SOCIO-DEMOGRAPHIC CHARACTERISTICS OF CAREGIVERS AND THE CLINICAL PROFILE OF UNDERNOURISHED UNDER FIVE YEAR OLD CHILDREN ADMITTED IN NYANGABGWE REFERRAL HOSPITAL, BOTSWANA

MASTER OF PUBLIC HEALTH

A MADONDO

2012

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by

ANDREW MADONDO

RESEARCH DISSERTATION

Submitted in fulfilment of the requirements for the degree of

MASTER OF PUBLIC HEALTH

in the

SCHOOL OF HEALTH CARE SCIENCES

at the

UNIVERSITY OF LIMPOPO – MEDUNSA CAMPUS

SUPERVISOR: Prof U. MacIntyre
CO-SUPERVISOR: Ms. B. Ntuli-Ngcobo

2012

Declaration

I, Andrew Madondo hereby declare that the work on which this dissertation is based, is original (except where acknowledgements indicate otherwise) and that neither the whole work nor any part of it has been, is being, or shall be submitted for another degree at this or any other university, institution for tertiary education or examining body.

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A. Madondo (Mr.)   Date

Student Number: 200906260

Dedications

This study is dedicated to my family, my wife Mrs. T. Madondo my children Heather and Gerald

Acknowledgements

First and foremost I would like to thank the almighty God for giving the strength and guidance to complete this study.

I would like extend my sincere thanks to the following people for their numerous contributions in different ways during the undertaking of this study

- My supervisor and mentor Professor Una MacIntyre for her unwavering strength and guidance throughout the study. Thanks, I would not have done it without you.
- My co-supervisor Mrs Busi Ntuli-Ngcobo for her consistent support and encouragement throughout the study.
- My wife Thasiselo Madondo and my two lovely kids Heather and Gerald for the patience and support you gave me
- To Mr Chengeta for the wonderful assistance he gave me during the study
- To the caregivers and children who participated in the study and the Nyangabgwe Referral Hospital management and paediatric medical ward staff.

To all those who I may have not mentioned by name but have contributed in one way or the other to the completion of this project, thank you. May the good Lord continue blessing you in all your endeavours.

Abstract

Background: Despite Botswana being a middle income country undernutrition among children younger than five years of age continues to affect different parts of the country. Undernutrition can be attributed to a number of reasons which vary from region to region. There is little information on the socio-demographic characteristics of caregivers and the clinical profile of undernourished children in Francistown and surrounding villages.

Purpose: To determine the socio-demographic characteristics of caregivers and the clinical profile of undernourished children admitted at Nyangabgwe Referral Hospital, Francistown, Botswana.

Method: Data were collected from 113 caregiver-child pairs using a researcher administered questionnaire targeting caregivers and the child's hospital card and the child's anthropometric measurements were taken. Data were analysed using the WHO Anthro 2006 software and Stata 10. Descriptive statistics were derived and Chi-square tests were done at 5% level of significance to determine any associations.

Results: The majority of the caregivers were single mothers (80%) younger than 30 years of age. Oedematous malnutrition was found in 50% of the children and was more common in males at 55%. The reasons given by caregivers as to why their children had been admitted did not relate to the child's nutritional state. The child's gender was associated with stunting ($\chi^2 = 4.0638$, p = 0.044) at 5% level of significance. Looking at any associations between caregiver characteristics and the child's clinical profile only marital status was associated with child presenting with cough ($\chi^2 = 4.0947$, p = 0.045) at 5% level of significance. There was no association between the caregiver characteristics and the severity of any of the three types of undernutrition (wasting, stunting and underweight).

Conclusion: This study showed that the majority of caregivers were younger than 30 years of age and single. The child's gender was associated with stunting which may need more research on. Almost 50% of the children had oedematous malnutrition. Public health interventions should focus on providing caregivers with health education on the early signs of undernutrition so as to facilitate timely interventions and prevent severe cases of undernutrition.

Key words: young children, malnutrition, sociodemographic, anthropometry, clinical profile, caregivers and Botswana.

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CHAPTER 1

INTRODUCTION

1.1 Background to the study

Malnutrition is one of the leading contributors to morbidity and mortality in children under the age of five years. Worldwide, it is directly or indirectly responsible for 60% of 10,9 million deaths annually among children under five (Amsala & Tigabu 2008). Reducing child malnutrition should therefore be one of the vital strategies for child survival. Malnutrition refers to either undernutrition or overnutrition. Overnutrition results from intakes of energy and/or micronutrients in excess of the body's requirements. Undernutrition refers to an insufficient intake of energy and nutrients to meet the needs of a child (Faber & Wenhold 2007).

Undernutrition occurs as either protein-energy malnutrition or micronutrient deficiencies (Faber & Wenhold 2007 p 393). In most of the literature undernutrition is used synonymously with malnutrition. However, specific micronutrient deficiencies and other descriptive names are at times used, for example kwashiorkor, marasmus and protein-energy malnutrition for specific nutrient deficiencies. Given that protein-energy malnutrition does not exist without specific micronutrient deficiencies, neutral terms such as undernutrition are encouraged to cater for both protein-energy malnutrition and micronutrient deficiencies (Maleta 2006). In this study, undernutrition and malnutrition refer to protein-energy malnutrition and is used interchangeably throughout the study.

A number of indicators are used to measure nutritional status. These include anthropometry, body composition, clinical signs of deficiencies, physical function, biochemical compounds, and dietary intake (Maleta 2006). In most cases not all these indicators are used to assess nutritional status due to resources constraints. The choice of an indicator depends on the issue to be addressed. In clinical settings, quantitative and

qualitative descriptions of undernutrition (e.g. kwashiorkor and marasmus) are used, and in community studies of protein-energy malnutrition, body size is widely used because it is easily measurable and is a sensitive indicator of nutritional status and health (Maleta 2006).

Malnutrition has negative effects on especially children. Their physical growth, morbidity, mortality, cognitive development and physical activity are dependent on their nutritional status. In the developing world, 146 million children under five years of age are underweight. This predisposes them to a number of common childhood illnesses (The Lancet 2006). Theoretically the basic causes of child malnutrition are fairly well understood (i.e. food insecurity, poor care and feeding practices, inadequate quality public health services), but the precise pathways and subsequent clinical manifestations of malnutrition are still somewhat unclear (Grobler-Tanner 2006).

The objective of this study was to provide a description of the demographic, socioeconomic and clinical profile of malnourished children admitted at the Nyangabgwe referral hospital. The extent of the caregiver's awareness of the nutritional status of children was also determined. The results from this study might indicate focus areas when interventions or policies are developed to reduce child malnutrition.

1.2 Problem statement
The number of malnourished children in terms of weight, age and clinical diagnosis, and admitted to the Nyangabgwe Referral Hospital, continues to be a challenge. Of the approximately 60 children monthly admitted to the Nyangabgwe paediatric medical ward, 20 to 30 are diagnosed as malnourished (Nyangabgwe Referral Hospital Records 2011). A number of studies on child malnutrition have been conducted (Smith & Haddad 2000; Mahgoub et al 2006; Faber & Wenhold 2007; Emina & Kandala 2009). These studies show that the demographic, socioeconomic and clinical profiles of malnourished children differ from one region to another. The different characteristics that were found to

contribute to child malnutrition in the different regions range from the age of the child or the caregiver, the family size and income, and the caregiver's education to underlying clinical conditions. As little literature is available on common characteristics among malnourished children in Botswana, this study intended to describe the sociodemographic characteristics of caregivers and the clinical profiles of malnourished children admitted to the Nyangabgwe Referral Hospital.

1.3 Aim of the study

To determine the socio-demographic characteristics of caregivers and the clinical profile of undernourished children admitted at Nyangabgwe Referral Hospital, Francistown, Botswana.

1.4 Objectives

1) To investigate the sociodemographic characteristics of caregivers to children under five years old diagnosed as undernourished and admitted to the Nyangabgwe Referral Hospital
2) To investigate the clinical profile of children under five years old diagnosed as undernourished and admitted to the Nyangabgwe Referral Hospital
3) To assess the anthropometric status (i.e. weight-for-age, length/height-for-age, weight-for-length/height) of children under five years old diagnosed as undernourished and admitted to the Nyangabgwe Referral Hospital
4) To determine the distribution of underweight, wasting and stunting among children under five years old diagnosed as undernourished and admitted to the Nyangabgwe Referral Hospital by calculating z-scores for weight-for-age, weight-for-length/height and length/height-for-age, using the WHO reference values with a cut-off of -2 z-scores indicative of wasting, underweight and stunting (WHO 2010)

5) To determine the association between the caregivers' characteristics and the clinical profile and anthropometric status of children under five years old

6) To determine the extent of the caregiver's awareness of a child's nutritional status

1.5 Research questions

1) What are the sociodemographic characteristics of caregivers of children younger than five years diagnosed as undernourished and admitted to the Nyangabgwe Referral Hospital?

2) What is the clinical profile of children under five years old diagnosed as undernourished and admitted to the Nyangabgwe Referral Hospital?3)

3) What are the anthropometric status (weight-for-age, length/height-for-age, weight-for-length/height) of children under five years old diagnosed as undernourished and admitted to the Nyangabgwe Referral Hospital?

4) What is the distribution of underweight, wasting and stunting among children under five years old diagnosed as undernourished and admitted to the Nyangabgwe Referral Hospital where underweight, wasting and stunting were defined in terms of z-scores below -2 for weight-for-age, weight-for-length/height and length/height-for-age respectively, using WHO reference values (WHO 2010)?

5) What is the association between a caregiver's characteristics and the clinical profile and anthropometric status of children under five years old?

6) To what extent is the caregiver aware of a child's nutritional status?

1.6 Operational definitions

Clinical profile. This refers to the clinical presentation of a child when physically assessed by a doctor and the subsequent clinical/medical diagnosis. This profile presents various signs and symptoms and the medical history of the child.

Malnutrition. This situation occurs when a child is either undernourished or overnourished. This study focused on undernutrition.

Undernutrition is a form of malnutrition due to an inadequate intake of macro and/or micronutrients to maintain good health (Maleta 2006). In this study malnutrition refers to undernutrition. Child malnutrition in this study includes underweight, wasting and stunting.

Sociodemographic characteristics. These are social characteristics (e.g. age, sex, education, marital status and occupation) and demographic characteristics (e.g. family size and place of residence of caregivers).

Anthropometric status. The physical measurements of a child under five years old (length, weight and height) and the subsequent z-score value that provides an indirect assessment of the body's development/growth (Faber & Wenhold 2007).

Z-score. This score indicates the number of standard deviations (SD) below or above the median value that applies to weight-for-age, weight-for-length/height and height/length-for-age (WHO 2010).

Nutritional status. This status is determined by a child's health after physical examination and anthropometric measurements. The child's nutritional status is influenced by the intake and utilisation of nutrients (Cogill 2003).

Awareness of nutritional status. This awareness refers to the caregiver's understanding of the nutritional status of a child under five years of age.

Wasting. This is weight falling significantly below the weight of a child of the same length or height (Cogill 2003) as indicated by a z-score for weight–for-height/length of less than -2 in terms of the WHO reference values (WHO 2010).

Underweight. This is low weight-for-age of a child (Cogill 2003) indicated by a z-score for weight-for-age of less than -2 in terms of the WHO reference values (WHO 2010).

Stunting. This is low length/height-for-age of a child and is associated with chronic food shortages (Cogill 2003). Stunting is indicated by a z-score for height/length and length/height-for-age of less than -2 in terms of the WHO reference values (WHO 2010).

1.7. Conclusion

This chapter introduced the problem of child malnutrition in Botswana. Different types of malnutrition were studied. The research indicated the effects of undernutrition on children younger that five and the global extent of this problem. The aim, objectives and research questions pertaining to this study were highlighted.

CHAPTER 2

LITERATURE REVIEW

2.1 Introduction

"Malnutrition" is a broad term which includes overnutrition as well as undernutrition. Malnutrition can be assessed in a number of ways, for example by determining nutritional status by means of anthropometric measurements, including weight and length/height measurements. Other anthropometric measurements are also used to assess nutritional status, including mid-upper arm circumference (MUAC), the ratio between sitting height and standing height (Cormic index), and measuring skin folds (Cogill 2003). Height measurement is used for two-year old and older children, and length measurement is used for children younger than two years of age (WHO 2010). These anthropometric measurements are then compared with WHO reference values (WHO 2010).

Malnutrition in the form of undernutrition falls into the categories of wasting, underweight and stunting (Faber & Wenhold 2007, p. 393). Taking anthropometric measurements and calculating z-scores for weight-for-age, height/length-for-age and weight-for-height, serve to identify three types of undernutrition. Malnutrition may be acute or chronic, with chronic malnutrition beginning early in life and closely associated with poverty, whereas acute malnutrition is mainly a combination of wasting and oedematous malnutrition (Grobler-Tanner 2006, p. 1).

Wasting is a measure of acute malnutrition. It is indicated by low weight-for-height/length and may be due to inadequate intake of food, poor feeding practices, disease and infection, or, most frequently, a combination of factors. Wasting among children occurs rapidly, is in most cases seasonal, and is associated with disease and insufficient food (Cogill 2003).

Underweight is a measure of both chronic and acute malnutrition, and is indicated by low weight-for-age (Faber & Wenhold 2007).

