health systems (World

Health Organization/World Food Programme/United Nations System Standing Committee on Nutrition/United Nation Children's Fund 2007:1; Emergency Nutrition Network and Food and Nutrition Technical Assistance 2008:12-14).

Admission to the CMAM programme is based on the presence of bilateral pitting oedema of the feet or measurement of mid upper arm circumference (MUAC) less than 11.0 cm. Routine medicines and RUFT are given according to the national protocol, and children are followed up on a weekly basis until they are discharged from the programme. The discharge criteria for children admitted with oedema are the absence of oedema for 10 days for inpatients or 14 days for outpatients. Children admitted by the criteria of MUAC are discharged when they attain standard target weights set for the respective admission weight (Federal ministry of health 2007:96).

International Sphere standards were used to assess the performance of the programme. The proportion of discharges from OTP who have died is less than 10%, defaulted is less than 15% and recovered is greater than 75%. Coverage is 50% for rural and 70 for urban areas (Sphere 2012: 169-72). The national standard for length of stay is less than four weeks and weight gain is greater or equal to eight gram per kilogramme per day (Ethiopia Federal Ministry of Health 2007:80).

1.2 BACKGROUND INFORMATION ABOUT THE RESEARCH PROBLEM

Ethiopia is administratively subdivided into nine regional states and two city administrations. The total population of Ethiopia is 73 750 932. Oromia is one of the regional states of Ethiopia with a total population of 26 993 933, the largest proportion in the country (Central Statistical Agency 2007:7-10). Borena is a pastoral zone located in the Southern part of Oromia regional state bordering Kenya. Livestock is the main source of food and income in the population of one million people residing in the zone (Trocaire/CAFOD/Sciaf Joint Office and HelpAge International 2011:5). Dhas is one of the 13 districts in Borena zone with total population of 36 811 and is divided into 12 kebeles (the smallest administrative unit in Ethiopia) and the communities are pastoralists. The district has 11 health posts and one health centre.

Communities of pastoral area move from one place to another in search of pasture and water during dry seasons, but the current CMAM programme in Borena zone is delivered in static health facilities. The programme provides RUFT and routine medical treatment to malnourished children on a weekly basis. In the absence of a mobile health and nutrition team that improves access to services, the number of deaths and defaulters may increase, and this will undermine the effectiveness of the programme in pastoral areas compared to agricultural areas in other parts of the country.

Evidence shows that 80% of severely acutely malnourished children can be treated with RUFT at home (World Health Organization/World Food Programme/United Nations System Standing Committee on Nutrition/United Nation Children's Fund 2007:1-3). Valid international (2006:72) states that 85-90% of severely acutely malnourished children are treated in the OTP with a weekly follow up for medical check-up and provision of their one-week supply of RUFT. A study in a rural agricultural area in the southern part of Ethiopia indicates that outpatient treatment exceed internationally accepted minimum standards for recovery, default, and mortality rates. However, time spent in the programme and rates of weight gain did not meet these standards (Collins, & Sadler: 2002: 1824-30). Similar results were obtained from CTC programmes in northern Ethiopia, Malawi, South, and North Sudan (Deconink *et al* 2008:1-2).

The researcher has worked on the management of acute malnutrition for different non-governmental organisations (NGOs) in various rural agricultural areas of Ethiopia for more than 5 years. The types of nutrition programs implemented included therapeutic feeding centres, a centre-based care where children were required to stay as in-patients in a feeding centre for two months or more until they fully recover, and CMAM where children are treated as out-patients using RUFT foods at home with weekly monitoring of weight and medical conditions. During this period, the researcher anecdotally observed the effectiveness of CMAM programme in both agricultural and pastoral areas in achieving Sphere minimum humanitarian standards. These observations motivated the researcher to establish whether the outcome of the CMAM program in Dhas was within international standards.

After failure of the seasonal rain and prolonged dry season in Borena zone in 2009, an international NGO undertook emergency nutrition intervention in six districts of the zone

including Dhas (Humanitarian requirements 2009:24). The current study aims to evaluate the outcome of the CMAM in Dhas district.

1.3 STATEMENT OF THE RESEARCH PROBLEM

CMAM was started in all health facilities of Dhas district in June 2010 as an emergency response to the 2009 drought in Borena zone (Humanitarian requirements 2010:4). There are no studies found that have assessed the performance of community-based management of acute malnutrition in pastoral communities like Dhas.

The rationale for conducting the study is that there are performance indicators against which to interpret the functioning of individual programmes stipulated by the Sphere project and adopted by the MoH of Ethiopia. The indicators and reference values are shown in table 1.1 below (Ethiopia Federal Ministry of Health 2007:80).

Table 1.1 Reference values for main performance indicators.

Indicator	Acceptable	Alarming
Recovery rate	>75%	<50%
Death rate	<10%	>15%
Defaulter rate	<15%	>25%
Weight gain	>= 8g/kg/day	<8 g/kg/day
Length of stay	<4 weeks	>6 weeks
Coverage	>50-70%	<40%

Adapted from Ethiopia Federal Ministry of Health, March 2007.

Performance indicators, according to Sphere (2011:55), relate to discharged individuals ending treatment. The total number of discharged individuals is made up of all patients who have recovered/cured, died, defaulted, patients who did not respond to treatment (non-responders), and patients with an unknown outcome (Federal ministry of health 2007:78). The terms ‘cured’ and ‘recovered’ will be used in this document interchangeably.

Coverage, also known as treatment coverage, is the proportion of people needing or eligible to receive a service that actually receive that service (Myatt *et al* 2012:215). Coverage is greater than 50% in rural areas, greater than 70% in urban areas and greater than 90% in camp situations (Sphere 2011:166).

Geographical coverage refers to the physical availability of CMAM services (geographical access) through the decentralization of health facilities and services providing the care. P*rogram or service coverage* refers to the use of CMAM services by those in need of care. Period overage is the preferred indicator to express program or service coverage (Deconink *et al* 2008:25). Service coverage is referred to in this study.

Point coverage is the ratio of children with SAM in treatment (a) to the total number of children with SAM identified in the community at a particular time. Children with SAM identified in the community is calculated as children with SAM in treatment (a) plus children with SAM not in treatment (b). [Point coverage = a/a+b]

Period coverage is the ratio of all children attending SAM treatment services- i.e., children with SAM in treatment (a) plus children recuperating from SAM and still in treatment (c)- to the number of children in treatment (a+c) plus the number of children with SAM not in treatment (b). [Period coverage = (a+c)/(a+c+b)] (Deconink *et al* 2008:27).

This study intends to assess the effectiveness and coverage of the CMAM project in Dhas implemented from July 2010 to December 2010 on addressing the management of child malnutrition by comparing the outcome of the study to international reference values as measured by performance indicators.

1.4 RESEARCH AIM

1.4.1 Research purpose

The purpose of the research was to assess (in line with the international standards) the coverage and effectiveness of the six months project of the management of severe acute malnutrition implemented in Dhas district from July 2010 to December 2010.

1.4.2 Research objectives

1. To estimate the community-based management of acute malnutrition programme coverage based on the number of malnourished children admitted in the programme and the underlying rate of malnutrition in Dhas district.

2. To analyse the performance of the community-based management of acute malnutrition programme in all health facilities in Dhas based on international performance indicators.

1.5 SIGNIFICANCE OF THE STUDY

The study envisaged to find out if the OTP in Dhas achieved the project target by comparing the outcomes of the study to international nutrition programme quality indicator benchmarks. In addition, the study envisaged to find ways for the improvement of the OTP in the district and other areas with similar contexts. It will also serve as a baseline for further large scale studies in the field, and contributes in bridging the information gap. The study findings could also be used by the local zone and district health offices, NGOs, other service providers, and donor agencies in designing locally appropriate nutrition intervention projects. Furthermore, the findings could be used in the development of training of health staffs and in revising local recording and reporting formats and guidelines. Finally, the findings of the study will be used by Dhas district health office to inform the health workers in the district to improve the OTP service delivery to the community, which in turn contributes to reduced child morbidity and mortality in the area. .

1.6 DEFINITIONS OF TERMS

Acute malnutrition

Is defined by the presence of bilateral pitting oedema or wasting (low mid-upper arm circumference or low weight-for-height) (Food and Nutrition Technical Assistance Project-2 module 2:21).

Severe acute malnutrition (SAM)

Severe acute malnutrition is defined by a very low weight for height (below -3 z score of the median WHO growth standards), by visible severe wasting, or by the presence of

nutritional oedema. In children aged 6-59 moths, an arm circumference less than 110 millimetres is also indicative of severe acute malnutrition (WHO/WFP/UNSSCN/UNICEF 2006:2).

Malnutrition

Comprises of both over nutrition (obesity) and under nutrition, but the term malnutrition is often used for forms of under nutrition (e.g., acute malnutrition) (Food and Nutrition Technical Assistance Project-2 module 1:17). In this study it will be used for under nutrition.

Stunting

Stunting is a low height-for-age (WHO 1999). Stunting, or chronic under nutrition, is a form of under nutrition and is defined by a height-for-age Z-score below two standard deviations (SDs) of the median (WHO standards) (Food and Nutrition Technical Assistance Project-2 module 1:19).

Under nutrition

Under nutrition is a consequence of a deficiency in nutrient intake and/or absorption in the body (Food and Nutrition Technical Assistance Project-2 module 1:19).

Defaulter

Patients absent for two consecutive weighing (two days in inpatients and 14 days in outpatients) confirmed by a home visit (Ethiopia Federal Ministry of Health 2007:78).

Cured

A patient that has reached a discharge criteria (Ethiopia Federal Ministry of Health 2007:78).

Coverage

The proportion of all people needing or eligible to receive a service that actually receive that service. Also known as ‘treatment coverage’ (Myatt *et al* 2012:215).

Unknown

Patients absent for three consecutive weighing, 21 days in outpatient care where the outcome (actual defaulting or death) is not confirmed or verified by a home visit (Ethiopia Federal Ministry of Health 2007:78).

Non-responder

Patient that has not reached discharge criteria after 40 days in the inpatient programme or two months in the outpatient programme (Ethiopia Federal Ministry of Health 2007:78).

Medical transfer

Patient that is referred to a health facility/hospital for medical reasons and this health facility will not continue the nutritional treatment or transfer the patient back to the programme (Ethiopia Federal Ministry of Health 2007:78).

Death

Patient that has died while he was in the programme at your facility or in transit to another component of the programme but has not yet been admitted to that facility. For the outpatient programme, the death has to be confirmed by a home visit (Ethiopia Federal Ministry of Health 2007:77).

New admission

Patients that are directly admitted to the programme to start the nutritional treatment (Ethiopia Federal Ministry of Health 2007:77).

Readmission

If the patient previously absconded before reaching the discharge criteria, it is considered to be the same episode of malnutrition if the patient is readmitted within two months. If the patient presents after that time it is a separate episode of malnutrition (Ethiopia Federal Ministry of Health 2007:77).

Transfer in

Patients that have started the nutritional therapeutic treatment in a different OTP site or other facility and is referred to your programme to continue the treatment that has already been started (Ethiopia Federal Ministry of Health 2007:77-78).

Underweight

Underweight is a composite form of under nutrition including elements of stunting and wasting and is defined by a weight-for-age Z-score below two standard SDs of the median (WHO standards) (Food and Nutrition Technical Assistance Project-2 module 1:19).

Kwashiorkor

Kwashiorkor is a clinical term for a form of severe acute malnutrition. Bilateral pitting oedema is always present in kwashiorkor (Myatt *et al* 2012:219).