Stunting is mainly associated with low height-for-age, and is a measure of chronic malnutrition which is closely related to chronically insufficient protein and energy intakes, frequent infections and sustained inappropriate feeding practices (Cogill 2003). Since stunting is associated with chronic malnutrition, stunted children are not admitted to hospital wards as most cases, unless the children suffer from disease, can be managed from home.

Underweight, wasting and stunting are identified by a z-score for weight-for-age, weight–for-height/length and length/height-for-age of less than -2 in terms of the WHO reference values (WHO 2010).

This chapter looks into the sociodemographic characteristics of the caregiver and a child and the clinical profile of malnourished children. The clinical profile focuses on medical conditions and various signs and symptoms of malnourished children admitted to hospital and during six months prior to admission. The caregiver's knowledge and awareness of the nutritional status of children are also examined.

2.2 Prevalence of child malnutrition (underweight, wasting and stunting)

Worldwide. Inadequate nutrition is the underlying cause in about one third of all child deaths throughout the world. The 2008 to 2010 global increases in food prices together with reduced incomes have increased the risk of child malnutrition. The percentage of children under five years of age who are underweight has declined globally from 25% in 1990 to 18% in 2005. However, this decline has been uneven: in some countries the prevalence of undernutrition increased, and worldwide stunted growth still affects 186 million children under five years of age (WHO 2010).

Table 1: Regional prevalence of undernutrition in children under the age of five years

Region	Percentage of under–fives (1995–2003) suffering from		
	Underweight Moderate and severe	Wasting Moderate and severe	Stunting Moderate and severe
Sub-Saharan Africa	29	9	38
Middle East and North Africa	14	4	21
South Asia	46	15	44
East Asia and Pacific	17	3	19
Latin America and Caribbean	7	2	16
World	27	8	31

UNICEF 2005

Table 1 above illustrates the prevalence of underweight, wasting and stunting among children in specific regions of the world. Underweight and stunting are extensive (27% and 31% respectively). When the prevalence of underweight and stunting in these regions are compared, specific regions in sub-Saharan Africa come second after South Asia.

South Africa. Studies in South Africa of children aged between one and nine years old found that at the national level, stunting was the most common nutritional disorder affecting one in five children. These studies found that children from urban areas were least affected. However, according to the same study, one in ten children were underweight (Labadarios et al 2005; Labadarios et al 2008).

Botswana. One of Botswana's new millennium development goals is the eradication of extreme poverty and hunger. This goal was set to be achieved by 2015. Indicators of success in this regard would be an improvement in the proportion of Botswana's population living with less than US$1 per day. In 2007 this proportion was 23.5%, showing a decrease in the number of citizens living below the national poverty line (30,2% in 2003). The number of underweight children under the age of five years declined from 7.1% in 2003 to 4.6% in 2007. Nationally, 13% of the children aged five years and younger were malnourished in 2007, 26% were stunted, 7.2% were wasted, and 13.5% of the overall population were underweight (UN 2010).

A cross-sectional study in one province of Indonesia found that 2 168 children between the ages of 0-59 months were stunted and severely stunted, that is 29% (95% Confidence Interval (CI) 26.0–32.2) and 14,1% (CI 11.7–17.0) of children younger than 23 months, and 38,4% (CI 35.9–41.0), and 18,4 % (CI 16.1–20.9) for children of less than one year to 59 months (Ramil et al 2009, p. 1). After checking for confounding, multivariate analysis showed that the risk factors for stunted children were the child's age in months, the male sex and the family income for the group (Ramil et al 2009, p. 3). Stunting has been associated with poverty (Cogill 2003, p. 11).

In view of the above figures, children below 23 months of age appear to be at high risk for stunting -- which could mean that poverty is extensive in this particular province. A study in South Africa found that stunting was more common in male children than in female children (Zere & McIntrye 2003). Poverty and family income are related: an inadequate family income means inadequate food supply culminating in stunted children. Low family income is not a short-term situation, but a long-term situation, meaning that children born to such families are likely to suffer from chronically insufficient food intake and consequently stunting. One study in Egypt showed that urban children were less likely to be stunted than their rural counterparts (Khatab 2010). Another study in South Africa showed that the prevalence of stunting decreased with age from 25.5 % of children aged one to three years, to 21% in children aged four to six years, and 13% in children aged seven to nine years (Labadarios et al 2005).

Research in South Africa (Labadarios et al 2005) found that at the national level, one out of ten children would be underweight. Less than 1.5% of these children were severely underweight. The prevalence of severe malnutrition was higher (at 5%) on commercial farms (Labadarios et al 2005, p. 536). The prevalence of underweight declined marginally with respect to the age of the children (Labadarios et al 2005).

The same study found wasting to be less common, affecting one in twenty children. At the national level, severe wasting was even less common (<1%) but was constant in all age groups at less than 4% (Labadarios et al 2005, p 536). One study in Roma, Siberia, found that wasting was more prevalent in 4.3% of children in urban settlements. These children were three times more likely to suffer from wasting than children in rural settlements (Odds Ratio (OR) = 2.8, 95% CI = 1.1, 7.7), even after adjusting for other sociodemographic characteristics (Adjusted Odds Ratio (AOR) = 2.8, 95% CI = 1.3, 6.2) (Janevic et al 2010).

2.3 Conceptual framework of child malnutrition
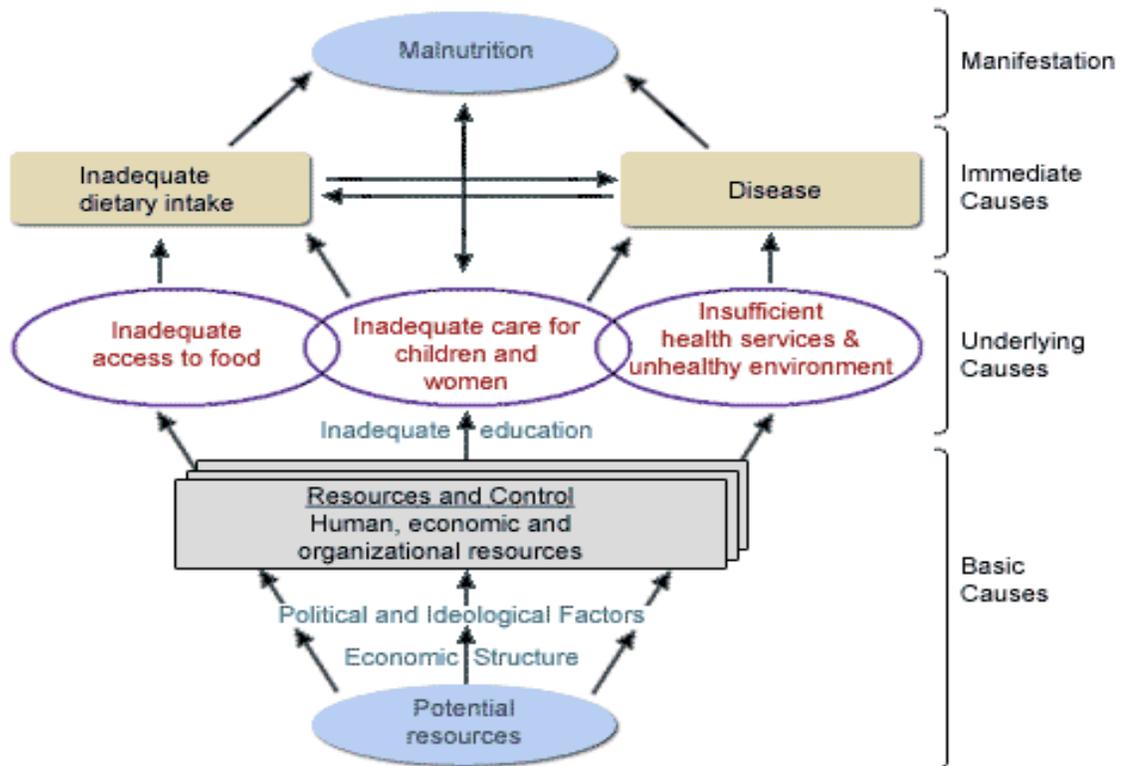
Figure 1: Conceptual framework of malnutrition (UNICEF 1990)

The United Nation's International Children's Emergency Fund (UNICEF) developed a comprehensive framework on child malnutrition which looks into the various causes of malnutrition in children. The framework classified these causes into: basic causes, underlying causes and immediate causes. Under basic causes this model looks at the overall economic structure, political and ideological factors (UNICEF 1990). Human and economic resources contribute indirectly to child malnutrition that is, availability of health workers and health facilities and the economic performance of the country. At country level, political instability plays a major role in contributing to child malnutrition as it can negatively affects on the economy (Food Security 2010).

The underlying causes to child malnutrition according to the framework relate to families. These include inadequate access to food, inadequate care for children,

insufficient health care services and unhealthy living environment. Household food security involves sustainable access to safe food of sufficient quality and quantity (UNICEF 1990). In some rural areas this depends on access to land and other resources to guarantee sufficient production. In urban areas food is bought from the shops, so food should be available at affordable prices to ensure food security (Food Security 2010). Women play a major role in maintaining food security in households and also the provision of basic education to women is necessary so as to provide them with information on child care (Food Security 2010).

The immediate causes of child malnutrition according to the framework are inadequate dietary intake and illness (UNICEF 1990). When a malnourished child whose resistance to illness is lowered falls ill, the malnutrition will worsen. This malnutrition-infection cycle can eventually lead to death. Infectious diseases, such as diarrhoeal and acute respiratory diseases are responsible for the majority of malnutrition problems in developing countries (Food Security 2010).

2.4 Sociodemographic characteristics associated with malnutrition

2.4.1 Family size
A number of studies have found that family size has different effects on the nutritional status of children. Studies in Kenya and Uganda (Ayaya et al 2004; Turyashemererwa et al 2009) concluded that large polygamous families had no malnourished children. On the other hand, a study in Ethiopia (Amsala & Tigabu 2008) found that family size was connected to underweight and stunting among children and that children from bigger households were more vulnerable to malnutrition. Big polygamous families perhaps protected their children against malnutrition. This finding could be attributed to mutual support in these families in these regions. Findings in other regions showed that large households were more likely to have malnourished children. This could be attributed to less food being available in bigger households without adequate family support systems.

However, Hien and Kam (2008, p. 236) in a study in Vietnam found that large families protected their children against malnutrition. These authors show that the size of the household and cultural aspects play a crucial role in preventing or potentiating child malnutrition in different regions.

2.4.2 Caregiver's marital status

A study in the Democratic Republic of Congo found no statistically significant association between stunting and the caregiver's marital status and household size (Kandala et al 2011). A cross-sectional study conducted in Botswana among children under the age of three years across different regions in the country, found that the marital status of the primary caregiver played a role in determining the nutritional status of children (Mahogoub et al 2006). These findings indicated that children in single-parent households were more likely to be significantly underweight ($p < 0.01$) than children brought up by both parents (Mahogoub et al 2006, p. 7).

Studies in South Africa (Saloojee et al 2007) and in Kenya (Adeladza 2009) found that mothers of severely malnourished children were more likely to be unmarried and without a secondary education. However, a study in Uganda found that marital status did not seem to affect the nutritional status of children (Owor et al 2000, p. 474). The marital status across Botswana follows its own unique pattern. Nationally single headed households constitute 71% of the total number of households and account for 69% of the population. The average number of household members is four. Of every ten of these households, six (60%) were headed by females (Gaisie 2000, p.133).

2.4.3 Family economic status

The economic status of families plays an important role in the nutritional status of the children. The risk of malnutrition increased in families with poor incomes (Amsalu &

Tigabu 2008; Owor et al 2000; Janevic et al 2010, Hong et al 2006). A survey of household income and expenditure in Botswana in 2002/03 showed that the number of national households with a monthly disposable income of less than P200.00 came to 19,158. The number of people living below US$1,00 per day increased from 19.9% in 1993/94 to 23.4% in 2002/03 (Botswana CSO 2004). One study in Botswana (UNDP 2005), showed that rural households were more likely to be poor than urban households. The elderly and the children were more likely to be affected by poverty than other age groups, and that female-headed households were more likely to be poorer than their male-headed counterparts (UNDP 2005).

Studies of child malnutrition in developing countries in sub-Saharan Africa, Latin America and the Caribbean, South and Southeast Asia and the Eastern Mediterranean, have shown that stunting was variously prevalent among the poor because of small differences in socioeconomic status, and that wasting was generally more common among the poor (Van de Poel et al 2007). A study in South Africa found that children subject to both stunting and underweight were responsive to an improved socioeconomic household status (Zere & McIntyre 2003). This particular study measured economic status in terms of income -- a common measure of economic status in most urban communities.

2.4.4 Caregiver educational background

Child malnutrition has been seen to be associated with a poor educational background of the primary caregiver (Sah 2003; Chakraborty et al 2006; Turyashemererwa et al 2009). Poorly educated caregivers are likely to have malnourished children, mainly due to poor job opportunities and poor basic knowledge on child nutrition (Van de Poel et al 2007). A study among Serbian children of mothers with a primary education or less were found to be more than twice as likely to suffer from stunting (OR = 2.2, 95% CI = 0.9, 5.3) (Janevic et al 2010). These findings correlate with those of a study in Brazil (Souza de Tera et al 1999) and another in Egypt (Khatab 2010) which showed that poor maternal

education and a low household income contributed to the high prevalence of underweight children (Souza de Tera et al 1999, p. 898).

In South Africa, improved maternal education was associated with a significant decline in the prevalence of stunting, underweight and wasting across all age groups (Labadarios et al 2005, p. 537). In a case control study in Bangladesh, caregivers of malnourished children were younger and less educated and more likely to be divorced or widowed and to work far from home than the caregivers of the control group (Nahar et al 2010, p. 478). These results are contrary to a study by Owor et al (2000) in Kampala, Uganda, which found that formal education and the occupation of the caregiver had no effect on the nutritional status of the children (p = 0.92). The same study found that an urban background could be associated with severe forms of malnutrition (odds ratio 3.15, 95% confidence interval 1.18-8.64 p=0.02).

Maternal occupation was found to have no explicit effect on the nutritional status of the child in a study in Ghana, whereas maternal education showed a significant association with childhood malnutrition (Van de Poel et al 2007). A study in Iran showed no significant correlation between the prevalence of wasting, stunting and underweight on one hand and the sex, occupation of the caregiver, family size and rural or urban residence (Nojomi et al 2004).

2.5 Clinical profile of undernourished children

About 11 million children under the age of five die each year from infections that can be associated with malnutrition (Horton 2006). A number of clinical conditions are associated with malnutrition in children. These clinical conditions include diarrhoeal disease, intestinal and urinary ailments, helminths, malaria and HIV (Maleta 2006, p. 195-196). A Ugandan study (Bachou et al 2006) found that of 315 severely malnourished children, 40% were HIV-infected. It was also found that HIV-positive children were less likely to present with oedema (OR 0.5, 95% CI 0.3-0.7). The same study showed that of

all the severely malnourished children, regardless of their HIV status, 72% had more than one type of infection (i.e. pneumonia (68%), diarrhoea (38%), urinary tract infection (26%), bacteraemia (18%), malaria (9%) and oral thrush (11%) (Bachou et al 2006). HIV infection can also cause undernutrition in some children because the infection increases metabolic demand and because immune suppression predisposes children to opportunistic infections (Rabinowitz et al 2010; Maleta 2006). HIV infection contributes to undernutrition in children, firstly due to the indirect effects on the child through the effects on the mother, irrespective of the child's status. Secondly, HIV can result in reduced care and disruption of feeding due to maternal morbidity. Thirdly, HIV can be transmitted from mother to child through breastfeeding. Children who are not breastfed are at risk of undernutrition, yet breastfeeding may increase transmission of the virus from mother to child (Maleta 2006, p. 197).

Chronic and persistent forms of diarrhoea have a harmful effect on weight gain (Maleta 2006, p, 195). A study in Serbia showed that previous diarrhoea or cough was not associated with stunting (Janevic et al 2010).   Another study in India showed that children with more than one anthropometric failure (i.e. wasting and underweight or stunting and underweight) were more likely to have had diarrhoea than children with a single anthropometric failure (Nandy et al 2005). The same study reported that children with multiple anthropometric failures had symptoms of acute respiratory tract infections, especially children who were stunted, underweight and wasted (OR = 1.39 95% CI = 1.23–1.58) (Nandy et al 2005). A case control study in South Africa showed that diarrhoea in the past twelve months was an obvious risk factor for malnutrition in children (OR = 2.73) (Saloojee et al 2007).

Various clinical profiles therefore contribute to child malnutrition. Knowledge of which clinical conditions are specific to a geographic area will be an important aspect in addressing child malnutrition in that specific area. In a study in South Africa the key determinants of stunting and underweight in children were found to be HIV status and age, at the maternal level it was the mother's age (All p <0.05). Children born to mothers

younger than 25 years had 1.6 higher odds of being stunted than children born to women aged 35–49 years (Kimani-Murage et al 2011, p. 259).

2.5.1 Signs and symptoms of undernourished children

A study in Tanzania found that more female children had oedematous malnutrition than male children (Bruno 2006). A study in Karachi of 112 malnourished children admitted to hospital showed that 25% of these children suffered from oedematous malnutrition, 44.6 % had diarrhoea, and 24% presented with respiratory tract infections (cough) (Ejaz et al 2010)

2.6 Gender of undernourished children

The prevalence of malnutrition among boys and girls has been the subject of a number of studies. Studies in Botswana (Mahogoub et al 2006), Uganda (Olwedo et al 2008), the Democratic Republic of Congo (Emina & Kandala 2009) and in Kenya (Leth et al 2000) have shown that malnutrition was more common among male than female children. In the Botswana study, the prevalence of malnutrition was significantly (p<0.01) higher among boys than among girls (Mahogoub et al 2006). In another study in Ethiopia, child malnutrition increased with age, from one to two years, irrespective of gender (Mulugeta et al 2010). A study in South Africa showed significantly more stunting in male children (26.8 vs 22.2 % p = 0.001), and that both stunting and underweight were responsive to improved socioeconomic status of the household (Zere & McIntyre 2003). In Ghana, the prevalence of malnutrition increased with the children's age, and male children were more prone to malnutrition than their female peers (Van de Poel et al 2007). The increased prevalence of malnutrition among male children has not been fully explained by researchers. This represents a knowledge gap that should be further explored. There may be aspects in caring for male children that could contribute to this common finding.

2.7 Caregivers' knowledge and awareness of nutrition

In a study in Sri Lanka involving 1 102 children aged between zero and five years and their caregivers, maternal knowledge and practices regarding safeguarding of the nutritional status of their children was found to be unsatisfactory (Peiris & Wijesinghe 2010). Only 19% of the mothers knew that special attention was needed for feeding children during an illness. Of the caregivers, 28% tried home remedies during illness before the child was taken to a health facility. The percentage of caregivers who immediately took the sick child to the health facility was 51% (Peiris & Wijesinghe 2010, p. 333).

A study in Kenya showed that caregivers saw no reason to go to a hospital unless the child was severely malnourished (Leth et al 2000). Lack of awareness of the child's nutritional status and taking care of children were found to contribute to malnutrition in a study in Oman (Gohar & Ismail 2002, p. 16). This study reported that caregivers may not be in a position to identify the early stages of malnutrition and would only take the children to a clinic when they were severely malnourished. This means that the children may present with chronic, generalised body malaise, generalised oedema, diarrhoea, vomiting, persistent cough or a poor appetite necessitating a visit to the clinic by the caregiver.

2.8 Summary

The sociodemographic characteristics that contribute to malnutrition in children are diverse and differ from one region to the next. The population in each region has unique characteristics which play a major role in contributing to child malnutrition. Identifying aspects which contribute to malnutrition in one's locality plays an important role in finding solutions to reducing or eliminating malnutrition among children.

The clinical profiles of malnourished children are also of paramount importance as most cases of malnourished children present with some form of clinical condition(s). Knowledge of common clinical conditions among malnourished children in a specific geographical area will help educate caregivers and clinicians during health promotion activities targeting children. This study aims to provide such crucial information in the fight against malnutrition in Francistown and the surrounding villages.

CHAPTER 3

METHODOLOGY

3.1   Introduction

This chapter covers the methods that were used to achieve the study objectives. The study setting, study design, study approach, study population, sampling method and data collection and data analysis techniques are discussed. The study looked into the demographic and socioeconomic status of caregivers and the clinical profiles of undernourished children admitted to the Nyangabgwe Referral Hospital. This study also determined whether caregivers are able to identify the nutritional status of children in their care.

3.2 Study setting

The study was conducted at the Nyangabgwe Referral Hospital which is the only tertiary hospital in Francistown.

Francistown is located in the northeast region of Botswana. It is also the second largest city in Botswana with an estimated population of 85 363 (Botswana Central Statistics Office 2001). Close to Francistown are small villages whose inhabitants use most facilities in town. The Nyangabgwe Referral Hospital has an official bed capacity of approximately 500. This study was conducted in the paediatric medical ward with a bed capacity of approximately 60 patients. Caregivers stay with their children during hospitalisation.
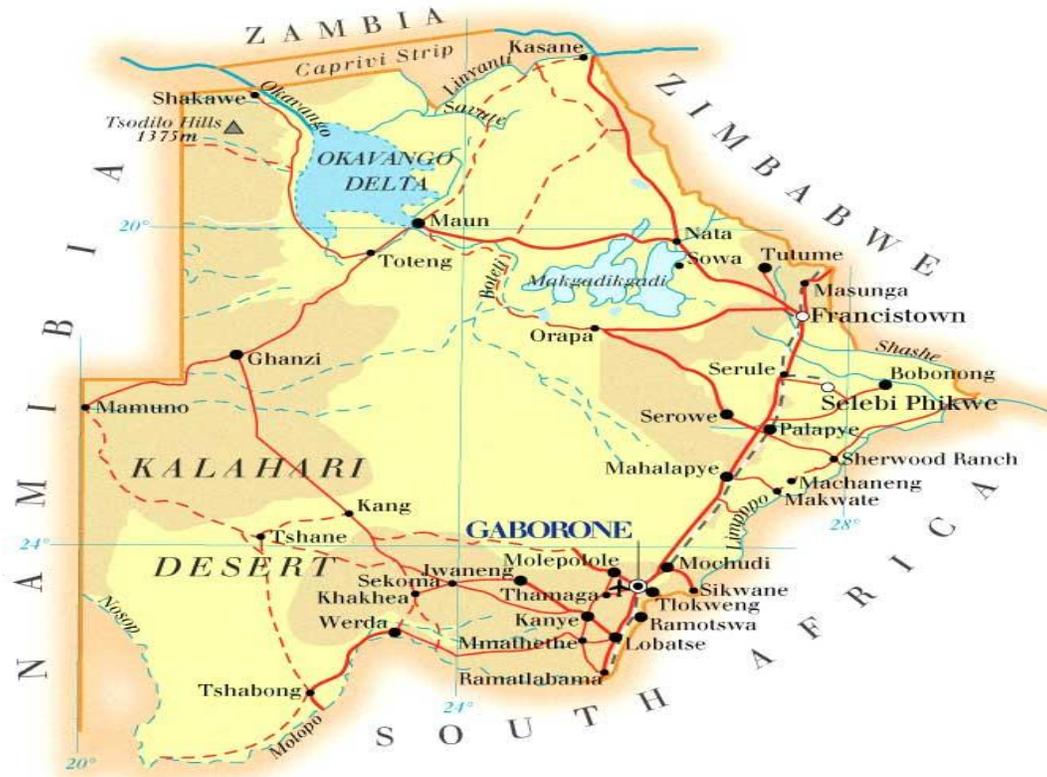
Figure 2: **Map of Botswana** (Reference Wiki 2005)

3.3   Study approach

This study used a quantitative approach in which both quantitative and qualitative data were obtained.

3.4   Study design

This is a descriptive study. It looked into the demographic and socioeconomic characteristics of caregivers, and evaluated the clinical profile of undernourished children admitted to Nyangabgwe Referral Hospital. The extent of caregivers' awareness of the nutritional status of these children was also determined.

3.5 Study population and sample

3.5.1 Study population

The study population comprised caregivers and children under five years old who were admitted to the paediatric wards of Nyangabgwe Referral Hospital after being diagnosed with malnutrition. The data collection period came to seven months. The estimated number of malnourished children admitted to the paediatric ward, based on previous admissions, was 30 children per month.

3.5.2 Study sample

The sampling unit for this study was the caregiver and the malnourished child. The sample size was calculated using Statcalc in Epi info^{TM} 3.5.1 (18 August 2008). At an 80% power and a 95% confidence interval the desired sample size was calculated to be 96 caregiver-child pairs. During the data collection period, losses of caregiver-child pairs because of incomplete medical records, failure to complete data collection or for other reasons, the sample size increased by 20% to a target of 116 caregiver-child pairs.

3.5.3 Sampling method

Convenience sampling was used to select participants in this study. Participants were recruited until the calculated sample size was reached. Convenience sampling was deemed appropriate because the number of malnourished children was limited. Hence selecting every case of a malnourished child whose caregiver consented to participate in the study was appropriate so as to reach the calculated sample size. Potential caregiver-child pairs were identified from the ward admission book in which the admission diagnosis was captured. This diagnosis was confirmed by medical records which indicated malnutrition, protein-energy malnutrition (PEM) or oedematous malnutrition. Potential caregiver-child pairs were identified by checking the diagnoses for all new admissions at least three times per week.

3.5.4   Inclusion criteria

All caregivers with malnourished children admitted to the paediatric wards during the data collection period (1 February 2011 to 19 August 2011) who had signed the Informed Consent form.

Malnourished children aged between 6 and 60 months.

Caregivers had been taking care of the child for at least 6 months prior to admission.

3.5.5   Exclusion criteria

All critically ill malnourished children in the ward were excluded if they were too weak to participate in anthropometric measurements.

3.6   Data collection

3.6.1   Data collection tools

All sociodemographic data were collected by a researcher-administered questionnaire (see Appendix A) directed at caregivers. This was a self-developed questionnaire with 16 survey items that captured information on the caregiver's sociodemographic characteristics, the child's clinical signs and symptoms, and the extent of the caregiver's awareness of the child's nutritional status. The questionnaire (see Appendix B) had been translated into Setswana for caregivers who could not speak English.

Clinical profile data and anthropometric measurements were captured in one data collection form (see Appendix C). This data collection form comprised 10 survey items which captured information on every child's age in months, its gender, anthropometric measurements, diagnosis and clinical signs and symptoms.