Severe wasting

Severe wasting is a form of *acute malnutrition*. It is defined by a MUAC less than 110 millimetre or weight for height less than -3 z score (WHO standards) or weight for height less than 70 per cent of the median (NCHS reference). Severe wasting is also called marasmus (Food and Nutrition Technical Assistance Project Module 1.2).

Health extension worker

Women aged 18 years or older with at least10th grade education and additional one year training at Technical and Vocational Education Training Schools (Health extension and education Centre 2007:9).

1.7 FOUNDATIONS OF THE STUDY

1.7.1 Meta-theoretical assumptions

A fundamental assumption of positivist paradigm is that there is a reality out there that can be studied and known. Because of their fundamental belief in an objective reality, positivists seek to be as objective as possible in their pursuit of knowledge. Positivists attempt to hold their personal beliefs and biases in check during their research. The following assumptions were made in this study (Polit, Beck, & Hungler 2001:12-13):

1.7.1.1 Ontologic assumptions

Ontologic assumptions deal with the nature of reality. The positivist assumption about reality is that there is a reality that can be studied and known (Polit *et al* 2001:12-13). In this study it was assumed that analysis of data from patient records will indicate the coverage and effectiveness of the nutrition programme in Dhas district.

1.7.1.2 Methodologic assumptions

Methodologic assumptions enquire how knowledge is obtained. In this study it was assumed that:

- The effectiveness and coverage of the management of severe acute malnutrition implemented in Dhas district was best assessed by using the quantitative descriptive study design
- Review of patients' records was undertaken using a structured data abstraction form designed for this study
- Due to the limited number of patient records available in the health posts in the district, census of the patient records helped the researcher to include a representative sample.

1.7.2 Theoretical framework

Community therapeutic care (CTC) is based on three important principles. The first is that if malnourished people access nutritional treatment early and remain in the programme until they have recovered, the success rates are high. The second principle involves maximum coverage and access of community therapeutic care programmes to target population. In order to present early and comply with the treatment, communities must understand, accept, and participate in the programme. Barriers to access should be overcome by providing services close to where the people live. The third principle is social mobilisation through engagement, enhancing understanding, and participation of communities, and local stakeholders (Valid international 2006:5-14).

The CTC model has four programmatic components:

1. Community mobilisation through stimulating the understanding and engagement of the target population.

2. Supplementary feeding programmes (SFP)

This is the provision of dry take-home ration and routine medicines for children without medical complications.

3. Outpatient therapeutic programme

Children with severe acute malnutrition without medical complications receive RUFT and medical treatment in the OTP

4. Stabilisation centres (SC)

These are established in health centres and hospitals to provide inpatient care for severely acutely malnourished children (Valid international 2006:8-14).

1.8 RESEARCH DESIGN AND METHOD

1.8.1 Research design

A research design is the overall plan for answering the research questions (Polit *et al* 167). In this study, a quantitative, descriptive survey was used to analyse the performance of CMAM in Dhas district of Borena zone.

1.8.2 Research method

Research methods are the techniques used by researchers to structure a study and to gather and analyse information relevant to the research question (Polit *et al* 2001:13).

1.8.2.1 Population

A population is the aggregate of all the individuals or objects with some common defining characteristics (Polit *et al* 2001:40). In this study, the population included 163 records of severely acutely malnourished children aged 6-59 months admitted and treated in all health facilities in Dhas district from July 2010 to December 2010.

1.8.2.2 Sample

A sample is a subset of the population (Polit *et al* 2001:41). In this study, the sample included 163 records of severely acutely malnourished children aged 6-59 months admitted and treated in all health facilities in Dhas district from July 2010 to December 2010.

1.8.2.3 Sampling procedure

Sampling is the process of selecting a portion of the population to represent the entire population (Polit *et al* 2001:234). Since there were only 163 records available, no sampling was performed and a census of the available records was conducted.

1.8.2.4 Data collection

Data was gathered using data collection instrument designed for the study.

1.8.2.5 Data analysis

In this study, data was analysed using epi-info version 3.5.3. Frequency tables of categorical variables and data summaries for continuous variables were done. Cross-tabulation of signs and symptoms on admission and during discharge was done.

1.9 VALIDITY AND RELIABILITY

1.9.1 Validity

Validity is the degree to which an instrument measures what it is intended to measure (Polit *et al* 2001:473). The data capture sheet was adapted from standard national OTP registration book and health workers with work experience in the field of nutrition were also consulted to ensure that all required information was included in the study.

1.9.2 Reliability

Reliability is “the degree of consistency or accuracy with which an instrument measures the attribute it is designed to measure” (Polit *et al* 2001:469). Joubert (2007:117) defines reliability as “the degree of similarity of the results obtained when the measurement is repeated on the same subject or the same group”. In this study, pre-testing of the instrument was done at a nearby health facility to identify problems in the question.

1.10 ETHICAL CONSIDERATIONS

Polit *et al* (2001:461) defines ethics as “a system of moral values that is concerned with the degree to which research procedures adhere to professional, legal, and social obligations to the study participants”. To ensure that ethical considerations were ensured in this study, the following issues were considered by the researcher:

- The research proposal was approved by the Research and Ethics Committee of the Department of Health Studies of the University of South Africa.
- To maintain anonymity, individual patient names were not used during data collection and analysis.
- All information about individual patient records will be confidential.
- Permission to conduct the study was requested and approved by Borena Zone Health Department.

1.11 SCOPE AND LIMITATION OF THE STUDY

Appropriate design, sampling procedure and data collection instruments were selected and rigor was maintained throughout the research process to ensure the validity of the study. The study was conducted in a pastoral community and may not be possible to extrapolate the results to other non-pastoral contexts.

1.12 STRUCTURE OF THE DISSERTATION

The structure of this study is as follows:

Chapter 1: Orientation

Chapter 2: Literature review

Chapter 3: Research design and method

Chapter 4: Analysis, presentation and description of the research findings

Chapter 5: Discussion; Conclusions and recommendations

CHAPTER 2: LITERATURE REVIEW

2.1 INTRODUCTION

A literature review is defined in Joubert (2007:66) as “a ‘re’-view or ‘further look’ at what has previously been written on a particular subject”. According to Joubert (2007:66-69) and Polit *et al* (2001: 120-121), a literature review serves the following purposes:

- Identification of a research problem, appropriate designs and development or refinement of research questions.
- Justification of future research by showing knowledge gaps the proposed research intends to fill.
- Contribute to interpreting research by evaluating the influence of differences in study design, participants, interventions and outcomes on primary studies.
- Identification of relevant theoretical or conceptual frameworks for a research problem.
- To determine a need to replicate a prior study in a different setting or with a different study population.

2.2 OUTCOMES OF COMMUNITY-BASED MANAGEMENT OF SEVERE ACUTE MALNUTRITION

2.2.1 Effectiveness and evolution of CMAM

The effectiveness of CMAM was briefly presented in Chapter 1. This chapter will focus on the details of studies conducted to date.

Initial studies conducted in Ethiopia have shown that CTC outcomes such as recovery, mortality, and defaulter rates exceeded the Sphere standards for therapeutic feeding programme. Collins and Sadler conducted a retrospective cohort study in agricultural area in southern Ethiopia from September 2000 to January 2001. Clinical records of 170 severely malnourished children aged 6-120 months of age were assessed to measure treatment outcomes. Recovery (85%), death (3%) and defaulter (5%) rates were reported to exceed Sphere standards. However, the rates for weight gain and length of stay in the programme did not meet these standards. The rate for weight gain varied

among different categories of SAM patients. For patients who recovered in the outpatient treatment, the median rate of weight gain was 3.16 gram per kilogramme per day (g/kg/d) (1.86-5.60) for all patients, 4.8 g/kg/d (2.95-8.07) for marasmic patients, 4.03 g/kg/d (2.68-4.29) for patients with marasmic kwashiorkor, and 2.7 g/kg/d (0.00-4.76) for kwashiorkor patients. The median time to discharge was 42 days (IQR 28-56), days to death was 14 (7-26), and days to default was 14 days (7-28) (Collins and Sadler 2002:1824-30).

Outcome from monitoring data of 667 SAM children treated in CTC in south Wollo, Ethiopia, between February 2003 to January 2004 achieved Sphere standards for defaulter rate (9.7%) and death rate (7.5%) but the standards were not met for recovery rate (74.6%), rate of weight gain and length of stay in the programme (Humanitarian Practice Network 2004; 48:14). Programme coverage rate for severely malnourished estimated using the Centric Systematic Area Sampling (CSAS) method was 77.5% (CI: 65.7-86.2). The coverage rate in 2005 estimated using the same method was 77.3%, higher than the 50% coverage standard for rural populations stipulated in Sphere standards (C.I. 72.0-82.2) (WHO 2005:14).

André *et al* (2006; 27(3): S49-S82) reviewed the outcomes of 21 CTC programmes implemented in Ethiopia, Malawi, North, and South Sudan between 2001 and 2005. Of 23511 patients treated, 79.4% recovered, 4.1% died and 11.0% defaulted. Rates of weight gain and length of stay in the programme did not achieve Sphere standards. Average coverage rate using systematic area sampling method was 75.2%.

A study to compare cost and outcome of inpatient treatment of SAM with community-based treatment of SAM was carried out in agricultural area in southern Ethiopia in 2007 (Tekeste *et al* 2012:13). A total of 368 patients who had received either type of treatment were randomly sampled and their medical records were reviewed. The cure rate in therapeutic feeding centres (TFC) was 95.36% compared to 94.30% in CTC and the defaulter rate in TFC was 1.24% compared to 1.08% in CTC. There was no reported death in TFC and the death rate in CTC was 1.2%. The result also showed that CTC was twice more cost-effective than TFC. The authors recommended further comprehensive and prospective studies in drought prone pastoralist areas or socio-culturally different populations.

A prospective cohort study was carried out to evaluate the effectiveness of CMAM initiated and run by the Ethiopian MoH between December 2005 and April 2007 in a non-emergency context in western Ethiopia (Eklund and Girma 2008:1-3). Data from OTP cards of 324 patients treated in one of four health centres was reviewed to assess treatment outcomes. The recovery rate was 45% and was lower than the defaulter rate of 47% and mortality rate was 1%. Rates of weight gain (5-6 g/kg/day) and length of stay in the programme (35-45 days) were within the normal international standards.

Sphere standards for recovery rate (82%), default rate (5%) and death rate (0.5%) were achieved from analysis of monitoring data of 370,559 children treated in CMAM in four regions of Ethiopia from January 2008 to August 2010 (Chamois 2009:10).

Mates (2011:7-8) analysed data of 34,480 discharges in CMAM in four regions of Ethiopia and reported gradual improvements in performance indicators (Table 2.1).

Table 2.1: National CMAM programme performance data Jan 2006 - Dec 2010, four regions

Year	Jan-Dec 2006	Jan-Dec 2007	Jan-Dec 2008	Jan-Dec 2009
Total number of discharges (n)	1,343	4,463	10,171	15,496
Cured (%)	56	61	66.9	77.3
Death (%)	1	0.9	1.2	1.1
Unknown (%)	10 0	11.6	15.1	9.9
Defaulter (%)	35.5	20.3	12.3	7.4
Non-responder (%)	0.5	3.2	3.1	3.2
Medical transfer (%)	7	3	1.4	1.1
	100%	100%	100%	100%

Adapted from: Emily Mates 2011.