3.6.2   Data collection procedure

Data collection took place in a side room within the ward. Participants were identified from an admission register and all those diagnosed as malnourished were targeted for recruitment. The researcher subsequently recruited participants. Ward personnel knew about the study and acknowledged the presence of the researcher and an assistant during data collection. However, they did not participate in recruitment. Participants were recruited based on the inclusion criteria. They had to sign the informed consent form (see Appendix D and Appendix E) agreeing to participate in the study. The researcher checked the ward register for new admissions and approached the caregivers to talk about the study. Consent to participate in the study was sought from those who met the inclusion criteria.

Data were collected by the researcher and a research assistant and interviews were conducted in the caregiver's language where necessary. The researcher trained the research assistant to administer the questionnaire (see Appendix A), to take anthropometric measurements, and to collect data from the malnourished child's medical file (see Appendix C). Data collection took place at a convenient time for the participants, mainly during weekends, because the ward was less busy and fewer interruptions occurred during data collection. The wards were relatively busy during weekdays with doctors reviewing the children and their caregivers and nurses carrying out orders which needed the caregiver's and the child's participation. There were on average four days between the admission date and the data collection date.

Clinical profile data were extracted from existing medical records. The two anthropometric measurements (i.e. weight and length of children younger than 24 months) or the height of children aged 24 months or older, were taken in the ward, in the weighing area, using standardised techniques. Weight was recorded in kilograms to the nearest 0.1 kg using a standardised 25 kg Salter spring scale, Model 235 6S. (Salter Industrial Measurements Ltd, West Bromwich, U.K). The children were weighed in their

underclothes, and infants were weighed naked in an upright free hanging position. The same scale was used for infants aged 6 months and older, and for children younger than 60 months. The length of children younger than 24 months was measured with the child in a flat lying position, using a Shorr measuring board, (Shorr Productions, Maryland, USA) and recording the child's length in centimetres to the nearest 0.1 cm. The heights of children aged 24 months and older were measured by using a perpendicular Seca Model 220 stadiometer. (Seca Ltd, Birmingham UK), The child did not wear shoes, was standing upright and facing forward, and the measurement was recorded in centimetres to the nearest 0.1 cm.

3.7   Data management and analysis

The researcher administered the questionnaire and the data collection form shared the same participant number so as to link the questionnaire and the data collection form of each caregiver-child pair. The data entry was done simultaneously into the Microsoft Excel 2007 spreadsheet and on the WHO Anthro v2.0.2 (WHO 2006) data input sheet for the calculation of z-scores.

The researcher captured the data on Microsoft Excel 2007 and imported the data into STATA 10 (StataCorp 2007) for analysis. Data entry into Microsoft Excel 2007 followed coding of the questionnaire and activation of data validation in Microsoft Excel 2007 spreadsheet function to check for errors.

Anthropometric data (i.e. weight and height/length of each child) were entered directly into WHO Anthro v2.0.2 (WHO 2006) software and then exported to STATA 10 (StataCorp 2007) for analysis.

Data on age, gender and weight and length/height were used to calculate z-scores for weight-for-age, weight-for-length/height and length/height-for-age by using the WHO Anthro v2.0.2 (WHO 2006) programme. Underweight, wasting and stunting were identified by the z-scores below (i.e. -2 for weight-for-age, weight-for-length/height and length/height-for-age respectively) (Cogill 2003, p. 40).

Descriptive statistics were calculated by using STATA 10 (StataCorp 2007). Means and standard deviations were calculated for every child and frequencies for gender, marital status, income, education and occupation of the caregiver and the clinical profile data and anthropometric status of the child were calculated. The mean of the two weights and heights/lengths was used for analysis purposes.

The data from each source (questionnaire, medical records and anthropometric measurements) were merged into a single file for data analysis by using STATA 10 (StataCorp 2007). Chi-squared tests were applied for associations between caregiver characteristics and child anthropometric status and clinical profile by using a p-value of 0.05 to indicate statistical significance.

Open-ended questions (Questions 13 and 15) that addressed the extent of the caregiver's awareness of a child's nutritional status were analysed after quantification. Doing so involved identification of common themes in 40 responses for each open-ended question and then coding each theme for quantitative analysis.

3.8   Reliability

The reliability of this study's findings was ensured by using one trained research assistant for data collection to ensure that all data were collected in the same way.
The reliability of the anthropometric measurements (i.e. length, height and weight) was ensured by collecting duplicate measurements of every child who participated in the study and by using standardised instruments.
The reliability of the data extracted from records was ensured by careful training of the research assistant. Moreover, the research assistant had a medical background which also assisted in comprehension of medical terminology in the files.

3.9   Validity

The content validity of the questionnaire and the data collection tool were ensured by developing data collection instruments based on a literature review of child malnutrition studies. These instruments were pretested on eight caregiver-child pairs who were not participants in the study to verify that the questions were clear and appropriate. Minor adjustments were made to the questionnaire after the pilot study (see 3.11 below). Content validity was ensured by obtaining input from an expert on child nutrition for the data collection instruments.

Face validity was sought by asking a colleague to determine whether the questions in the questionnaire and data collection form were reasonable and in fact measured what they were supposed to measure.

3.10   Bias

Interviewer bias was controlled by asking closed and precisely structured questions in the questionnaire, and by asking the same questions in the same way of every participant. Open-ended questions were structured to be clear, precise and short. Respondent bias was minimised by administering the questionnaire in a pilot study to ensure that the respondents understood the questions in the same way.

Measurement/instrument bias was minimised by ensuring that the research assistant received adequate training on data collection and interviewing techniques. A standardised weighing scale was used during the data collection period and the questionnaire was duly structured.

3.11   Pilot study

A pilot study was conducted with eight consenting caregivers and children who met the inclusion criteria for participation in the study. Procedures and techniques were pretested for use in the main study. In view of the pilot study findings, minor adjustments were made to the original questionnaire. For example: A question asking about the number of

individuals in the family was rephrased to include "excluding you and the child". Recording the date of birth of the child was rearranged to comply with the WHO Anthro v2.0.2 (WHO 2006) data entry format. The eight caregiver-child pairs were not included in the study sample.

3.12   Ethical considerations

Ethical clearance was sought from the Medunsa Research Ethics Committee (MREC) Medunsa campus, the University of Limpopo, the Research Ethics Committee of the Botswana Ministry of Health, and the Nyangabgwe Referral Hospital's Research Ethics Committee (see Appendix 1). Clearance was granted by the respective bodies (see Appendices F, G and H).

The researcher and the research assistant explained the research study to the caregivers (e.g. the title, aim, objectives, benefits to the participants and the community) in the local language. The voluntary nature of the study and the guarantee of participants' privacy were also explained to the caregivers in the study and those who consented to participate in the study. All the participants in the study signed a consent form (see Appendix D or Appendix E) to participate. The participants remained free to withdraw from the study at any time without consequences although this did not happen.

The participants were identified by using numbers. Each caregiver-child pair and the relevant data extraction form shared the same number. Interviews and anthropometric measurements took place in a private room adjoining the ward. The researcher kept all the data collection tools, and also analysed the data to ensure data safety.

3.13 Conclusion

This study required participants (i.e. caregiver-child pairs) who met the study inclusion criteria and consented to participate in the study. Standard techniques were used to collect and analyse the data.

CHAPTER 4

RESULTS

4.1   Introduction

The purpose of this chapter is to summarise the data collected and to present the relevant statistical analyses. Descriptions of caregivers' sociodemographic characteristics are presented first. Descriptive statistics (frequency distributions) of the clinical profiles, child illness histories and the results of the anthropometric measurements (frequency distributions, means and standard deviations) of the children are presented next. These are followed by a discussion of the extent of caregivers' awareness of nutritional status and actions taken to address the problem. Lastly associations between the sociodemographic characteristics of the caregivers and the clinical and anthropometric profiles of the children are presented by using the Chi-squared test at a 5% level of significance.

4.2   Sociodemographic characteristics of caregivers

The final sample size was 113 caregiver-child pairs.

Table 2 summarises the results of the caregivers' characteristics, indicating the percentage frequencies of each characteristic.

Table 2: Sociodemographic characteristics of caregivers

Characteristic	Frequency (n=113)	Percentage frequency
1. Gender		
Female	112	99.12
Male	1	0.88
2. Age (years)		
15 – 20	17	15.04
21 – 30	67	59.30
31 – 40	21	18.60
41 – 50	5	4.42
Older than 50	3	2.65
3. Relationship to child		
Mother	101	89.38
Father	1	0.90
Grandmother	6	5.31
Sister	5	4.42
4. Marital status		
Married	4	3.54
Single	90	79.65
Cohabiting	18	15.93
Widowed	1	0.88
5. Level of education		
Primary	27	23.90
Secondary	70	61.95
Tertiary	6	5.31
No formal education	10	8.85
6. Number of individuals in household		
≤ 4 people	30	26.55
5 – 7 people	53	46.90
8 – 10 people	21	18.58
More than 10 people	9	7.96
7. Place of residence		
Urban	33	29.20
Village	88	70.80
8. Occupation		
Employed	16	14.16
Self-employed	34	30.09
Pensioner	1	0.88
Unemployed	60	53.10
Other	2	1.77
9. Monthly income (Pula)		
< 500	65	57.52
500 – 1 999	44	38.94
2 000 – 3 999	3	3.65
4 000 – 5 999	1	0.88
10. Residence		
Rental	27	23.89
Own house	38	33.63
Family house	48	42.48
11. Number of rooms		
1 – 3 rooms	73	64.60
4 – 6 rooms	29	25.66
More than 7 rooms	11	9.73

Table 2 shows that 112 (99%) of the caregivers were female and that 101 (89%) of these were mothers. Only one male was a caregiver. Looking at the marital status of the caregivers, 79% were single, 16% were cohabiting, and 3% were married. Caregivers in the age group 20 to 30 years represented 59% of the study population. Only 2% of the caregivers were older than 50 years. Caregivers and children from the village were 70%. Most caregivers (91%) had some formal education, but 9% had no formal education. The employment status of the caregivers was that 44% of the caregivers were employed or engaged in some income-generating activity, and 53% were unemployed. Looking at household income, 57% of the caregivers survived on less than 500 pula a month (i.e. approximately US$2 per day).

4.3 Clinical profiles of children

Figure 3 below illustrates gender distribution in the sample.
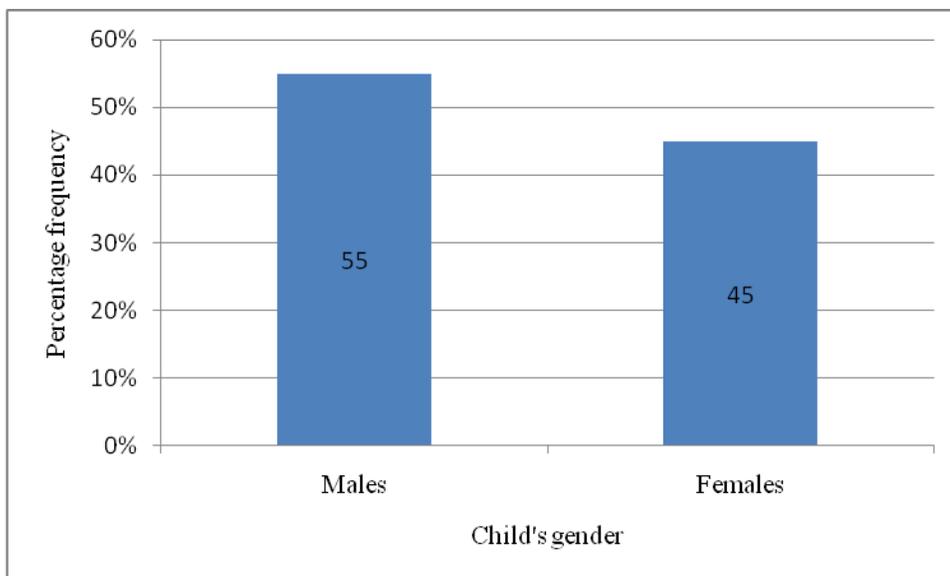
Figure 3: Children's gender distribution (N=113)

It is clear from the above figure that the number of undernourished male and female children admitted to hospital, 62 (55%) and 51 (45%) respectively does not vary much.