2.2.2 CMAM in pastoralist settings

There were no published reports found about the implementation and effectiveness of CMAM in pastoralist settings. Monitoring data from CTC programmes in pastoralist districts in Afar (n=133) and Somali (n=428) regions of Ethiopia by two international humanitarian organisations through a mobile nutrition team reported achievement in recovery, mortality and defaulter rates to exceed Sphere standards (Save the Children March 2007:4-6; Kokere *et al* 2006:7). Water points, emergency food distribution sites and villages selected by the community which changed depending on the movement of

the pastoralist were used as OTP sites. In Somali region, the average weight gain ranged from 5.6 to 9 g/kg/day and the length of stay ranged from 26 to 51 days. Average weight gain and length of stay in Afar region were 3.5 g/kg/day and 92 days, respectively.

CMAM programme evaluation report in southern Ethiopia in 2010 (Nyirenda and Belachew 2010:20) reported higher defaulter rate in static health facilities in a pastoralist area supported by an NGO as compared to neighbouring agricultural area supported by MoH.

A nutrition intervention programme coverage assessment in a district in northern Kenya where most residents were pastoralists also reported a higher defaulter rate than expected international standards (ACF March 2012:6). Population movement was said to be the main cause for the higher defaulter rate.

The studies mentioned above have served as a basis for the implementation and expansion of CMAM programme in various countries in the world but published studies about CMAM in pastoralist communities were not found and further studies are required to assess the effectiveness of CMAM in context of the pastoralist communities.

CHAPTER 3: RESEARCH DESIGN AND METHODS

3.1 INTRODUCTION

The overall purpose of the research was to assess the coverage and effectiveness of the six months project of the management of severe acute malnutrition implemented in Dhas district from July 2010 to December 2010. The research design and method facilitated the attainment of the following objectives:

- To estimate the community-based management of acute malnutrition programme coverage based on the number of malnourished children admitted in the programme and the underlying rate of malnutrition in Dhas district.
- To analyze the performance of the community-based management of acute malnutrition programme in all health facilities in Dhas based on international performance indicators.

3.2 STUDY DESIGN

Polit *et al* (2001:40) describe research design as “the overall plan for obtaining answers to the questions being tested”. The function of a research design is to ensure that the evidence obtained enables the researcher to answer the initial question as unambiguously as possible (de Vaus 2001:9).The type of study design chosen depends on the type of the problem, the knowledge already available about the problem, and the availability of resources for the study (Ethiopian science and technology commission 2005:4).

Quantitative studies produce results that can be used to describe or note numerical changes in measurable characteristics of a population of interest (Encyclopaedia of research design 2012:1167-1172). Quantitative study design was used in this study.
When an epidemiological study is not structured formally as analytical or experimental study, when it is not aimed specifically to test a hypothesis, it is called a descriptive study and belongs to the observational category of studies. In a descriptive study the investigator simply describes the distribution of a phenomenon or the outcome of a programme. A survey could be defined as a descriptive study. The findings from descriptive studies help to generate hypothesis which can be tested by analytical or

experimental designs (WHO 2001:16). A descriptive survey design was used for this study.

3.3 RESEARCH METHOD

Research methods are the techniques used by researchers to structure a study and to gather and analyse information relevant to the research question (Polit *et al* 2001:13).

3.3.1. Study Population

A population is the entire aggregation of cases that meets a specified set of criteria. The target population is the entire population in which the researcher is interested, and an accessible population comprises cases from the target population that are accessible to the researcher as a pool of subjects (Polit *et al* 2001:233-234). The target population in this study were records of all severely acutely malnourished children 6-59 months of age in Dhas district and the accessible population were records of 163 severely acutely malnourished children 6-59 months of age who were admitted to the OTP in all health facilities in Dhas district from July 2010 to December 2010.

3.3.2 OTP Admission and discharge criteria

MUAC less than 11cm and/or the presence of oedema of both legs were the criteria for admission to the OTP. Children with SAM were identified either at the village level or any one of the 12 health posts which serve as OTP sites and admitted. At the village level, malnutrition screening was conducted by community health volunteers who were trained to identify children with SAM and refer them to the nearest health post. Patients presenting to health posts were screened and admitted by health extension workers who were also trained in the implementation of community-based management of acute malnutrition and responsible for the overall programme in health posts. Patients were also examined for any underlying medical problems and then registered in the facility registration book.

Patients admitted by MUAC were discharged from the programme once they attained a standard target weight which is proportional to the child's admission weight. The discharge criteria for patients admitted with oedema was the absence of oedema for 10 consecutive days (Federal ministry of health 2007:96). Patients who recovered from the nutritional problems and discharged are referred to supplementary feeding programmes to receive additional nutritional support to prevent relapse.

3.3.3 Treatment and follow up

Plumpynut, a ready-to-use therapeutic food, is used for the dietary treatment of severely malnourished children in the OTP. Each patient receives sachets of Plumpynut, calculated based on the child's weight, on admission and then on weekly basis afterwards.

BP-100 biscuit and Plumpynut are high-energy high-protein products containing vitamins and minerals. They are more energy dense than the WHO F-100 milk but has similar nutrient profile. BP-100 is a 300 kilo calorie biscuit that can be eaten dry or crumbled in hot water to make porridge. Plumpynut is a peanut-based paste with a shelf life of 24 months. Each sachet of 92 gram paste contains 500 kilo calorie. Both BP-100 and Plumpynut have been shown to be efficacious and appropriate for rehabilitating severely malnourished children (Ashworth 2005:6-7; Valid International 2006:132).

On admission, all patients receive routine medications as per the national protocol which include; Amoxicillin 50-100mg per kg of body weight twice daily for five days; Folic acid 5 mg, one tablet on admission; Albendazole 400 mg, ½ tablet for children aged 1-2 years and one tablet for children aged above two years given on admission; Vitamin A according to age of the patient. Patients are referred to the nearest higher health facility if they develop any medical complications while in the programme (Ethiopia-Federal Ministry of Health 2007:17-20).

All patients in the programme are expected to visit the health posts on a weekly basis for follow up. During each visit, patients are examined for any medical complications and oedema. Weight and MUAC measurements are taken and Plumpynut is given

according to the patient's current weight. Mothers or caretakers are also given health and nutrition education.

3.3.4 Sampling

Sampling is "the process of selecting a portion of the population to represent the entire population" (Polit *et al* 2001:234). Advantage of sampling over complete enumeration is that the available resources can be better spent in refining the measuring instruments and methods so that the information collected is accurate (valid and reliable) (WHO 2001:71-72). Only 163 children aged 6-59 months with severe acute malnutrition were admitted to nine OTP sites in Dhas between July 2010 and December 2010. For this study a census of the records of severely acutely malnourished children was undertaken. Criteria for inclusion of records in the study were records of children 6-59 months of age admitted from July to December 2010 with MUAC less than 11cm and/or pitting oedema of both legs.

3.3.4.1 Ethical issues related to sampling

There was no preferential consideration of one area, gender or ethnic group over another since anonymous data of all records in all health facilities in the district were included in the study.

3.3.4.2 Sample size

All available patient records which amounted to 163 records of children 6-59 months of age with severe acute malnutrition who were admitted and treated in OTP were available in nine health facilities in the district and all the records were used to collect data for this study. Patient registers were not available in two health facilities.

Table 3.1 Number of clinical records obtained in each health post in Dhas, Ethiopia, July-December 2010.

Name of health post	Number of sample	Percent
Anole	14	8.6
Borbor	20	12.3
Dhas	30	18.4
Gayo	18	11
Gorile	17	10.4
Har Jarte	14	8.6
Meta Arba	16	9.8
Raro	16	9.8
Teso Kello	18	11
Total	163	100

Please note that one of the Kebeles in Dhas district has got the same name “Dhas” as the district itself.

3.3.5 Data collection

According to Polit *et al* (2001:460), data collection is “the gathering of information needed to address a research problem”. Instruments are tools by which data are collected (WHO 2001:154). In this study, review of patients’ records was undertaken using a structured data abstraction form. The facility registration book was the source of data for this study.

The results of a nutrition survey conducted by the government in Moyale district, a neighbouring district in Borena zone, in March 2010 (Early warning and response directorate, Emergency Nutrition Coordination Unit first quarter 2010:6) was used to assess the malnutrition prevalence in Dhas district which in turn was used to make indirect estimate of the OTP service coverage in the district. The programme data was also used to complement coverage estimation. The survey results indicated a global acute malnutrition rate of 12.7% (CI 9.8-15.6) and severe acute malnutrition rate of 1.6% (CI 0.5-2.8) (Early warning and response directorate, Emergency Nutrition Coordination Unit 2010:12).

3.3.5.1 Development and testing of data collection instrument

The questions were adapted from the national health facility register designed to capture all relevant variables used to assess nutrition interventions and were reviewed to be clear and unambiguous. Colleagues working in the field of nutrition were consulted while developing the questionnaire. The questionnaire included demographic, admission, discharge and outcome data of the patients.

Demographic profile of the patients (section A) included patient code, address of the patient, age of the patient expressed in months, gender, and whether it was the first admission or re-admission after discharge or after default. Data on re-admission after default indicates the presence of follow up of children on treatment at home and community level. Data on re-admission after discharge helps to assess the availability and adequacy of food at the house hold level and the presence of malnutrition prevention activities such as supplementary feeding programme (Annex E).

Data on admission profile (section B) of the patients included the date of admission, admission weight, the presence or absence of oedema during admission, and MUAC measurement.

Section C in the data collection tool captured discharge characteristics of the children. Discharge data included the date of discharge, weight on discharge, the presence or absence of oedema, MUAC measurement, and minimum weight recorded while the child was in the programme and the date of the minimum weight recorded.

The last section (section D) of the data collection tool captured data about the outcome of treatment. This is data when the child left the programme and include whether the child was cured, dead, defaulted, a non-responder, had medical transfer, or transfer out, and or the outcome is unknown.

Pre-test is the trial administration of a newly developed instrument to identify flaws or assess time requirement (Polit *et al* 2001:468). Pre-testing was done in a nearby health facility running CMAM using similar patient cards and registers after getting permission from the head of the health post. The main purpose was to identify problems encountered during data collection and to test the validity and reliability of the research instrument. Since both the data capturing sheet and the facility patient registration book

had the same format, there was no problem of losing any data for the study. Suggestions were reviewed and the instrument was used for the final data collection.

Prevalence data used to estimate coverage was obtained from a nutrition survey conducted in a neighbouring district by the Emergency nutrition coordination unit of Ethiopia. The total number of study sample in this study,163 records of malnourished children admitted to the OTP in Dhas from July to December 2010, was also used for estimation of the programme coverage.

3.3.5.2 Advantage and disadvantage of the data collection instrument

According to Polit *et al* 2001: 261), records are “an important existing data sources for nurse researchers”. Advantages of record reviews include; little expense in collecting the data, allows historical comparison, can be quick, and data cannot be influenced by the project. Disadvantages of review of records include***;*** cumbersome formatting as data were recorded for non-research purposes, data often incomplete, variables are inconsistently defined and recorded by different people at different times, and often limited variables are available (Joubert 2007:108).

3.3.5.3 Variables

Variable, according to Joubert (2007:127), are characteristics which one measures and are classified according to their scale of measurements. Categorical variables include nominal or ordinal variables while numerical variables include discrete and continuous variables.

Both numerical and categorical variables were covered in this study. Categorical variables, according to Fathalla & Fathalla (2004:99), are “ones where each individual is one of a number of mutually exclusive classes”. Polit *et al* (2001:466) defines categorical variable as “a variable with discrete values rather than values incrementally placed along a continuum”. Categorical variables specify in to which category an observation falls (Joubert 2007:127).

Categorical variables can either be ordinal or nominal. Ordinal variables are grouped variables that are ordered or ranked in increasing or decreasing order while groups in nominal variables do not have an order or ranking. (World Health Organization/International Development Research Centre 2003:72; Fathalla & Fathalla 2004:99).

In this study, gender, treatment outcomes such as recovery, death, default and unknown outcome are nominal categorical variables.