Figure 4 below shows the children's distribution according to age.
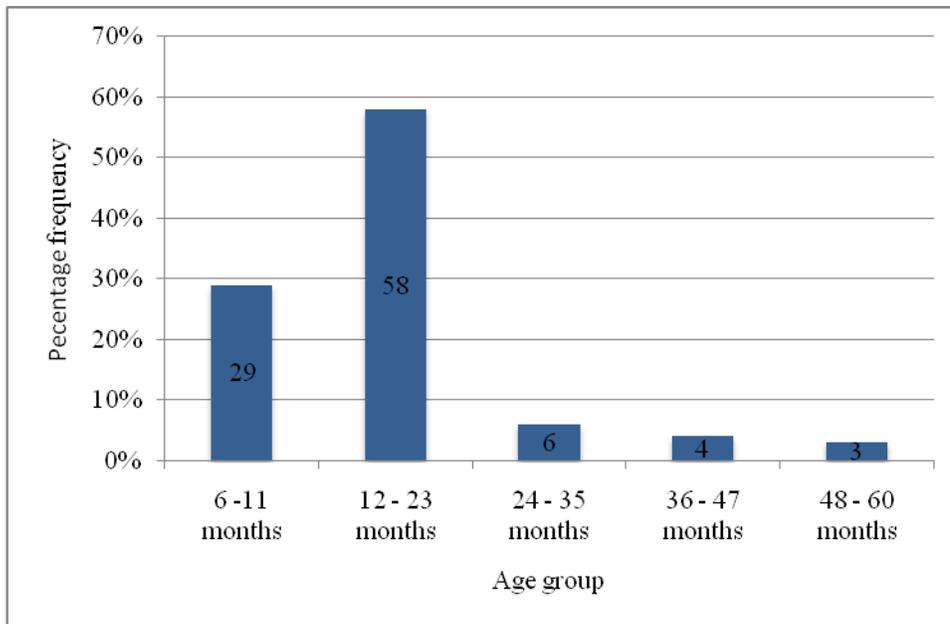
Figure 4 Children's age group percentage distribution (N=113)

According to figure 4, the number of undernourished children was highest in the age group 12 to 23 months. As the child's age increased from 24 months old, the precentage of undernourished children in the sample decreased sharply.

Table 3 presents the mean and standard deviations in terms of age for male and female children in the study population (n=113).

Table 3: Means and standard deviations for age according to gender

Gender	Mean age (months)	Standard deviation
Male	17.2	9.5
Female	18.8	11.3

Table 3 shows that the mean age for female and male children was less than 24 months. It is therefore clear that the majority of children in the study were younger than two years of age.

Table 4 presents an overview of the medical status of undernourished children, mainly focusing on their HIV status and common diseases (e.g. tuberculosis and pneumonia).

Table 4:   Medical status of children on admission (N=113)

Age group (months)	HIV status of the child			Secondary diagnoses			
	HIV– n (%)	HIV+ n (%)	HIV status unknown n (%)	Pneumonia n (%)	TB n (%)	Other n (%)	None n (%)
6 – 11	11 (9.7)	6 (5.2)	16 (14.2)	5 (4.4)	2 (1.8)	1 (0.9)	24 (21.2)
12 – 23	30 (26.5)	2 (1.8)	34 (30.0)	1 (0.9)	1 (0.9)	1 (0.9)	63 (55.7)
24 – 35	3 (2.7)	1 (0.9)	3 (2.7)	1 (0.9)	0	0	7 (6.2)
36 – 47	1 (0.9)	1 (0.9)	2 (1.8)	2 (1.8)	0	0	2 (1.8)
48 – 60	0	2 (1.8)	1 (0.9)	0	0	1 (0.9)	2 (1.8)
Total	45 (39.8)	12 (10.6)	56 (49.6)	9 (8.0)	3 (2.7)	3 (2.7)	98 (86.7)

HIV– : Human immunodeficiency virus negative
HIV+: Human immunodeficiency virus positive
TB: Tuberculosis
"Secondary diagnosis" means diagnosis is secondary to malnutrition

Table 4 indicates that most children (87%) did not present with a secondary illness. The HIV status of 50% of the children was unknown, 40% were HIV-negative and 10% were HIV-positive.

Table 5 summarises the illnesses of the sample children during the six months prior to admission, according to age group. A total of 108 (96%) children were reported to have had one or more illnesses during the six months prior to admission to hospital.

Table 5:   **Reported medical problems of children during the six months prior to admission**

Age group (months)	Coughing n	%	Vomiting n	%	Diarrhoea n	%	Swollen limbs n	%	Peeling skin n	%	Total
6 – 11	5	(4.4)	7	(6.2)	15	(13.2)	8	(7.1)	2	(1.8)	37
12 – 23	23	(20.3)	17	(15.0)	29	(25.6)	31	(27.4)	2	(1.8)	102
24 – 35	2	(1.8)	2	(1.8)	2	(1.8)	6	(5.3)	0	(0.0)	12
36 – 47	3	(2.6)	1	(0.9)	1	(0.9)	0	(0.0)	0	(0.0)	5
48 – 60	2	(1.8)	1	(0.9)	2	(1.8)	1	(0.9)	0	(0.0)	6
Total	35	(30.9)	28	(24.8)	49	(43.3)	46	(40.7)	4	(3.6)	

According to table 5, the highest number of illnesses 102 (90%) reported for the six-months period prior to admission was in the age group 12 to 23 months. Diarrhoea and swollen limbs were the most common, with 43.3% and 40.7% respectively. Coughing and vomiting were also common (31% and 25% respectively) and the affected age group was 12–to 23 months.

Table 6 below illustrates the signs and symptoms the undernourished children presented on admission, according to age group.

Table 6:   **Signs and symptoms of children on admission**

Age group (months)	Oedema n	%	Fever n	%	Vomiting n	%	Diarrhoea n	%	Coughing N	%	Anaemia n	%	Peeling skin n	%
6 – 11	13	(11.5)	1	(0.9)	4	(3.5)	6	(5.3)	11	(9.7)	5	(4.4)	2	(1.8)
12 – 23	36	(31.9)	1	(0.9)	15	(13.3)	17	(15.0)	24	(21.2)	0	(0.0)	4	(3.5)
24 – 35	5	(4.4)	0	(0.0)	2	(1.8)	2	(1.8)	2	(1.8)	2	(1.8)	0	(0.0)
36 – 47	1	(0.9)	0	(0.0)	0	(0.0)	0	(0.0)	2	(1.8)	0	(0.0)	0	(0.0)
48 – 60	1	(0.9)	0	(0.0)	2	(1.8)	0	(0.0)	1	(0.9)	1	(0.9)	0	(0.0)
Total	56	(49.6)	2	(1.8)	23	(20.4)	25	(22.1)	40	(35.4)	8	(7.1)	6	(5.3)

According to table 6, oedema and coughing were the most common symptoms the children presented on admission to hospital (50% and 35% respectively). Of all age groups, the highest percentage of signs and symptoms was in the 6 to 11 and 12 to 23 months age group.

Figure 5 below shows the percentage distribution of oedematous malnutrition among the 56 children, according to age group
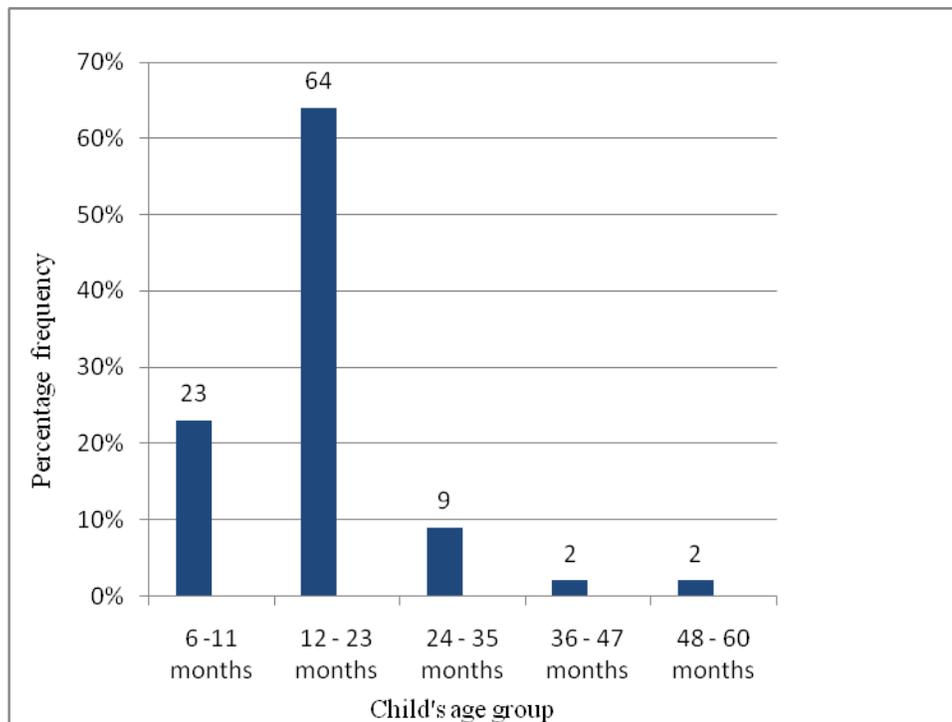
Figure 5: Distribution of oedematous malnutrition among the children (N=56)

Most children with oedematous malnutrition were in the age group 12 to 23 months 36 (64%). Almost a quarter of the children (23%) were in the 6 to 11-month age group. Of the 56 children with oedematous malnutrition, 31 (55%) were male and 25 (45%) were female.

4.4 Anthropometric status of the children

The following tables (i.e. 7 to 12) show the frequency distributions, means and standard deviations of the z-scores for weight-for-length/height (WHZ), length/height-for-age (HAZ), and weight-for-age (WAZ) of the children according to gender and age group.

Table 7:   Frequency distribution, means and standard deviations of z-scores for WHZ according to age groups for male children (n=62)

Age group (months)	N	Oedema n	< -3SD n	(%)	-3 to -2.1 SD n	(%)	>= -2SD n	(%)	[1]Mean	SD
6 – 11	16	8[1]	12	(75.0)	4	(25.0)	0	(0)	-3.54	1.04
12 – 23	40	20[1]	29	(72.5)	7	(17.5)	4	(10)	-2.93	1.03
24 – 35	3	3[1]	3		0		0		[2]-	[2]-
36 – 47	1	0	0		0		1	(100)	-1.65	0
48 – 60	2	0	1	(50.0)	1	(50.0)	0		-2.1	1.94
Total	62	31[1]	45	(72.6)	12	(194)	5	(8.0)	-3	1.12

SD: Standard deviation
WHZ: Weight-for-length/height z-score
[1]Oedema cases not used to derive the mean and standard deviation of z-scores (WHO 2006)
[2]All cases were oedematous, thus no mean and standard deviation could be calculated.

Table 7 shows the distribution of wasting among males according to age group. In the age group 12 – 23 months (n=40), most of the children (73%) were severely wasted (below −3SD). Given the small number of children aged 24 months and above, the severely wasted children were younger than 24 months. Of the 16 children in the age group 6 to 11 months, 75% appeared severely wasted.

Table 8: Frequency distribution, means and standard deviations of z-scores for HAZ according to age groups of male children (n=62)

Age group (months)	n	HAZ score							
		< -3SD		-3 to -2.1 SD		>= -2SD		Mean	SD
		n	(%)	n	(%)	n	(%)		
6 – 11	16	3	(18.8)	3	(18.7)	10	(62.5)	-0.98	2.01
12 – 23	40	13	(32.5)	18	(45.0)	9	(22.5)	-2.66	0.94
24 – 35	3	1	(33.3)	1	(33.4)	1	(33.3)	-1.57	2.37
36 – 47	1	1	(100)	0	(0)	0	(0)	-3.29	0
48 – 60	2	2	(100)	0	(0)	0	(0)	-3.21	0.04
Total	62	20	(32.3)	22	(35.4)	20	(32.3)	-2.2	1.53

SD: Standard deviation

HAZ: Length/height-for-age z-score

Table 8 indicates the distribution of stunting among male children according to age group. Severe stunting was clearly not common in male children in the age groups 6 to 11 and 12 to 23 months, 3 (19%) and 13 (33%) respectively. However, in all the age groups for male children stunting was generally high at 42 (68%) with a mean at −2.2 (SD=1.53)

Table 9: Frequency distribution, mean and standard deviation of z-scores for WAZ according to age groups of male children (n=62)

Age group (months)	N	Oedema n	WAZ- score						[1]Mean	SD
			< -3SD		-3 to -2.1 SD		>= -2SD			
			n	(%)	n	(%)	n	(%)		
6 – 11	16	8[1]	12	(75.0)	2	(12.5)	2	(12.5)	-3.23	1.44
12 – 23	40	20[1]	33	(82.5)	6	(15.0)	1	(2.5)	-3.39	0.83
24 – 35	3	3[1]	3		0		0		[2]-	[2]-
36 – 47	1	0	0	(0)	1	(100)	0	(0)	-3	0
48 – 60	2	0	1	(50.0)	1	(50.0)	0	(0)	-3.19	1.12
Total	62	31[1]	49	(79.0)	10	(16.2)	3	(4.8)	-3.32	0.98

SD: Standard deviation

WAZ: Weight-for-age z-score

[1]Oedema cases not used to derive the mean and standard deviation of z-scores (WHO 2006)

[2]All cases were oedematous, thus no mean and standard deviation could be calculated.

Table 9 indicates the distribution of underweight male children according to age group. Severe underweight was high in the age group 12 to 23 months at 33 (83%) and in the

age group 6 to 11 months at 12 (75%). The mean z-score for for male children in all the age groups was less than or equal to −3, which confirms that most of the male children were severely underweight across all age groups.