Variables whose values are expressed in numbers are called numerical variables. Numerical data may be discrete or continuous. Continuous variables are measured on a continuous scale and they can take any value within a range. Discrete variables can take only whole-number values (World Health Organization/International Development Research Centre 2003:71; Fathalla & Fathalla 2004: 99).

Age, MUAC, and weight, are continuous variables covered in this study. A continuous variable may be grouped in to ordered categorical variables, for example age can be ordered into age groups, but groups should not overlap (Fathalla & Fathalla 2004:99). For the purpose of analysis, age in months in this study was presented in groups as an ordered categorical variable.

Age of the children was recorded in months and ranged from 6 to 59 months. MUAC was recorded in centimetres to the nearest one decimal place and only children with MUAC less than 11cm were included in this study. Weight was recorded in kilograms. Date of admission was from July 1, 2010 to December 31, 2010.

3.3.5.4 Data collection process

Data collection took place from 16 November to 7 December 2012. Data was collected by two research assistants, health professionals with previous work experience in the field of nutrition, who were trained by the researcher using the data capturing sheet designed for this study.

In this study, the following dimensions were observed during data collection:

- Structure: to ensure that the same information is collected from all health facilities in a comparable and pre-specified way, data collection was undertaken in a highly structured manner. Structured data collection approaches yield data that are more easily quantified.
- Quantifiability: structured data collection method was used to collect quantitative data that was amenable for statistical analysis. .
- Objectivity: in this study, a quantitative research method was used to collect objective data (Polit *et al* 2001:263-293).

After obtaining permission from Borena zone health office, the head of the district health was informed about the study, and a travel plan to the health facilities was prepared based on the availability of transportation services in the area. Non-OTP days were selected for each facility to avoid inconveniences to health staffs as well as those attending the OTP programme. Since date was recorded in Ethiopian calendar in all health facilities, a table was prepared to convert it to Gregorian calendar and handed over to the research assistants for reference. Because of constraints in access of transportation service, both research assistants travelled together to health posts and data collection for each health facility was finalized in one day. Separate data capture sheet was used to collect data from each health facility. Patient code and serial number on the facility registers were used for identification and patient names were not recorded. Data collected by one research assistant was verified by the second one and further checked by the researcher at the end of each day to enhance accuracy of the data. Data was entered into a computer spread sheet (Microsoft Excel) on a daily basis.

Each 12 month in the Ethiopian calendar consists of 30 days. The 13^{th} month consists of 5 days which becomes 6 days every leap year. September is the first month of the year. September 2013 in Gregorian calendar was September 2006 in the Ethiopian calendar, a difference of seven years from September to December and eight years difference from January to August.

3.3.5.5 Ethical considerations related with data collection

Since the study involved the collection of data from health facilities under the responsibility of local health authorities, permission to conduct the study was requested

and approved by Borena zone health office. The research proposal was approved by the Research and Ethics Committee of the Department of Health Studies of the University of South Africa. To maintain anonymity, individual patient names were not used during data collection and analysis. All information will be confidential. It was believed that the community in the district benefits from the outcome of the study of facility records by serving as evidence to decision.

3.3.6 Data analysis

Data analysis, according to Polit *et al* (2001:460), is the "systematic organization and synthesis of research data and the testing of research hypothesis using those data". Data for performance indicators was analysed by a statistician using Epi-info and SPSS version 17.0.

3.3.6.1 Performance indicators

Analysis included descriptive statistics (frequency tables, measurement of central tendency, measurement of dispersion and standardized scores), cross tabulations, correlation analysis, and regression analysis including goodness of fit and analysis of variance (ANOVA).

The performance indicators such as cure rate, death rate, defaulter rate, average weight gain and average length of stay were calculated using the data collected for this study. The formula to calculate the performance-related indicators are as follows (The Sphere project 2011:167; Ethiopia- Federal ministry of health 2007:79):

Proportion of discharges recovered =

Proportion of discharges died =

Proportion of discharges defaulted =

Proportion of discharges non-recovered (non-responder) =

Mean length of stay for wasted cured children =

Average weight gain for wasted cured children = discharge weight minus the minimum weight multiplied by 1000 to convert the weight gain to grams. This is then divided by the admission weight to give grams of weight gain per kilo body weight. Lastly this total weight gain is divided by the number of days from the date of minimum weight to the date of discharge to give g/kg/d. The average rate of weight gain is then:

Average weight gain (g/kg/day) =

Average weight gain should be calculated separately for individuals with and without oedema. The value of average weight gain obtained in this study was only for wasted children since there were no children with oedema in the programme. Minimum weight was not recorded in the registers in all health facilities and admission weight was used to calculate individual as well as average weight gain.

Transfer out rate =

There were no children who were transferred to another nutrition programme and this indicator was not calculated.

Rate of unknown outcome =

3.3.6.2 Coverage

Microsoft Excel was used to analyse data about programme coverage. Malnutrition prevalence data in the district were obtained from a standard cross sectional survey conducted in Moyale district. The nutrition survey results indicated a global acute malnutrition rate of 12.7% (CI 9.8-15.6) and severe acute malnutrition rate of 1.6% (Early warning and response directorate, Emergency Nutrition Coordination Unit 2010:12). Indirect method was to estimate number of severely malnourished patients expected in the district from July 2010 to December 2010. Indirect coverage estimate is an estimate of coverage made using data collected for other purposes (secondary data) or proxy measures of coverage (Myatt *et al* 2012:217). The following formula was used to estimate coverage (UNICEF and Valid International 2011:23; Food and Nutrition Technical Assistance Project 2008 Module 7:10):

$$\text{Coverage} = \frac{\text{Estimated cases of SAM} = \text{SAM prevalence (1.6\%)} \times \text{population of aged 6-59 months (6199) in the district, which is 99 cases.}}{}$$

Estimated new cases to add in one year (incidence over one year could be twice the prevalence but the standard is 1.5%) equals 192 but since the programme lasted six months, the number of cases will be 96.

Estimated number in need of treatment over six months will be 195 (99 + 96).
With expected service coverage of 70%, expected number to be treated in the CMAM programme during the project period will be 137 patients.

Admission trend in the programme and measurement of MUAC at admission were also plotted in a graph using Excel and used to indicate whether there were problems in the recruitment of malnourished children in to the programme which affect programme coverage.

3.3.7 Internal and external validity

Validity, according to Polit *et al* (2001:473), is “the degree to which an instrument measures what it is intended to measure”.

3.3.7.1 Internal validity

Internal validity is the degree to which it can be inferred that the independent variable, rather than uncontrolled, extraneous factors, is responsible for observed effects on the dependent variable (Polit *et al* 2001:463). To ensure internal validity, experts working in the area of nutrition were consulted and review of the literature on the researcher’s area of study was done to ensure that the data capture sheet included all information required to address the study.

3.3.7.2 External validity

External validity is the degree to which the results of a study can be generalised to settings or samples other than the ones studied (Polit *et al* 2001:461). Generalizability of results of study is enhanced by selecting a representative sample (Polit *et al* 2001:195). All clinical records in all health facilities in Dhas district were included in this study and this helped in enhancing the representativeness and generalizability of the study and ensured the external validity.

3.3.8 Conclusion

The research design and method was presented and discussed in this chapter. The next chapter will present the analysis, presentation and description of the research findings.

CHAPTER 4: ANALYSIS, PRESENTATION AND DESCRIPTION OF THE RESEARCH FINDINGS

4.1 INTRODUCTION

The previous chapter described the methodology of the study. The research result will be presented in this chapter. The purpose of this study was to assess (in line with the international standards) the coverage and effectiveness of the six months project of the management of severe acute malnutrition implemented in Dhas district from July 2010 to December 2010.

The objectives of the study were to estimate the community-based management of acute malnutrition programme and the rate of malnutrition and analyse the performance of the community-based management of acute malnutrition programme in all health facilities in Dhas district.

4.2 DATA COLLECTION AND ANALYSIS

Data collection was conducted using a data capturing sheet. The study population consisted of all clinical records of children aged 6-59 months, diagnosed with SAM, admitted, and treated in nine health facilities in Dhas district, from July 2010 to December 2010. A total of 163 clinical records were included in this study. The data of all 163 clinical records of children with SAM was analysed by a statistician using Epi Info version 3.5.3 and SPSS version 17.0.

4.3 DEMOGRAPHIC AND CLINICAL CHARACTERISTICS

Demographic, admission, discharge and outcome data was collected from 163 participants in nine health facilities in the district.

4.3.1 Age of the children

The mean age at admission was 20 months. Children below one year of age represented the highest proportion, 35% (n=57) among the overall number of admissions. More than half 57% (n=93) were children aged below two years (Table 4.1).

Table 4.1: Age distribution of children admitted to OTP in Dhas, Ethiopia, July to December 2010.

Age (month)	Frequency	Percentage
6 to 11	57	35
12 to 23	36	22
24 to 35	37	23
36 to 47	21	13
48 to 59	12	7
Total	**163**	**100**

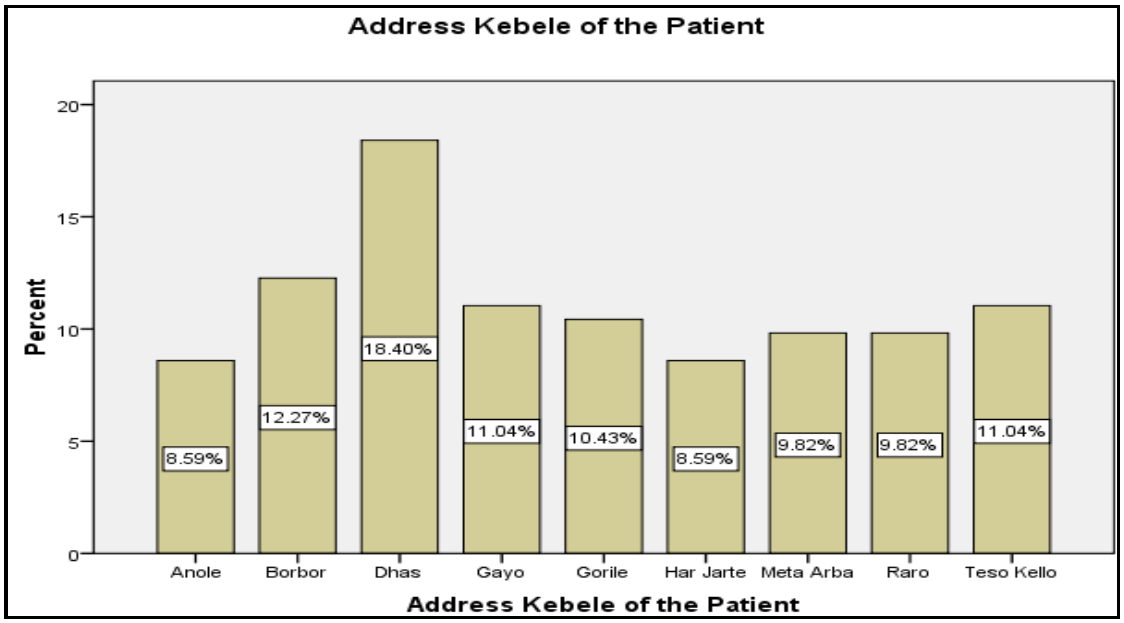
4.3.2 Kebele of residence and OTP site

The highest number of admissions to OTP was recorded in Dhas kebele (18.4%) and the lowest was recorded in Har Jarte kebele (Table 4.2 and Figure 4.1).