Table 10: Frequency distribution, means and standard deviations of z-scores for WHZ according to age groups of female children (n=51)

Age group (months)	n	Oedema n	WHZ score						[1]Mean	SD
			< -3SD		-3 to -2.1 SD		>= -2SD			
			n	(%)	n	(%)	n	(%)		
6 – 11	13	5[1]	9	(69.2)	4	(30.8)	0	(0)	-2.94	0.7
12 – 23	28	16[1]	21	(75.0)	6	(21.4)	1	(3.6)	-2.89	0.94
24 – 35	6	2[1]	4	(66.7)	2	(33.3)	0	(0)	-2.78	0.49
36 – 47	2	1[1]	1	(50.0)	0	(0)	1	(50.0)	-1.7	0
48 – 60	2	1[1]	2	(100)	0	(0)	0	(0)	-3.57	0
Total	51	25[1]	37	(72.5)	12	(23.6)	2	(3.9)	-2.8	0.8

SD: Standard deviation
WHZ: Weight-for-length/height z-score
[1]Oedema cases not used to derive the mean and standard deviation of z-scores (WHO 2006)

The distribution of wasting of female children according to age group is shown in Table 10. Wasting was severe (SD < −3) in the age groups of 6 to 11 and 12 to 23 months at 9 (69%) and 21 (75%) respectively. The mean z-scores of the two groups (i.e. −2.94 and −2.89) also indicate severe wasting in both groups. The standard deviation for both groups is less than 1, meaning that the z-scores for these children are close to the mean.

Table 11: Frequency distribution, means and standard deviations of z-scores for HAZ according to age groups of female children (n=51)

Age group (months)	n	HAZ score							
		< -3SD		-3 to -2.1 SD		>= -2SD		Mean	SD
		n	(%)	n	(%)	n	(%)		
6 – 11	13	1	(7.7)	3	(23.1)	9	(69.2)	-0.9	2.05
12 – 23	28	4	(14.3)	9	(32.1)	15	(53.6)	-1.79	1.28
24 – 35	6	3	(50.0)	2	(33.3)	1	(16.7)	-3.06	0.8
36 – 47	2	0	(0)	1	(50.0)	1	(50.0)	-2.15	0.77
48 – 60	2	1	(50.0)	0	(0)	1	(50.0)	-2.86	1.83
Total	51	9	(17.6)	15	(29.5)	27	(52.9)	-1.77	1.58

SD: Standard deviation

HAZ: Length/height-for-age z-score

Table 11 illustrates the distribution of stunting among female children according to age group. Severe stunting was not common among female children in all age groups. The majority of female children in the age groups 6 to 11 and 12 to 23 months showed means of −0.9 and −1.79, indicating the absence of stunting among female children.

Table 12: Frequency distribution, mean and standard deviation of z-scores for WAZ according to age groups of female children (n=51)

Age group (months)	n	Oedema n	WAZ score						[1]Mean	SD
			< -3SD		-3 to -2.1 SD		>= -2SD			
			n	%	n	%	n	%		
6 – 11	13	5[1]	9	(69.2)	2	(15.4)	2	(15.4)	-2.8	1.19
12 – 23	28	16[1]	23	(82.1)	4	(14.3)	1	(3.6)	-3.04	0.85
24 – 35	6	2[1]	6	(100)	0	(0)	0	(0)	-3.48	0.3
36 – 47	2	1[1]	1	(50.0)	1	(50.0)	0	(0)	-2.81	0
48 – 60	2	1[1]	2	(100)	0	(0)	0	(0)	-4.66	0
Total	51	25[1]	41	(80.4)	7	(13.7)	3	(5.9)	-3.09	0.94

SD: Standard deviation

WAZ: Weight-for-age z-score

[1]Oedema cases not used to derive the mean and standard deviation of z-scores (WHO 2006)

Table 12 displays the distribution of underweight female children according to age group. Severe underweight was common in the age groups 6 to 11 and 12 to 23 months, 9 (69%) and 23 (82%) respectively. The means in all the age groups ranged between −2.80 and −4.66 indicating that severe underweight was common among females.

4.5 Association between gender and severity of wasting, stunting and underweight

Table 13 shows the chi-square results for children's gender and the severity of wasting, stunting and underweight.

Table 13: Chi-square results for children's gender and wasting, stunting and underweight

Variable	Wasting	Stunting	Underweight
Child's gender	$\chi^2 = 0.5170$ p = 0.472	$\chi^2 = 4.0638$ p = 0.044	$\chi^2 = 0.0000$ p = 0.995

Table 13 illustrates that a child's gender is associated with stunting only (p = 0.044) at a 5% level of significance. The frequency of severe stunting among male children (32%, see table 8) was almost double the frequency among female children (17.6%, see table 11).

4.6 Awareness of children's nutritional status

Table 14 indicates the caregiver's awareness of the reason why the child was admitted. It gives insight into the number of caregivers who knew why a child in their care was admitted to hospital.

Table 14: Caregiver's knowledge of the reason for admission to hospital

Caregiver age group (years)	Aware of the reason for admission		Unaware of reason for admission	
	n	%	n	%
15 – 20	16	(14.2)	1	(0.9)
21 – 30	66	(58.4)	1	(0.9)
31 – 40	21	(18.6)	0	(0)
Above 40	7	(6.2)	1	(0.9)
Total	110	(97.3)	3	(2.7)

According to Table 14, most caregivers (97.3%) had some knowledge of why their child had been admitted to hospital.

Table 15 shows the various reasons caregivers in the four age groups presented why the child has been admitted to hospital.

Table 15: Caregivers' reasons why a child has been admitted to hospital

Caregiver age group (years)	Vomiting		Diarrhoea		Coughing		Swollen limbs		Not eating well		Weight loss	
	n	%	n	%	n	%	n	%	n	%	n	%
15 – 20	3	(2.7)	3	(2.7)	0	(0)	7	(6.1)	3	(2.7)	4	(3.5)
21 – 30	13	(11.4)	17	(15.0)	9	(7.9)	23	(20.4)	11	(9.0)	14	(12.4)
31 – 40	1	(0.9)	3	(2.7)	2	(1.8)	9	(8.0)	4	(3.5)	5	(4.4)
Above 41	2	(1.8)	2	(1.7)	2	(1.8)	1	(0.9)	2	(1.8)	0	(0)
Total	19	(16.8)	25	(22.1)	13	(11.5)	40	(35.4)	20	(17.7)	23	(20.3)

As indicated in Table 15, the caregivers' reasons for admission ranged from vomiting, diarrhoea, coughing, oedema, not feeding well and weight loss. Swelling limbs was the most common reason at 40 (35%) and the least was coughing at 13 (12%).

Table 16 shows whether caregivers took action because of a child's condition prior to admission.

Table 16: Caregiver action or non-action because of child's condition

Caregiver age group (years)	Yes action taken		No action taken	
	n	%	n	%
15 – 20	11	(9.7)	6	(5.3)
21 – 30	54	(47.8)	13	(11.5)
31 – 40	20	(17.7)	1	(0.9)
Above 41	6	(5.3)	2	(1.8)
Total	91	(80.5)	22	(19.5)

Table 16 illustrates that 91 (80 %) caregivers took some form of action to address the child's condition. However, 22 (20%) caregivers took no action to assist the child. Caregivers in the age group 21 to 30 years who took no action to assist the child came to 13 (11%) -- the highest compared to other age groups. The steps caregivers took are shown in Table 16. They took the child to the clinic, took the child to the traditional healer, tried different feeds, and administered some medicine bought at the pharmacy.

Table 17: Actions taken by caregivers to address a child's condition

Caregiver age group (years)	Immediately took child to clinic		Took child to traditional healer		Tried different feeds		Bought medicine at the pharmacy	
	n	%	n	%	n	%	n	%
15 – 20	11	(9.7)	0	(0)	0	(0)	0	(0)
21 – 30	47	(41.6)	5	(4.4)	0	(0)	2	(1.8)
31 – 40	17	(15.0)	1	(0.9)	1	(0.9)	1	(0.9)
Above 41	6	(5.3)	0	(0)	0	(0.0)	0	(0)
Total	81	(71.6)	6	(5.3)	1	(0.9)	3	(2.7)

Table 17 shows that most caregivers (72%) took the sick child to the clinic. A small number of caregivers 6 (5.3%) took the child to a traditional healer before going to the hospital.

4.7 Association between caregiver characteristics and the clinical profiles and anthropometric status of children

Tables 18 and 19 present the Chi-square results on caregiver characteristics, the clinical profile, and the child's anthropometric status.

Table 18: Chi-square results of caregiver characteristics and child's clinical profile

Care-giver Characteristic	Previous illness			Present signs and symptoms		
	Vomit/Diarrhoea	Cough	Oedema	Oedema	Vomit/Diarrhoea	Cough
Age	$\chi^2 = 3.2669$ $p = 0.071$	$\chi^2 = 0.001$ $p = 0.993$	$\chi^2 = 0.2743$ $p = 0.600$	$\chi^2 = 0.0733$ $p = 0.787$	$\chi^2 = 0.6381$ $p = 0.424$	$\chi^2 = 1.0411$ $p = 0.308$
Marital Status	$\chi^2 = 0.1499$ $p = 0.699$	$\chi^2 = 0.0039$ $p = 0.950$	$\chi^2 = 0.4201$ $p = 0.517$	$\chi^2 = 0.0791$ $p = 0.779$	$\chi^2 = 0.1320$ $p = 0.716$	$\chi^2 = 4.0947$ $p = 0.043$
Education	$\chi^2 = 0.4319$ $p = 0.511$	$\chi^2 = 0.0548$ $p = 0.815$	$\chi^2 = 1.5609$ $p = 0.212$	$\chi^2 = 0.0182$ $p = 0.893$	$\chi^2 = 0.0560$ $p = 0.813$	$\chi^2 = 0.7730$ $p = 0.379$
Household size	$\chi^2 = 0.2987$ $p = 0.585$	$\chi^2 = 0.1064$ $p = 0.744$	$\chi^2 = 1.9403$ $p = 0.164$	$\chi^2 = 0.6330$ $p = 0.426$	$\chi^2 = 0.2409$ $p = 0.624$	$\chi^2 = 0.0762$ $p = 0.783$
Residence	$\chi^2 = 0.4452$ $p = 0.505$	$\chi^2 = 0.2986$ $p = 0.585$	$\chi^2 = 0.4351$ $p = 0.509$	$\chi^2 = 1.1988$ $p = 0.274$	$\chi^2 = 0.6942$ $p = 0.405$	$\chi^2 = 2.0614$ $p = 0.151$
Income	$\chi^2 = 1.5402$ $p = 0.215$	$\chi^2 = 0.1274$ $p = 0.721$	$\chi^2 = 0.9680$ $p = 0.325$	$\chi^2 = 2.0785$ $p = 0.149$	$\chi^2 = 0.0033$ $p = 0.955$	$\chi^2 = 1.4338$ $p = 0.231$
House Ownership	$\chi^2 = 1.7131$ $p = 0.191$	$\chi^2 = 1.2708$ $p = 0.260$	$\chi^2 = 0.1981$ $p = 0.656$	$\chi^2 = 0.0747$ $p = 0.785$	$\chi^2 = 0.1847$ $p = 0.667$	$\chi^2 = 0.0417$ $p = 0.838$
No of rooms	$\chi^2 = 0.2655$ $p = 0.606$	$\chi^2 = 1.2336$ $p = 0.267$	$\chi^2 = 0.4726$ $p = 0.492$	$\chi^2 = 0.0048$ $p = 0.944$	$\chi^2 = 0.0353$ $p = 0.851$	$\chi^2 = 0.1196$ $p = 0.729$

According to table 18, the only significant association was between the caregiver's marital status and a child presenting with a cough on admission ($\chi^2 = 4.0947$, $p = 0.043$) at a 5% level of significance. The clinical presentation on admission and prior to admission was not associated with any of the caregiver's characteristics.

Table 19 presents the chi-square results of the caregiver's characteristics and the child's anthropometric status.

Table 19: Chi-square results of the caregiver's characteristic and the child's anthropometric status

Caregiver's - characteristic	Severity of undernutrition		
	Wasting	**Underweight**	**Stunting**
Age	$\chi^2 = 0.3834$ p = 0.536	$\chi^2 = 0.0053$ p = 0.942	$\chi^2 = 1.2609$ p = 0.261
Marital status	$\chi^2 = 0.2106$ p = 0.646	$\chi^2 = 0.0069$ p= 0.934	$\chi^2 = 0.1360$ p = 0.712
Education	$\chi^2 = 0.1495$ p = 0.699	$\chi^2 = 0.0643$ p = 0.800	$\chi^2 = 0.2958$ p = 0.587
Household size	$\chi^2 = 0.7326$ p = 0.392	$\chi^2 = 0.0969$ p = 0.756	$\chi^2 = 0.1573$ p = 0.692
Residence	$\chi^2 = 0.9298$ p = 0.335	$\chi^2 = 1.1745$ p = 0.278	$\chi^2 = 3.5147$ p = 0.061
Income	$\chi^2 = 0.2074$ p = 0.649	$\chi^2 = 2.0768$ p = 0.150	$\chi^2 = 0.3330$ p = 0.564
House ownership	$\chi^2 = 0.0993$ p = 0.753	$\chi^2 = 0.0006$ p = 0.981	$\chi^2 = 0.3489$ p = 0.555
Number of rooms	$\chi^2 = 0.0188$ p = 0.891	$\chi^2 = 0.4529$ p = 0.501	$\chi^2 = 0.4819$ p = 0.488

According to table 19 there were no significant association between the caregiver's characteristics and the severity of the different types of undernutrition.

4.8 Conclusion

The results show that 99% of the caregivers were females. Most caregivers were below the age of 30 years, and most of them were single mothers. The gender distribution among the participants was almost equal, with 55% male children and 45% female children. The majority of the children were in the age groups 12 to 23 months and 6 to 11 months. Few children had a secondary diagnosis accompanying the undernutrition. Oedematous malnutrition was common among the participants (50%). The reasons caregivers mentioned as to why their children had been admitted to hospital were not related to the children's nutritional status. Most of the caregivers took a child to the clinic because she suspected that something was wrong with the child. Child gender was associated with stunting ($\chi^2 = 4.0638$, p = 0.044) at a 5% level of significance. As for associations between caregivers' characteristics and the children's clinical profiles, only

marital status was associated with children presenting with a cough (χ^2 = 4.0947, p = 0.045) at a 5% level of significance. No association could be found between the caregiver's characteristics and any of the three types of undernutrition (wasting, stunting and underweight).

CHAPTER 5

DISCUSSION

5.1 Introduction

The overall purpose of this study was to determine the sociodemographic characteristics of caregivers and the clinical profiles of undernourished children younger than five years admitted to the Nyangabgwe Referral Hospital in Francistown, Botswana. The discussion of the results is guided by the objectives, and with reference to various findings from other studies.

A quantitative approach was followed to achieve the objectives of this study. A researcher administered a questionnaire, a data extraction form and anthropometric measurements were used to collect the data. The final sample size was 113 caregiver-child pairs. The sample size after a 20% increase in the calculated sample of 96 was 116 caregiver-child pairs.

5.2 Sociodemographic information

There were 112 (99%) female caregivers and only 1 (1%) male caregiver in this study, bringing the total number of participants to 113. Most of the female caregivers (79%) were single mothers. This corresponds with studies by Mahogoub et al (2006) in Botswana, Saloojee et al (2007) in South Africa, and Adeladza (2009) in Kenya who found that severe malnutrition was common among the children of single mothers. Severe underweight was common in female-headed households in Kenya ($p < 0.05$).

Only 10 (9%) of the participants had no formal education, 27 (24%) had a primary education, and 70 (62%) had a secondary education. Studies by Sah (2003), Chakraborty et al (2006) and Turyashemererwa et al (2009) found that a poor educational background

could be associated with child undernutrition. Janevic et al (2010) also found that caregivers with a primary education or less were more likely to look after stunted children, signalling chronic malnutrition (Cogill 2003, p.11). In this study, however, most caregivers (70%) with undernourished children had a secondary level of education. This particular finding is similar to one by Owor et al (2000) who found that a formal education exerted no influence on the nutritional status of children.

In this study 65 (58%) of the caregivers survived on less than P500.00 a month (equivalent to US$65.00). Comparison with findings from the Botswana Central Statistics Office (2004) in Botswana showed that the number of people living below US$1.00 per day increased from 19.9% in 1993/94 to 23.4% in 2002/03. Poverty levels have therefore increased given that a typical family comprises a caregiver and one or more children. Studies by Amsalu and Tigabu (2008), Owor et al (2000), Janevic et al (2010) and Hong et al (2006) found that the risk for undernutrition of children increased in families with poor incomes. Only 4 (4%) of the caregivers had a monthly income of more than P2 000.00. This finding corresponds with the above mentioned studies on child malnutrition and household income. The less a family earns, the higher the risk of undernourished children in that particular family.

Looking at family size, 83 (73%) of the caregivers reported that they were living with five or more people. A study by Amsala and Tigabu (2008) found that children from larger households were more vulnerable to malnutrition. This could be because food for each household was limited and because children were easily affected (Adeladza 2009, p. 1578).

However, some studies (Ayaya et al 2004; Turyashemererwa et al 2009) found that family size had no influence on the nutritional status of a child. This corresponds with the finding in this study that there was no association between family size and various forms of undernutrition. The different findings of a good number of studies necessitate further research on family dynamics.

The present study showed that 88 (71%) of the undernourished children came from surrounding villages and that 33 (29%) of these children lived in the city. This finding could be attributed to the fact that most families in the villages were large and experienced general food shortages. Most villagers relied on government food handouts to survive; as large tracts of land could not be developed to increase the availability of food (UN 2010).The results in this study correspond with the findings of a study in India which showed that urban children were less likely to be undernourished than rural children (Khatab 2010, p. 660)

5.3 Clinical profile of undernourished children admitted to hospital

The study comprised 62 (55%) male children and 51 (45%) female children with a mean age of 17 months for the male children and 19 months for the female children. These figures show an almost equal distribution in terms of gender and age among the malnourished children admitted to hospital. Studies by Olwedo et al (2008) in Uganda, Emina and Kandala (2009) in the Democratic Republic of Congo, and Leth et al (2000) in Kenya, showed that malnutrition was more prevalent among male children than among female children. In this study the extent of undernutrition was almost uniform across gender: (55% male and 45% female). The age groups with the highest number of malnourished children across gender were 12 to 23 months and 6 to 11 months: 66 (58%) and 33 (29%) respectively. The reason why male children are more vulnerable than female children is not clear. One can only speculate that male children are more often taken to the clinic because a boy child is "more important" in most African cultures than a girl child. Hence most cases of female malnutrition may be missed as they are not taken to the health facilities. An interesting finding in this study is a significant association (p = 0.043) between the caregiver's marital status and the child presenting with coughing, as 79% of the caregivers were single. One implication is that child care should focus on this group of caregivers. Another aspect is that female-headed households in Botswana come to 60% of the population (Gaisie 2000 p, 133)

In this current study 40% of the children were HIV -negative, 10% were HIV–positive, and the HIV status of 50% was not known. The unknown HIV status of 50% of the children could mean that a higher percentage of children in the study were HIV-positive. Most of the children 98 (87%) had not been diagnosed with secondary diseases (e.g. tuberculosis, pneumonia). A study in Uganda by Bachou et al (2006) found that HIV-positive children were more likely to become severely malnourished. The same study found that 72% of all the severely malnourished children suffered from one or more types of infection. These findings are almost similar to those in this study, namely that 108 of the 113 children suffered from one or more illnesses during the six months prior to their admission to hospital.

The most common signs and symptoms of the children in this study were oedema 56 (50%), coughing 40 (35%), diarrhoea 25 (22%), and vomiting 23 (20%). A small percentage of the children presented with anaemia 8 (7%) and with a fever (2 (1.8%). Various studies (Saloojee et al, 2007; Maleta, 2006) have shown that diarrhoea in children contributes to undernutrition given that it is a common illness to have been suffered by most undernourished children.   Infection in the child would increase the child's metabolic needs, thus necessitating more nutritious food intake (Rabinowitz et al 2010; Maleta 2006).

Oedematous malnutrition was common 36 (64%) in the age group 12 to 23 months, followed by 13 (23%) in the age group 6 to 11 months. These findings show that oedematous malnutrition is common among undernourished children admitted to hospital. A study in Karachi, India, showed that 25% of the 112 malnourished children admitted to hospital suffered from oedematous malnutrition, 45% from diarrhoea, and 24% had respiratory infections (Ejaz et al 2010). The distribution of oedematous malnutrition in this current study covered 55% of the male children and 45% of the female children. These findings are contrary to those of Bruno (2006, p. 33) in Tanzania where oedematous malnutrition was more common among girls than among boys. Oedematous malnutrition represents severe malnutrition in any population. As 50% of the

children in this study suffered from oedematous malnutrition, the reason for this late diagnosis could be the masking effect of oedema on undernourished children, meaning that caregivers cannot easily recognise undernutrition.

5.4 Anthropometric status of the children

5.4.1 Wasting among the children

Wasting (WHZ score <-2SD) was present in 56 (90%) of the male children and 49 (96%) of the female children. This means that most of the girls in this study were wasting. Wasting is a measure of acute malnutrition and is attributed to a combination of factors, from disease to poor feeding practices (Cogill 2003, p. 11). Wasting was relatively high across gender. The reasons for this finding are unknown, and further research is needed on this aspect. A community study by Labadarios et al (2005) in South Africa found the prevalence of wasting across all age groups to be less than 4%. In view of this small number, one would expect to see a few children suffering from wasting to be admitted to hospitals. As all the children in this current study suffered from some form of undernourishment, a high percentage of wasted children was to be expected. Wasting or acute undernutrition can be brought about by seasonal changes in the food supply or short-term nutritional stress due to illness (Cogill 2003). Early identification of wasted children could present a challenge to caregivers. Most of the caregivers in this study said they did not take a child to the clinic because he or she was malnourished, but rather to address some of the common illnesses i.e. vomiting (17%), diarrhoea (22%), coughing (12%) and swollen limbs (35%) and because they had been referred to the hospital.

Acute malnutrition is a combination of wasting and oedematous malnutrition, and acute malnutrition serves as an indicator of severe crisis. Severe acute malnutrition (<-3 z-score and/or oedema) is associated with a mortality risk and demands immediate attention (Tanner-Grobler 2006). As 50% of the children in this study suffered from oedema, the oedema could be masking severe wasting in these children.

5.4.2 Stunting among the children

Stunting (HAZ-score<-2SD), a sign of chronic malnutrition (Cogill 2003), was more common in male children than in female children. Stunting in boys came to 68% (n=42) compared to 47% of the female children (n = 24). This study found an association between the child's gender and stunting (χ^2 = 4.0638, p = 0.044) at a 5% level of significance.

A study by Ramil et al (2009) in Indonesia found that male children were at high risk of stunting. However, no explanation is available as to why stunting is more common among boys. The findings on stunting in this study correspond with those in a study by Zere and Mclntrye (2003) in South Africa which showed that stunting was significantly higher in boys than in girls. Further research is required in this area. Chronic malnutrition denotes long-term undernutrition which usually begins early in a child's life. As chronic malnutrition is associated with poverty, a number of interrelated factors could be contributing to stunting in males. However, this aspect also needs further research.

5.4.3 Underweight among the children

Most of the male children were severely underweight (WAZ-score < - 3) with an overall mean z-score of −3.32. A total of 59 of the 62 boys in this study (95%) were underweight. Underweight was also prevalent in girls, with an overall mean z-score of −3.09. A total of 48 of the 51 (94%) girls in this study were underweight. Underweight is a measure of both chronic and acute malnutrition (Faber & Wenhold 2007, p. 394). A national study by Labadarios et al (2005) in South Africa found that less than 1.5% of the children were underweight, although this study was at community level one would expect to see few underweight children admitted to hospitals. The 50% oedematous malnutrition in this study presents a challenge to determining the extent of underweight in the children, given that oedema masks the actual weight of children. As being underweight

points to both chronic and acute malnutrition in children, this study shows that undernutrition among children need to be addressed with respect to current as well as long-term sustainable interventions.

5.5 Awareness of nutritional status

5.5.1 Caregiver's knowledge of the reason for admission

The majority of caregivers (110 or 97%) knew why their child had been admitted to hospital. The few (3%) who did not know might not have been given information by the health professionals when they referred the child to hospital. In view of the reasons caregivers mentioned for admission, 43 (38%) mentioned that the child was "not eating well" and has lost weight. These caregivers seemed to know that the child suffered from some degree of malnutrition. One reason for admission given by 40 (35%) caregivers, was that the child had "swollen limbs". Caregivers were not aware that the swelling could be linked to malnutrition. Other reasons for admission included coughing, vomiting and diarrhoea. Most (62%) of the caregivers focused on the child's symptoms as the reason for admission. They were not aware that the primary reason for admission was undernutrition.

5.5.2 Caregiver action or non-action concerning child's condition

Most caregivers (81%) took some action to assist the child in addressing the illness, but 20% did nothing. These caregivers probably did not realise that the child was undernourished and why the child was referred to the hospital after a routine child welfare clinic visit. It was common clinic practice for nurses to refer severely malnourished children to the hospital. Eighty-one caregivers (72%) immediately took the child to the clinic when they suspected that the child was not well. Some caregivers 6 (5%) took the child to a traditional healer first, and a small number of caregivers bought some medicine at a pharmacy or tried different feeds at home before they took the child to the clinic. These findings are close to those of a study in Sri Lanka involving 1 102

children and their caregivers. Twenty-eight per cent of the caregivers tried some home remedies before they took the child to the clinic, and 51% immediately took the child to the clinic (Peiris & Wijesinghe 2010). Most of the caregivers in this study were aware that they had to take the child to the clinic before its condition worsened. A small percentage of caregivers were still attached to traditional medicine. This poses a challenge as a child's condition can deteriorate quickly while the caregiver still trusted the traditional healer.

5.6 Association between caregiver characteristics and children's clinical profiles and anthropometric status

Only one association was determined between the caregiver's characteristics and the child's clinical profile, and that is the marital status of the caregiver and the child presenting with a cough ($\chi^2 = 4.0947$, p = 0.043) at a 5% level of significance. Additional research in this context is needed as no previous studies have specifically sought to determine associations between caregivers' characteristics and the clinical profiles of malnourished children. Further research could offer new information in respect to the problem of child malnutrition which has already been found to have many determinants.

No association was found between the severity of undernutrition and the characteristics of caregivers. This could be attributed to the fact that almost all the children were undernourished. A study by Kimani-Murage et al (2011) in South Africa found that maternal age acted as a key determinant of stunting and underweight.

The findings in this study presents a need for further research as caregiver characteristics that are known to contribute to undernutrition did not reveal a significant association with severe undernutrition. Other factors that might contribute to severe undernutrition could require a different approach.

5.7 Conclusion

Malnourished children remain a challenge in most poor and developing countries. This study has shown that although a number of common factors contribute to the undernutrition of children, each region has its own unique features that play a role in undernutrition. Households with a single parent seem to play a major role in contributing to child malnutrition across most studies.