Table 4.2: Number of admission to OTP sites in Kebeles of Dhas district, Ethiopia, July to December 2010

Name of kebele	Frequency	Percent	Valid Percent	Cumulative Percent
Anole	14	8.6	8.6	8.6
Borbor	20	12.3	12.3	20.9
Dhas	30	18.4	18.4	39.3
Gayo	18	11.0	11.0	50.3
Gorile	17	10.4	10.4	60.7
Har Jarte	14	8.6	8.6	69.3
Meta Arba	16	9.8	9.8	79.1
Raro	16	9.8	9.8	89.0
Teso Kello	18	11.0	11.0	100.0
Total	163	100.0	100.0	

Figure 4.1: Percentage contributions of Kebeles in Dhas, Ethiopia, July-December 2010.



4.3.3 Admission category

Out of the total of 163 patients, 98.2% (n=160) were new admissions (admitted to health facilities for the first time) while 1.8% (n=3) were admitted as either transfers from another OTP sites or re-admitted after default (Table 4.3). This indicates that most of the discharged children were not admitted back to the program.

Table 4.3 Number of patients by admission category, Dhas, Ethiopia, July-December 2010

		Frequency	Percent	Valid Percent	Cumulative Percent
Is the patient new admission?	No	3	1.8	1.8	1.8
	Yes	160	98.2	98.2	100.0
	Total	163	100.0	100.0	

4.3.4 Gender

There were more girls than boys admitted to the OTP in all health facilities in the district (Table 4.4).

Table 4.4: Number of admissions to OTP in Dhas by gender, July-December 2010.

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Girls	88	54.0	54.0	54.0
	Boys	75	46.0	46.0	100.0
	Total	163	100.0	100.0	

4.3.5 Causes of admission to OTP

More than 98% of admissions to the programme were made based on MUAC criteria, with oedema contributing to only 1.8% of admissions (Table 4.5). The mean MUAC measurement during admission was 10.7 cm.

Table 4.5: Number of patient admissions with oedema, Dhas, July-December 2010

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	No	160	98.2	98.2	98.2
	Yes	3	1.8	1.8	100.0
	Total	163	100.0	100.0	

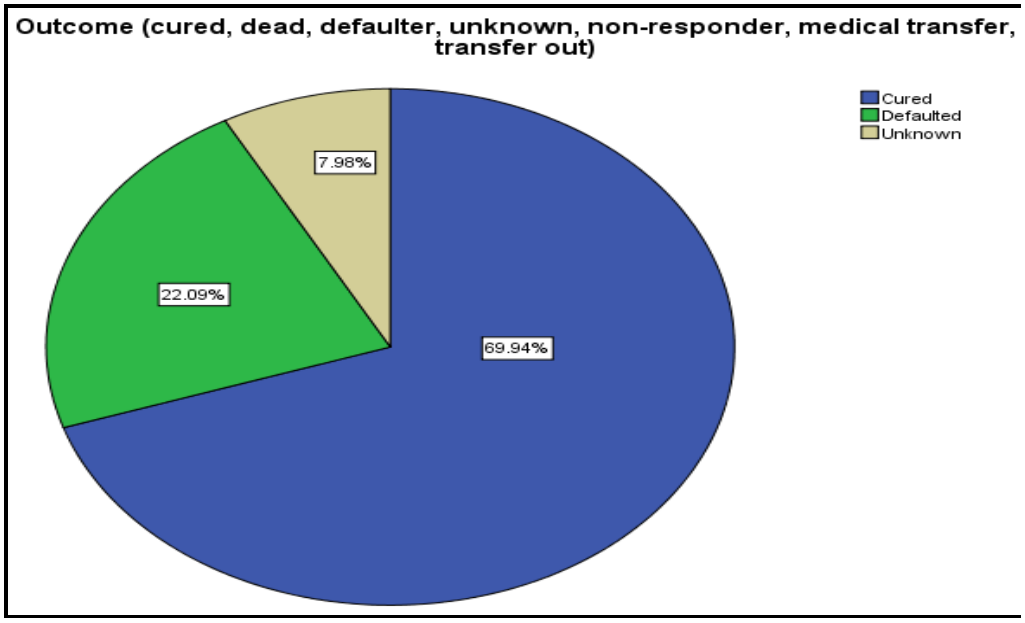
4.3.6 Treatment outcome

The treatment outcomes during the project were recovery, default, and unknown outcome. Most of the children admitted to the programme recovered and were discharged with recovery rate of 69.9% (CI: 62.9-77.0) followed by default and unknown outcome (Table 4.6). The recovery rate was below the expected standard of above 75% but above the alert level of 50%. Similarly, the default rate of 22.1% (CI: 16.6-27.6) was more than the standard cut-off point of below 15%.

Table 4.6: Treatment outcome of Dhas OTP, Ethiopia, July-December 2010.

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Cured	114	69.9	69.9	69.9
	Defaulted	36	22.1	22.1	92.0
	Unknown	13	8.0	8.0	100.0
	Total	163	100.0	100.0	

Figure 4.2: Treatment outcome of Dhas OTP, Ethiopia, July-December 2010.



4.4 MEASURES OF CENTRAL TENDENCY, MEASURES OF DISPERSION AND STANDARDIZED SCORES

Measures of central tendencies locate the center of variable of interest. Measures of central tendency include mean (average), median, mode, and quintiles (Quartiles, Deciles, and Percentiles). Measures of dispersion indicate how the values are distributed around the measure of central tendency. They include ranges, variance, standard deviation, quarter's deciles, and percentiles. All those measures are mainly calculated for continuous response variables. Therefore, measures of central tendency have been calculated for weight gain, MUAC measurement during discharge, and length of stay in the programme (Table 4.7). Length of stay and weight gain has been calculated only for patients who were discharged cured.

Table 4.7 Descriptive statistics for continuous response variables in Dhas, Ethiopia, July-December 2010.

Descriptive Statistics									
	N	Mean		Std. Deviation	Variance	Skewness		Kurtosis	
	Statistic	Statistic	Std. Error	Statistic	Statistic	Statistic	Std. Error	Statistic	Std. Error
MUAC at discharge	163	11.645	.0372	.4746	.225	.018	.190	.565	.378
Length of stay (day)	114	44.03	1.547	16.517	272.822	.124	.226	-.982	.449
Wt gain (g/kg/day)	114	4.350	.1982	2.1157	4.476	1.394	.226	1.810	.449
Valid N (list-wise)	114								

4.4.1 Mid-upper arm circumference during discharge

The mean MUAC measurement during discharge for all patients was 11.6 cm (CI: 11.573- 11.718) and standard error of 0.0372cm. The variance for MUAC at discharge was 0.225cm^2 while the standard deviation (SD) is 0.4746cm. The skewness is said to be symmetrical as the skewness is 0.018cm with standard error of 0.190 cm. Similarly, the kurtosis for MUAC at discharging period was 0.565 cm with standard error of 0.378 cm. Both Skewness and Kurtosis indicated that the average MUAC at discharge was normally distributed.

4.4.2 Length of stay in the programme

On average the admitted children reached the discharged criteria after 44 days with standard error of 1.5 days. The SD of the length of days the children stayed in the program was 16.5 days. The skewness of the length of days the admitted children stayed in the programme was 0.1 days with standard error of 0.226 days. This indicates that children who stayed more than 44 days are similar with those discharged before 44 days. However, the kurtosis of the length of days stayed indicates that there were more children discharged before 44 days.

4.4.3 Weight gain

The average weight gained by children who were discharged after recovering was 4.350 g/kg/day with standard error of 0.1982. The SD of the weight gained on average was 2.1157g/kg/day. On the other hand, the skewness of the weight gained was 1.394 with standard error of 0.226 g/kg/day. The calculated z-score for skewness (1.394/0.226) is 6.17, which is much greater than 1.96. This indicates that majority of the children gained more than the indicated average by the time they were discharged. Similarly, the kurtosis indicates that more children gained more than average values calculated from this sample.

4.5 CROSS TABULATION

Cross tabulation of gender (male/female) against residence of patients, admission category (yes/no for new admission) and the treatment outcomes in the programme (Tables 4.7, 4.8, 4.9).

Table 8.4 below shows that there is no significant difference in the gender of patients from the different Kebeles admitted in health facilities for treatment (χ^2 =1.538, P-value 0.992). Similarly, there is no significant difference between gender of overall children admitted to health facilities with malnutrition p=0.64. This indicates that there is no difference based on gender of the patients admitted to the programme.

Table 4.8 Gender distribution of patients in Kebeles of Dhas district, Ethiopia, July-December 2010.

			Gender (F/M)		Total
Address Kebele of the patient	**Kebele name**	**Indicator**	**Female**	**Male**	
	Anole	Count	8	6	14
		% of Total	4.9%	3.7%	8.6%
	Borbor	Count	10	10	20
		% of Total	6.1%	6.1%	12.3%
	Dhas	Count	14	16	30
		% of Total	8.6%	9.8%	18.4%
	Gayo	Count	10	8	18
		% of Total	6.1%	4.9%	11.0%
	Gorile	Count	9	8	17
		% of Total	5.5%	4.9%	10.4%
	Har Jarte	Count	9	5	14
		% of Total	5.5%	3.1%	8.6%
	Meta Arba	Count	9	7	16
		% of Total	5.5%	4.3%	9.8%
	Raro	Count	9	7	16
		% of Total	5.5%	4.3%	9.8%
	Teso Kello	Count	10	8	18
		% of Total	6.1%	4.9%	11.0%
	Total	Count	88	75	163
		% of Total	54.0%	46.0%	100.0%

Chi-Square Tests			
Type of test statistics	**Value**	**df**	**Asymp. Sig. (2-sided)**
Pearson Chi-Square	1.538[a]	8	.992
Likelihood Ratio	1.547	8	.992
N of Valid Cases	163		

The chi-square test statistics (χ^2 =0.198, P-value =0.657) given in table 4.9 below for new admission versus re-admission or transfer from other OTP/TFP has no difference in terms gender of children admitted to the program. Hence, there is no significant evidence to say that the admission is different for boys and girls in terms of admission to the program as new, re-admission, and transfer in from another therapeutic feeding program.

Table 4.9: Gender distribution of patients and the type of admission category to OTP in Dhas, Ethiopia, July-December 2010

			Gender (F/M)		Total
New admission Y/N			Female	Male	
	No	Count	2	1	3
		% of Total	1.2%	.6%	1.8%
	Yes	Count	86	74	160
		% of Total	52.8%	45.4%	98.2%
	Total	Count	88	75	163
		% of Total	54.0%	46.0%	100.0%
Chi-Square Tests					
Type of Test Statistic	**Value**	**df**	**Asymp. Sig. (2-sided)**		
Pearson Chi-Square	.198[a]	1	.657		
Likelihood Ratio	.203	1	.653		
N of Valid Cases	163				

In addition to the cross tabulation given above, cross tabulation of the outcome of children admitted to the program in terms of gender is given in table 4.10 below. The chi-square test (χ^2 =3.068, p-value =0.216) shows that there is no difference on the outcome of the children admitted to the program in terms of gender. From the given information one can generalize that the program benefited both genderes equally and children were exposed to malnutrition irrespective of their gender.

Table 4.10 Gender distribution of patients by OTP treatment outcome in Dhas, Ethiopia, July-December 2010

			Gender (F/M)		
			Female	Male	Total
Outcome (cured, dead, defaulter, unknown, non-responder, medical transfer, transfer out)	Cured	Count	60	54	114
		% of Total	36.8%	33.1%	69.9%
	Defaulted	Count	18	18	36
		% of Total	11.0%	11.0%	22.1%
	Unknown	Count	10	3	13
		% of Total	6.1%	1.8%	8.0%
	Total	Count	88	75	163
		% of Total	54.0%	46.0%	100.0%
Chi-Square Tests					
Type of Test Statistics	**Value**	**df**	**Asymp. Sig. (2-sided)**		
Pearson Chi-Square	3.068[a]	2	.216		
Likelihood Ratio	3.255	2	.196		
N of Valid Cases	163				

4.6 CORRELATION AND REGRESSION ANALYSIS

Correlation analysis deals with the measurement of the closeness of the relationship, which are described in the regression equation. In statistics, dependence refers to any

statistical relationship between two random variables or two sets of data. Correlation refers to any of a broad class of statistical relationships involving dependence. Correlations are useful because they can indicate a predictive relationship that can be exploited in practice (http://.en.wkipedia.org/wiki/Statistics).

There are several correlation coefficients measuring the degree of correlation. The commonest of these is the Pearson correlation coefficient, which is sensitive only to a linear relationship between two variables (which may exist even if one is a nonlinear function of the other) ((http://.en.wkipedia.org/wiki/Pearson_Product_Moment_Correlation).

The Pearson correlation is +1 in the case of a perfect positive (increasing) linear relationship (correlation), −1 in the case of a perfect decreasing (negative) linear relationship (anti-correlation), and some value between −1 and 1 in all other cases, indicating the degree of linear dependence between the variables. As it approaches zero there is less of a relationship (closer to uncorrelated). The closer the coefficient is to either −1 or 1, the stronger the correlation between the variables (http://.en.wkipedia.org).

Table 4.11: Correlation among explanatory/independent variables in OTP programme in Dhas, Ethiopia, July-December 2010

		Weight gain (g/kg/day)	Age (month)	Admission Weight (kg)	MUAC For Admission	Length of stay (day)
Std. Cross-product	Weight gain (g/kg/day)	1.000	.774	.866	.897	.730
	Age (month)	.774	1.000	.908	.857	.791
	Admission Weight (kg)	.866	.908	1.000	.981	.922
	MUAC For Admission	.897	.857	.981	1.000	.938
	Length of stay (day)	.730	.791	.922	.938	1.000
Sig. (1-tailed)	Weight gain (g/kg/day)	.	.000	.000	.000	.000
	Age (month)	.000	.	.000	.000	.000
	Admission Weight (kg)	.000	.000	.	.000	.000
	MUAC For Admission	.000	.000	.000	.	.000
	Length of stay (day)	.000	.000	.000	.000	.

Note that: - The total number of cases considered in this analysis is 114 that are cured only

As shown in table 4.11 above, all values on the diagonal are 1.000. This indicates perfect correlation as it is correlated with itself. On the upper or lower side of the diagonal line, the values indicate the correlation coefficient between two variables as a result of regression analysis. In addition to this, all values are positive. This shows that all variables are positively correlated to each other and dependent variable (weight gained). Moreover, all values are greater than 0.70, which indicate highly correlated.

Specifically, the correlation between weight gain and age, weight gain and admission weight, weight gain and MUAC admission, and weight gain and length of stay in the program are 0.774, 0.866, 0.897, and 0.730 respectively. Similarly, the correlation between age and admission weight, age and MUAC for admission, and age and length of stay in the program are 0.908, 0.857, and 0.791 respectively. In the same fashion when we look at the correlation coefficient between admission weight and MUAC for admission; and admission weight and length of stay in the program, the values are 0.981 and 0.922 respectively. Finally the correlation coefficient between MUAC for admission and length of stay in the program are 0.938.

Besides the correlation coefficients, the p-values of all correlations are statistically significant at any level of confidence limit. This assures that the relationships among all variables are strong.

Regression analysis

Regression analysis is a statistical tool for the investigation of relationships between variables. Usually, the investigator seeks to ascertain the causal effect of one variable upon another. Regression analysis with a single explanatory variable is termed simple regression.

Linear regression and correlation is studying and measuring the linear relationship among two or more variables. When only two variables are involved, the analysis is referred to as simple correlation and simple linear regression analysis, and when there are more than two variables the term multiple regression and partial correlation is used.

In general, regression analysis is a statistical technique that can be used to develop a mathematical equation showing how variables are related to each other.

Table 4.12 Regression analysis of children recovered in Dhas OTP, Ethiopia, July-December 2010.

Variables	Mean	Root Mean Square	N
Weight gain (g/kg/day)	4.350	4.8328	114
Age (month)	21.28	24.861	114
Admission Weight (kg)	6.618	6.7534	114
MUAC (cm) For Admission	10.616	10.6197	114
Length of stay (day)	44.03	46.997	114

As given above in table 4.12, the average weight gained over 44 days stayed in the program is 4.350g/kg/day. The average weight of children admitted to the TFP program at the admission point was 6.618 kg while the average MUAC for admission was 10.616 Cm. On average all cured children stayed 44 days in the program to reach the targeted weight. This is much lower than the maximum limit days (8 weeks=56 days) stipulated for admission to TFP programs but above four weeks which was adapted from the inpatient programmes.

Goodness of fit

Another common statistic associated with regression analysis is the R^2. It is a measure of the extent to which the total variation of the dependent variable is explained by the regression. The high the value of R^2 is suggesting that the regression model explains the variation in the dependent variable very well. The higher the value of R^2 is obviously important if one wishes to use the model for predictive or forecasting purposes. It is considerably less important if one is simply interested in particular parameter estimates. On the other hand large unexplained variation in the dependent variable, small R^2, will increase the standard error of the coefficients in the model (which are a function of the estimated variance of the error term), and hence regressions with low values of R^2 will often (but by no means always) yield parameter estimates with small t-statistics for any null hypothesis. This leads to accept the null hypothesis which is normally rejected.

Table 4.13: Regression Model summary of dependent variables against weight gain of Dhas OTP, Ethiopia, July-December 2010

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics				
					R Square Change	F Change	df1	df2	Sig. F Change
1	.957	.915	.912	1.4312	.915	297.475	4	110	.000

R^2 = 1 is a 'perfect score', obtained only if the data points happen to lie exactly along a straight line; R^2 =0 is perfectly lousy score, indicating that explanatory variable is absolutely useless as a predictor for dependent variable.

As shown in table 4.13, R square and adjusted R square is above 0.915 and 0.912 respectively. This indicates that explanatory variables accounts more than 90% are accounted for by the estimated equation. Hence, one can conclude that the fitted model best explain the dependent variables i.e. weight gain per kg per day.

Analysis of variance (ANOVA)

Analysis of Variance (ANOVA) is a technique for assessing the effect of an explanatory categorical variable on a normally distributed continuous outcome variable. Analysis of variation is an experimental outcome and especially of a statistical variance in order to determine the contributions of given factors or variables to the variance. Analysis of variation for regression model is given as follows:-

Table 4.14: Analysis of variance for regression model, Dhas, Ethiopia, July-December 2010

Model	**Sum of Squares**	**df**	**Mean Square**	**F**	**Sig.**
Regression	2437.218	4	609.305	297.475	.000[a]
Residual	225.308	110	2.048		
Total	2662.526[b]	114			

The ANOVA table given above shows that the regression model is significant at any level of confidence limit. This means weight gained per kg per day is well explained by age of admitted child, weight during admission, MUAC value at admission, and length of stay in the program.

Coefficients of explanatory variables

The values of coefficients explanatory variables in regression analysis determine how the value of dependent or response variables changes as the value of the explanatory variable change by one unit. If the model fitted by regression equation is best, R^2 is large; it will minimize the residual error and estimate the coefficient very well in the specific given model. The overall coefficient of explanatory variable is given by table 4.15.

Table 4.15 Coefficients of explanatory/independent variable for patients in Dhas OTP, Ethiopia, July-December 2010

Model	Un-standardized Coefficients		T	Sig. Lower Bound	B Upper Bound	95% Confidence Interval	
	B	Std. Error	Beta				
Age (month)	.021	.014	.110	1.512	.133	-.007	.049
Admission weight (kg)	-.396	.138	-.554	-2.879	.005	-.669	-.124
MUAC (cm) For admission	1.004	.077	2.207	12.988	.000	.851	1.158
Length of stay (day)	-.094	.008	-.917	-11.346	.000	-.111	-.078

As shown in table 4.15 above, the un-standardized coefficients of the age of admitted child, weight during admission, MUAC value at admission, and length of stay in the program are 0.021, -0.396, 1.004 and -0.094 with standard error 0.014, 0.138, 0.077 and 0.008 respectively. But the standardized coefficients of the age of admitted children, weight during admission, MUAC value at admission, and length of stay in the program are 0.110, -0.554, 2.207 and -0.917 respectively. Moreover, the 95% confidence interval for B contains 0 for age of admitted children. Hence, all coefficients of the explanatory variables expect coefficients of age of admitted children different from 0. Even though the coefficient of age of admitted child is not significant, as the age of the child for admission increased by one month, the weight gained on average increased by 0.021 g/kg/day. This means more older children gain more weight than younger children do.

On the other hand, children with high weight during admission will gain small weight to reach the targeted weight than children with small weight during admission. This means as the weight of child during admission increased by 1 kg the weight gain decreased by 0.396 g/kg/day as compared to low weight children. Similarly, if the admitted child

stayed in the program more than the average day by 1 day the weight gain will decrease by 0.094 g/kg/day as they are inversely related.

In contrast, if the MUAC of children is increased by 1 cm during the course of stay in the program, the weight gain increases by 1.004 g/kg/day.

4.7 COVERAGE

4.7.1 Malnutrition prevalence data

Indirect method was to estimate number of severely malnourished patients expected in the district from July 2010 to December 2010. Indirect coverage estimate is an estimate of coverage made using data collected for other purposes (secondary data) or proxy measures of coverage (Myatt *et al* 2012:217)

Incidence over one year could be twice the prevalence and 80% of all cases could be treated as outpatients (Food and Nutrition Technical Assistance Project 2008 Module 7:39). Population of children aged 6-59 months in the district is 6199 (16.84% of the total population) (Borena zone health office). Based on 1.6% malnutrition prevalence in Moyale district, one of the districts in Borena zone bordering Dhas and having similar socio-economic and geographical conditions (Early warning and response directorate, Emergency Nutrition Coordination Unit 2010:6), and 70% coverage, the total number of severely malnourished children requiring treatment in the outpatient treatment programme will be 139.

Based on the calculations made above, the estimated programme coverage in Dhas will be more than 100 per cent (117%).

4.7.2 Admission MUAC

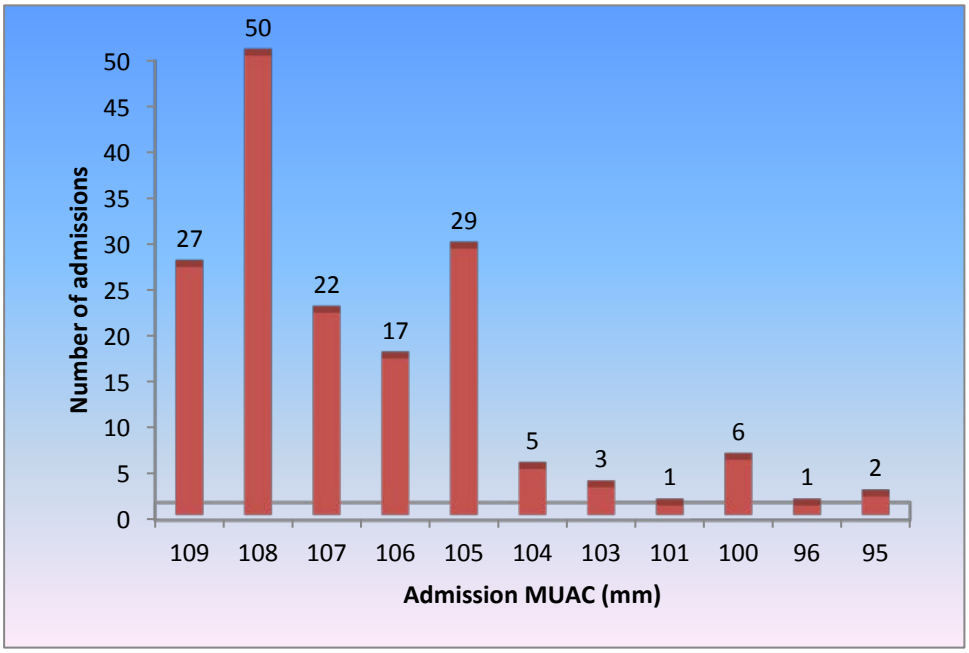
Late admissions are children that are admitted to the programme only after they have met the programme admission criteria after a considerable period of time. Late admissions are direct coverage failures and also affect coverage indirectly since it is associated with the need for inpatient care, longer treatment, defaulting, and poor

treatment outcomes. Late admission may be investigated by plotting MUAC at admission. Plots of admission MUAC from a programme with high coverage are likely to have very large numbers of admissions close to the programme admission criteria and plots that differ markedly from this pattern are indicative of problems with case finding and recruitment and low programme coverage (MYATT *et al* 2012:16-18). In this study, more than 88% of patients had admission MUAC of 10.5 cm to 10.9 cm (Table 4.16).

Table 4.16: MUAC measurement and number of patients in Dhas OTP, July-December 2010

MUAC in millimetre (mm)	Frequency	Percentage
109	27	16.6
108	50	30.7
107	22	13.5
106	17	10.4
105	29	17.8
104	5	3.1
103	3	1.8
101	1	0.6
10	6	3.7
96	1	0.6
95	2	1.2
Total	163	100

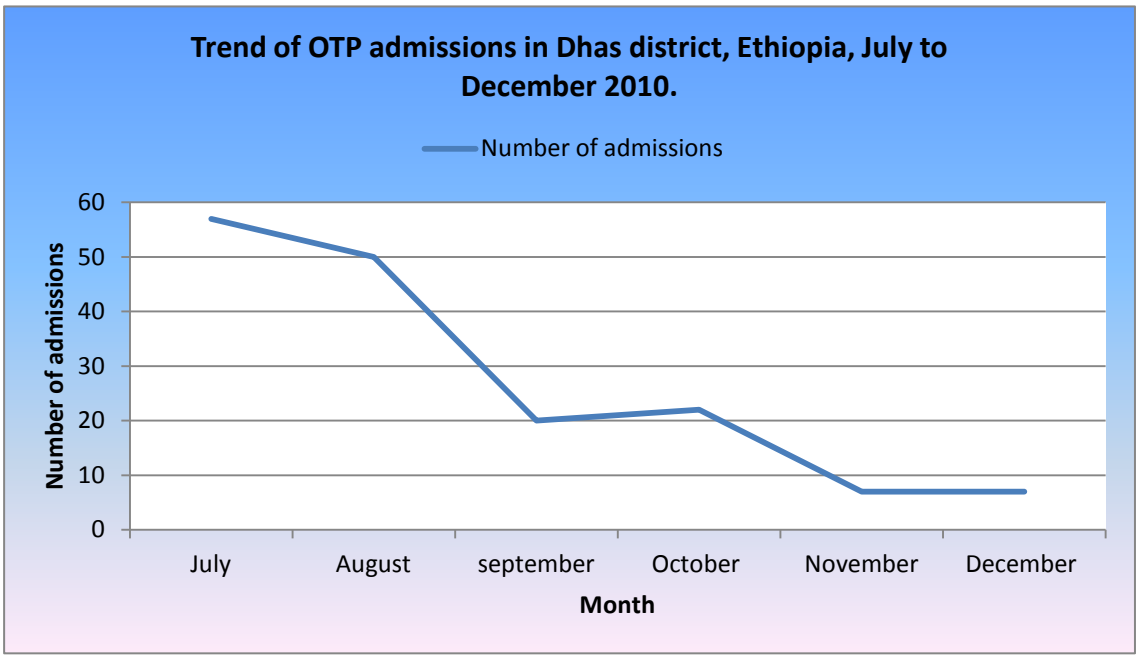
Figure 4.3: Admission MUAC in Dhas OTP admitting on MUAC less than 110 mm, July-December 2010.



4.7.3 Number of admissions over time

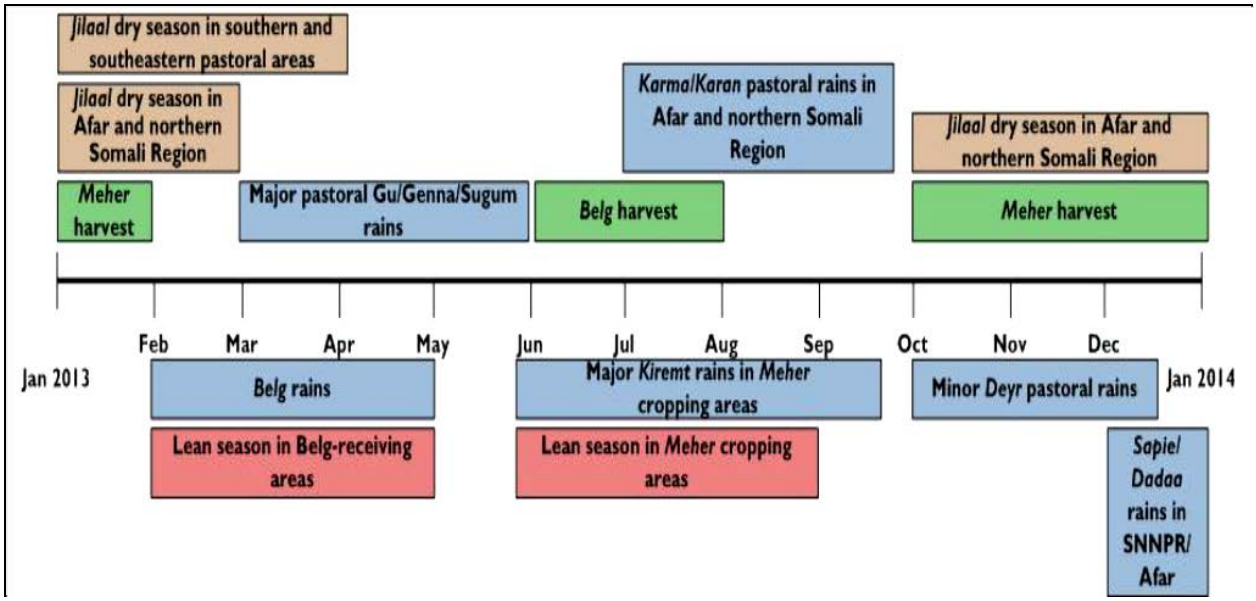
Number of admission over time is an important item of routine data with number of admissions graphed over y axis and time over the y axis. Programmes with reasonable coverage show a distinctive pattern in the plot of admissions over time. The number of admissions increases rapidly, falls slightly before stabilizing, and finally drops away as the emergency abates and the programme is scaled down and approaches closure. In the absence of mass migration or improvement in health and nutrition situation of the population, major deviations from this pattern indicate a potential problem with the recruitment process of the programme (Myatt *et al* 2012:12). This pattern is shown in figure 4.4.

Figure 4.4 Trend of OTP admissions in Dhas district, July to December 2010, Ethiopia.



The highest number of patient admission was recorded in July 2010 followed by August 2010 and the lowest number of admission was in November and December 2010 (Table 4.16). The high number of admissions coincides well with the dry season in the area (Figure 4.3)

Figure 4.5 Seasonal pattern in pastoral and agricultural areas of Ethiopia.



Source: FEWS NET Ethiopia.

Table 4.17 Number of Monthly OTP admissions in Dhas, July-December 2010.

Month	Number of admissions	Percentage
July	57	35
August	50	31
September	20	12
October	22	13
November	7	4
December	7	4
Total	163	100

Long treatment episodes may be due to late admission or poor adherence to the CMAM treatment protocol by program staff and beneficiaries. Programs with long treatment episodes tend to be unpopular with beneficiaries and suffer from late treatment seeking and high levels of defaulting (both of which are failures of coverage). Higher coverage programs tend to have a median duration of treatment episodes of less than or equal to about 8 weeks (Myatt *et al* 2012: 22-23)

4.7.4 Duration of treatment (Length of stay)

Examining the duration of the treatment episode (i.e., the time from admission to discharge) may also provide useful information about programme coverage. Programmes with long treatment episode are associated with high level of defaulting (Myatt *et al* 2012:22-24). The length of stay for recovered children in this study was 44.03 days.

4.7.5 Rate of defaulters

Defaulters are children that should be in the programme but are not in the programme. This means that high defaulting rates are associated with low programme coverage (Myatt *et al* 2012:23). Defaulter rate in this study was 22.1%.

CHAPTER 5: CONCLUSIONS AND RECOMMENDATIONS

5.1 INTRODUCTION

This chapter concludes the study and gives recommendation for implementation of community-based management of acute malnutrition in pastoral areas and future research. The research design was a descriptive survey design. This chapter discusses the research findings from nutrition intervention project implemented in Dhas district from July to December 2010. The section also discusses limitations and recommendations for management of children with severe acute malnutrition in pastoral communities and future research.

The purpose of this study was to assess the coverage and effectiveness of management of severe acute malnutrition implemented in Dhas district from July 2010 to December 2010.

5.2 SUMMARY AND INTERPRETATION OF THE RESEARCH FINDINGS

The CMAM approach was first implemented in 2001 and endorsed by the UN in 2007 (WHO, UNICEF, UNSCN, WFP 2007). CMAM is an innovative approach that successfully treats the majority of children with SAM, and Ethiopia is one of the 55 countries implementing CMAM. The CMAM approach is based on community engagement for early identification and treatment of SAM before complications.

After screening for malnutrition at village and health facility levels using MUAC tapes, malnourished children (MUAC less than 11cm or bilateral oedema of the feet) are admitted to the CMAM programme. Children are given RUFT such as plumpynut on a weekly basis with medical examination and provision of essential medicines at low level existing decentralised health structures (ENN 2012:9-26).

The findings of this study are based on CMAM implemented in Dhas district, Oromia region, Ethiopia, from July 2010 to December 2010. Communities in Dhas and neighbouring districts in Borena zone are pastoralists with frequent movement in search of water and pasture to areas within or outside of the district. This is assumed to make it

difficult for the communities to attend a weekly regular follow up at static health facilities and leads to poor performance of treatment outcome, indicators, and coverage of service. This study compared the outcome of CMAM in Dhas with other areas in Ethiopia, as well as other countries.

5.2.1 Recovery, default, weight gain and length of stay

The result show that the recovery rate of admitted children was 69.9% (CI: 62.9-77.0) which was below the expected Sphere standard of 75% or above. The defaulter rate was 22.1% (CI: 16.9-27.6) and was also above the Sphere standard of 15%. The death rate was 0 percent as there was no report of death in the programme. However, the number of unknown cases, which was 8% (n=13), was high and it is possible that some mortality occurred in this category. In addition, national standards were not achieved both in terms of the length of stay in the programme which was 4.03 days and the average weight gain which was 4.35 g/kg/day.

An earlier study conducted in southern Ethiopia achieved Sphere standards in recovery, death and defaulter rates. However, weight gain was 3.16 g/kg/day compared to 4.4 g/kg/day in this study and did not achieve Sphere standards (Collins and Sadler 2002: 1824-30) A study in southern Ethiopia also found 93.3% recovery rate, 1.08% default rate and no report of deaths (Tekeste *et al* 2012:13).

Sphere standards for recovery rate (82%), default rate (5%) and death rate (0.5%) were achieved from analysis of monitoring data of 370,559 children treated in CMAM in four regions of Ethiopia, from January 2008 to August 2010 (Chamois 2009:10).The recovery rate improved from 56% in 2006 to 77.3% in 2009, in CMAM programmes in four regions of Ethiopia, exceeding the International Sphere standards. The gains in recovery were attributed to declining defaulter/unknown outcome rates, and to some degree, the rate of medical transfer. The data also suggests improved capacity of the MoH to run CMAM programmes. As a result children are less likely to default with improved access to services and increasing satisfaction with services. Literature shows that high defaulter rate is due to challenging topography in many areas of the country and logistical problems of ensuring that all health facilities had uninterrupted supply chain of RUTF (Mates 2011:7-8).

In a study by Eklund and Girma (2008) in Jimma zone of Oromia region, Ethiopia, the recovery rate was 45%, lower than the defaulter rate of 47%, while mortality rate was 1%. Rates of weight gain and length of stay in the programme were within the normal international standards. The study found that absence of active case finding and community follow up of children absent from OTP, high turnover of staff, and low community mobilisation were the reasons for low recovery and higher defaulter rates.
CTC outcome in south Wollo, Ethiopia, achieved Sphere standards for defaulter rate (9.7%) and death rate (7.5%) but the standards were not met for rate of weight gain and length of stay in the programme. The recovery rate was 74.6% (Humanitarian Practice Network 2004; 48:14).

Outcomes of 21 CTC programmes implemented in Ethiopia, Malawi, North, and South Sudan, between 2001 and 2005, achieved recovery rates of 79.4%, death rates of 4.1% and defaulter rates of 11%. Rates of weight gain and length of stay in the programme did not achieve Sphere standards. Average coverage rate using systematic area sampling method was 75.2% (The Unite Nations University 2006; 27(3): S49-S82).

Performance indicators from monthly monitoring data from 22 out of 39 countries achieved all Sphere standards but 17 had one or more indicators that did not. The reliability of the data was questioned as reports may come from better performing sites (UNICEF and Valid international 2011:16).

Surveys in Sudan have shown 30% coverage with high defaulter rates and long length of stay. The cure and defaulter rates in Zimbabwe were 54% and 25 %. In Afghanistan, the cure rate was 82% but the defaulter rate was 17% (ENN 2012:49).

Percentage of health facilities offering CMAM service in 22 countries globally ranged from 1.4% to 94% (UNICEF and Valid international 2011:14) but the programme coverage was not known. In Dhas all health facilities provide CMAM services.

CTC programme in pastoralist area in Ethiopia Kokere *et al* (2006:7) achieved Sphere International standards for recovery, mortality and death but not for average weight gain (3.5 g/kg/day) and length of stay (92 days). Length of stay was long as the schedule was monthly which reduces recovery due to opportunistic infections that occur during

the month. In addition, non-compliance with the protocol may might have been missed which reduced the rate of recovery and weight gain. The RUTF may also be shared at home and this reduces the amount of calorie to be consumed by the child with SAM. The difficult terrain in the area and low treatment seeking behaviour of the pastoralist communities also contributed to reduced quality of the programme, especially the length of stay and weight gain. Due to mobility of the pastoralist communities, services should be provided through mobile units over several days in a week, and at multiple sites in the community, rather than static sites on bi-weekly basis (Kokere *et al*; 2006:7-10).

5.2.2 Coverage

The estimated outpatient treatment coverage in the district was greater than 100 per cent (117%), which was above the Sphere standard of more than 50% in rural areas. Malnutrition prevalence data from a standard nutrition survey conducted in the neighbouring district with an estimated incidence of 1.5% was used to assess the number of expected SAM cases in the district. The coverage was based on the number of SAM cases obtained from clinical records of nine health facilities in the district enrolled from July 2010 to December 2010. Though the survey was conducted during the dry season in the area with expected high rates of malnutrition, the data may not be representative since the survey was reported in weight-for-height but the enrolment of SAM children to the CMAM programme in the district was done based on MUAC measurement.

There were also some agreements as well as conflicts between the figure of the coverage estimate and other supporting evidences like the trend of admission over time, MUAC at admission, length of stay, and number of defaulters which affect programme coverage. Admission MUAC measurement and trend of admission over time were supportive of a programme with good coverage. The number of defaulters which was more than the expected International Sphere standard of less than 15%, low recovery rate, length of stay in the programme above the national target, and weight gain below national standard obtained in this study were indicative of a programme with problems in service coverage (Myatt *et al* 2012:12-24).

Coverage surveys using methods like Centric Systematic Area Sampling and Semi-Quantitative Evaluation of Access and Coverage (SQEAC) are the best methods to assess coverage. Data available on CMAM programme coverage were done using these methods, and it was difficult to compare the results of this study.

Evidences suggest that CMAM programmes could achieve or exceed Sphere standards for coverage. Two coverage surveys conducted using Centric Systematic Area Sampling method between 2003 and 2005 in south Wollo, Ethiopia, attained coverage rates of 77.5% and 77.3% which were higher than the 50% coverage standard for rural populations stipulated in Sphere standards (WHO 2005:14).

Surveys using Centric Systematic Area Sampling and Semi-Quantitative Evaluation of Access and Coverage in three regions of Ethiopia achieved more than Sphere target of above 50% coverage in rural areas (Emily Mates 2011).

5.2.3 Further research

Further research could be done on the following topics:

- Large scale study in different pastoralist area
- Replication of the current study in different settings
- Knowledge, attitude and practice survey in pastoralist areas
- CMAM Coverage surveys in pastoralist areas

5.4 LIMITATIONS

The study was done in Dhas district of Borena zone and the findings cannot be generalized to other areas.

Indirect method was used to estimate the programme coverage in the district, malnutrition prevalence was estimated using standard survey findings from a neighbouring district and estimates were used for the incidence of malnutrition. Indirect method is not a preferred way to assess coverage as the estimates could be affected by the season the survey was done and the measuring instrument used which may bias the findings.

5.5 RECOMMENDATIONS

Based on the findings, the following recommendations are made:

There is a need for strong community engagement in the CMAM process to reduce the rate of absenteeism and defaulting and improve the recovery rate for severe acute malnutrition. Health extension workers should work with community health volunteers to strengthen the defaulter tracing and follow up activity for children with malnutrition. The status of 8% of children in this study was unknown and an effort has to be made to trace absentees to their villages and classify them as defaulters if the reason for absence was not due to death.

Health education on proper child feeding practices for severe acute children enrolled in therapeutic programs should be given to care takers or mothers to avoid sharing of RUFT with members of the family which could be the reasons for low weight gain and more length of stay than normal.

Knowledge, attitude, and practice surveys should be undertaken with emphasis to investigate the reason for underachievement of most of the performance indicators to help design CMAM programmes appropriate for communities in Dhas and others with similar geographical, social, cultural and economic background.

The study further recommends the modification of the modalities of CMAM service delivery in pastoralist communities like mobile OTP sites in areas like Dhas where the mobility of the community is high, and there is poor health infrastructure and access to quality CMAM services. There is also a need to undertake population-based coverage surveys to get accurate data on coverage of the CMAM service in the district and in other pastoralist areas.

5.6 CONCLUSION

The study found that International Sphere and national standards were not achieved in terms of recovery rate, defaulter rate, length of stay in the programme, and weight gain. There should be strong community participation in CMAM to strengthen active case

finding and tracing of defaulters to improve other outcomes like recovery, weight gain and length of stay. Living conditions of the communities should be considered while designing health and nutrition interventions in pastoralist settings. Similar large scale studies would be useful to improve CMAM programmes in pastoralist areas.

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Annexures

A: UNISA ethical clearance certificate

UNISA university of south africa

UNIVERSITY OF SOUTH AFRICA
Health Studies Higher Degrees Committee
College of Human Sciences
ETHICAL CLEARANCE CERTIFICATE

HSHDC/66/2012

Date of meeting: 19 June 2012 Student No: 4366-111-4

Project Title: Performance of community-based management of children with severe acute malnutrition in a pastoral area of Ethiopia.

Researcher: Bekele Negussie

Degree: D Litt et Phil Code: DPCHS04

Supervisor: Dr MM Mokgatle-Nthabu
Qualification: D Litt et Phil
Joint Supervisor: -

DECISION OF COMMITTEE

Approved [√] **Conditionally Approved** [ ]

Prof D van der Wal
CHAIRPERSON: HEALTH STUDIES HIGHER DEGREES COMMITTEE

Dr MM Moleki
ACTING ACADEMIC CHAIRPERSON: DEPARTMENT OF HEALTH STUDIES

PLEASE QUOTE THE PROJECT NUMBER IN ALL ENQUIRES

Annexure B: A letter to MoH to request permission to conduct the study

To: Borena zone Health Department,
Yabello
25 May, 2012

Dear Sir/Madam,

Request to conduct research at Dhas district of Borena zone.

I, Bekele Negussie Demisse, I am MPH student at University of South Africa. My degree requires that I conduct research around Public Health issues in my country. The title of my research is 'Performance of community-based management of children with severe acute malnutrition in a pastoral area of Ethiopia', and will look at records of children aged 6-59 months patients from July 2010 through December 2010. The purpose of the research is to assess (in line with the international standards) the coverage and progress made by the nutrition intervention project for the management of severe acute malnutrition in Dhas from July 2010 to December 2010. The research approach involves collecting data from information in the health facility registers and patient's personal nutritional records and information pertinent to the treatment while the patient was under the care of health facility during the time period stipulated above. I have already submitted a request for clearance from University of South Africa and will not undertake any part of this research until such clearance is received. I promise that if granted such permission, I will observe all ethical rules of good practice as pertinent to the Department of Health.

I also attach hereto a copy of my research protocol and will disseminate research results to the health district.

Thanking you for the anticipated favourable response.

Yours faithfully,

Signature of Researcher

Annexure C: Permission letter to the clinic supervisors and managers

Date: November 5, 2005 EC.
To: All Dhas Health posts

Subject
Cooperation for conducting research in Dhas for MPH dissertation

Dear all,
As stated above, Dr Bekele Negussie has asked to undertake research in the field of nutrition in Dhas health posts. This includes collection of nutrition data from your health post. He has presented permission letter from Borena zone Health Department and Ethical clearance from the University of South Africa for the research which is attached with this letter. We therefore request you to make all necessary cooperation for his data collection in your health post.

Regards,

(Signature)

(Name)
Dhas woreda health office head

Annexure D: Permission letter from Borena Health department

Ref: O/G6 – 5480/EF-30
Date: 01/03/2005

To: Bekele Negussie Demisse

Subject: Permission to conduct research

You have requested for permission to conduct research in Dhas woreda for your MPH dissertation at UNISA. Based on your proposal and ethical clearance from UNISA, you are granted conduct the research in Dhas district.

Regards,

Signature

(Name)
Head of Borena zone health department

Annexure E: Data capture sheet

	Section A						**Section B**			
Serial #	Patient code	Address	Age (month)	Gender (F/M)	New admission (Y/N)	Transfer or re-admission (Y/N)	Admission			
							Date	Weight (kg)	Oedema (Y/N)	MUAC (cm)
1										
2										
3										
4										
5										
6										
7										

	Section C						**Section D**	
	Discharge						**Outcome (cured, dead, defaulter, unknown, non-responder, medical transfer, transfer out)**	**Remark**
Serial #	Date	Weight (Kg)	Oedema (Y/N)	MUAC (cm)	Minimum weight (kg)	Date minimum weight		
1								
2								
3								
4								
5								
6								
7								