In this study the caregiver's educational background did not seem to contribute to child malnutrition as half the study population represented educated caregivers. Marital status can be associated with a child presenting with coughing on admission. No association could be determined between a child's clinical profile and the age of the caregiver, the extent of the caregiver's education, place of residence, occupation, or monthly income. A strong association was found between the child's gender and stunting, with male children being more often stunted than female children. No association was found between the caregiver's characteristics and the severity of the three types of undernutrition (i.e. wasting, underweight and stunting). Oedematous malnutrition was common among the participants in this study. On admission to hospital, most caregivers were unaware that their child was suffering from undernutrition. This was evident from the reasons they gave for admission. This finding presents a gap in health education of caregivers as they were unable to recognise the various forms of undernutrition at an early stage. Proper health education could prevent severe forms of undernutrition, more complicated care and improve chances of survival. Undernutrition is a result of multidimensional characteristics of the caregiver and the clinical profile of a child, which may vary from one region to the next. Finding characteristics that can be associated with undernutrition represents a basic step in the fight against undernutrition in a particular locality.

5.8 Study limitations

The results of this study cannot be generalised for the whole population as the study participants were recruited in a hospital setting. This study comprised children who were undernourished, and is therefore not a true representation of the entire population. Only cases of undernutrition that could be admitted to hospital were considered -- This means that others at home with no money to go to the clinic have not been considered. The feeding practice data of the caregiver was not collected as this plays a major role in a child's nutritional health.

Anthropometric measurements were on average done four days after a child's admission as participants were recruited prospectively. This aspect could have affected the weight of some children as corrective steps had been taken soon after admission. The child could therefore have gained or lost weight during the four days prior to anthropometric measurement. This brief delay in weight measurements could have covered up severe forms of malnutrition.

5.9 Recommendations

- This study revealed a need for more region-specific research about the influence of a caregiver's characteristics on a child's nutritional and anthropometric status.

- Caregivers need education on how to differentiate between oedematous malnutrition in children and well-fed children as most confuse oedematous malnutrition with being healthy.

- Future studies should collect feeding practice information and compared with caregiver's characteristics.

- Stunting is a sign of chronic malnutrition and should guide policy makers in scaling up the provision of assistance to caregivers in the form of supplementary feeding programmes to children under the age of five.

- A more extensive, larger-scale study may be required in the community to explore the overall picture of undernutrition in this region. Such a study's findings on undernutrition could then be generalised for the populations of Francistown and its surrounding villages.

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APPENDICES

Appendix A

<u>QUESTIONNAIRE (English version)</u>

Participant Number: ………………………...

<u>Socio-demographic Characteristics</u>

<u>Caregiver</u>

1. Gender: Male ☐

       Female: ☐

2. Age (Years):

15 – 20 ☐

21 – 30 ☐

31 – 40 ☐

40 – 50 ☐

Above 51 ☐

 3. Relationship to child

Mother ☐

Father ☐

Other: _____

4. Marital status:

Married ☐

Single ☐

Divorced ☐

Separated ☐

Cohabiting ☐

Widowed ☐

5. Level of education

Primary ☐

Secondary ☐

Tertiary ☐

No formal education ☐

6. Number of other individuals in the household excluding you and the child

≤ 4 people ☐

5 – 7 people ☐

8 – 10 people ☐

Above 10 people ☐

7. Current place of residence

Urban ☐

Village ☐

8. Caregiver occupation

Employed ☐

Self employed ☐

Pensioner ☐

Unemployed ☐

Other _____

9. Total household monthly income

< P500 ☐

P500 –P1999 ☐

P2000 – P3999 ☐

P4000 – P5999 ☐

 6000 + ☐

10. Residence

Renting ☐

Own / Family House ☐

11. Number of Rooms

1- 3 rooms ☐

4 - 6 rooms ☐

Above 7 rooms ☐

12. Do you know why your child is admitted to the hospital?

Yes ☐

No ☐

13. If yes, please explain in your own words why your child has been admitted

....
....
....

14. Have you done anything before to address the condition that your child has been admitted for?

Yes ☐

No ☐

15. If **yes**, please explain what you have done

………

………

………

………

16. Child medical history for the past 6 months

Coughing ☐

Vomiting ☐

Diarrhoea ☐

Swollen legs / arms ☐

Peeling Skin ☐

Other _____

Appendix B

DIPOTSOLOTSO   (Setswana version)

Nomoro ya motsayakarolo…………………………

<u>Dintlha tse di farologanyang batho</u>
<u>Motlhokomedi</u>

1. Mong: Monna ☐

         Mosadi ☐
2. Dingwaga

15 – 20   ☐

21 – 30   ☐

31 – 40   ☐

40 – 50   ☐

Go feta 51   ☐

3. Botsalano le ngwana

Mmaagwe   ☐

Rraagwe   ☐

Tsedingwe _____

4. Ke tsa lonnyalo

Ke nyetswe / nyetse   ☐

Ga ke a nyala   ☐

Re fedisitse lonyalo   ☐

Re kgaogane   ☐

Re nna rotlhe ntleng ga lonyalo   ☐

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Motlholagadi   [ ]

Dintlha tse di foarologanyang batho mo botselong

5. Dithuto tsa motlhokomedi

Thuto e e potlana   [ ]

Thuto e kgolwanyane   [ ]

Thuto tse di kwagodimo   [ ]

Ga ke a tsena sekole   [ ]

6. Palo ya batho ba bangwe molwepeng kwantle ga wena le ngwana wa gago

Kwatlase ga 4   [ ]

5 – 7 batho   [ ]

8 – 10 batho   [ ]

Kwa godimo ga 10   [ ]

7. Kwa o nnang teng gompieno

Francistown   [ ]

Motse   [ ]

8. Tiro ya motlhokomedi

Ke a bereka   [ ]

Ke a ipereka   [ ]

Ke tlogetse tiro ka bogodi   [ ]

Ga ke bereke   [ ]

9. Madi a a amogelwang ka kgwedi mo lwapeng

Kwa tlase ga P500 ▢

P500 – P2000 ▢

P2000 – P4000 ▢

P4000 – P6000 ▢

Go fela P 6000 ▢

 Kwa e nna teng

10. Ke duela boroko kwa ke nnang teng

Ken ntlo yame ▢

Dikamore tse di leng teng ▢

11. Palo ya dikamore
Dikamore dile 1 – 3 ▢

Dikamore dile 4 – 6 ▢

Dikamore di feta 7 ▢

12. A o itsegore ke eng ngwana wa gago a robaditswe kwa kokelong?

Ee ▢

Nnya ▢

13. Fa ele gore e e o robaditswe, ke kopa gore otlhaluse gore ke eng fa ngwana wa gago a robaditswe kwa kokelong?

……………………………………………………………………………………………………
……………………………………………………………………………………………………
……………………………………………………………………………………………………
……………………………………………………………………………………………………
……………

14. A o kile wa dira sengwe gothusa ngwana ka seemo se a se robaletseng mo kokelong?

Ee ☐

Nnya ☐

15. Fa e legore odirile sengwe, tlholosa se o se dirileng?

……………………………………………………………………………………………
……………………………………………………………………………………………
……………………………………………………………………………………………

16. Botsogo jwa ngwang mo dikweding tse thataro tse di fitileng

O ne a gotlhola ☐

O ne a kgwa ☐

O ne a tsenwa ke lotshololo ☐

Go ruruga maoto le diatla ☐

Go oboga ga letlalo ☐

Tse dingwe……………………………………………………………………………

Appendix C

DATA COLLECTION FORM   Date: ..../............/...............

Participant number …………………

Date of admission: ..../............../...........

Date of birth: mm/ dd / yyyy
                  ___/____/_____

1. Age

6 – 11 months   ☐
12 – 23 months   ☐
24 – 35 months   ☐
36 – 47 months   ☐
48 – 60 months   ☐

2. Is the child growth card available?

Yes   ☐

No   ☐

3. Gender: Male   ☐

            Female   ☐

	1st Measurement	2nd Measurement	Average
4. Weight	☐	☐	☐
5. Height	☐	☐	☐
6. Length	☐	☐	☐

7. Current diagnosis

Moderate malnutrition ☐

Severe malnutrition ☐

8. HIV status

HIV negative ☐

HIV positive ☐

HIV status unknown ☐

9. Secondary diagnosis

Malaria ☐

Pneumonia ☐

Tuberculosis ☐

Intestinal infections ☐

None ☐

Other (specify): ....

10. Signs and symptoms

	Yes	No
Oedema	☐	☐
Fever	☐	☐
Vomiting	☐	☐
Distended abdomen	☐	☐
Diarrhoea	☐	☐
Cough	☐	☐
Anaemia	☐	☐
Skin discoloration	☐	☐
Peeling	☐	☐

Other (specify):_____

Appendix D

Statement concerning participation in a Research Project
Name of Project

SOCIO-DEMOGRAPHIC CHARACTERISTICS OF CAREGIVERS AND CLINICAL PROFILE OF UNDER-NOURISHED UNDER FIVE YEAR OLD CHILDREN ADMITTED IN NYANGABGWE REFERRAL HOSPITAL, BOTSWANA

I have heard the aims and objectives of the proposed study and was provided the opportunity to ask questions and given adequate time to rethink the issue. The aim and objectives of the study are sufficiently clear to me. I have not been pressurized to participate in any way.

I understand that participation in this Project is completely voluntary and that I may withdraw from it at any time and without supplying reasons. This will have no influence on the regular treatment that holds for my child's condition neither will it influence the care that my child receives from my regular doctor.

I know that this Project has been approved by the Medunsa Research and Ethics (MCREC), University of Limpopo (Medunsa Campus), Nyangabgwe Referral Hospital Research Committee and the Research Ethics committee of the Ministry of Health, Botswana. I am fully aware that the results of this Project will be used for scientific purposes and may be published. I agree to this, provided my privacy is guaranteed.

I hereby give consent to participate in this Project.

....

Name of caregiver   Signature caregiver

....

Place.   Date   Witness

_____

Statement by the researcher
I provided verbal and written information regarding this Project
I agree to answer any future questions concerning the Project as best as I am able.
I will adhere to the approved protocol.

....…… …………………….

Name of researcher   Signature   Date   Place

Appendix E

Mokwalo o o tsayang karolo mo tshekatshekong ya Patlisiso.

Leina la Tshekatsheko

TSHEKATSHEKO SEEMO LETSHOLELO YA BOTHOKOMEDI BA BANA BA BA KO TLASE GA DINGWAGA TSE TLHANO, BA BA TLHAELANG DIKOTLA LE BOTSOGO JWA BONE

Ke utlwile maikaelelo le maikemisetso a patlisiso e e mme ke filwe tšhono ya go botsa dipotso le go fiwa nako e e lekaneng ya go akanya gape ka ntlha e. Maikaelelo le maikemisetso a patlisiso e a tlhaloganyega sentle. Ga ke a patelediwa ke ope ka tsela epe go tsaya karolo.

Ke tlhaloganya gore go tsaya karolo motshekatshekong e ke boithaopo le gore nka ikgogela morago mo go yona ka nako nngwe le nngwe kwa ntle ga go neela mabaka. Se ga se kitla se nna le seabe sepe mo kalafong ya me ya go le gale ya bolwetsi jo ke nang le jona e bile ga se kitla se nna le tlhotlheletso epe mo tlhokomelong e ke e amogelang mo ngakeng ya me ya go le gale.

Ke a itse gore tshekatsheko e e rebotswe ke Patlisiso le Molao wa Maitsholo tsa Khampase ya Medunsa (MCREC), Yunibesithi ya Limpopo (Khampase ya Medunsa), komiti ya dipatlisiso ya kokelo ya Nyangabgwe lephata la dipatlisiso lemolao wa maitsholo la lephata la botsogo (Botswana). Ke itse ka botlalo gore maduo a tshekatsheko a tla dirisetswa mabaka a maranyane e bile di ka nna tsa phatlaladiwa. Ke dumelana le seno, fa fela go netefadiwa gore se e tla nna khupamarama.

  Fano ke neela tumelelo ya go tsaya karolo mo tshekatshekong e.

....

       Leina la Motlhokomedi   Seatla sa Motlhokomedi.

....

Lefelo.   Letlha.   Paki

Mokwalo wa Mmatlisisi Ke tlametse tshedimosetso ka molomo le/kgotsa e e kwadilweng malebana le tshekatsheko e. Ke dumela go araba dipotso dingwe le dingwe mo nakong e e tlang tse di amanang le tshekatsheko ka moo nka kgonang ka teng. Ke tla tshegetsa porotokolo e e rebotsweng.

....…… …………………………

Leina la Mmatlisisi   Tshaeno   Letlha   Lefel

Appendix F

UNIVERSITY OF LIMPOPO
Medunsa Campus

MEDUNSA RESEARCH & ETHICS COMMITTEE

CLEARANCE CERTIFICATE

P O Medunsa
Medunsa
0204
SOUTH AFRICA

Tel: 012 - 521 4000
Fax: 012 - 560 0086

MEETING: 07/2010

PROJECT NUMBER: MREC/H/163/2010: PG

PROJECT :

Title: Socio-demographic characteristics of caregivers and clinical profile of under-nourished under five year old children admitted in Nyangabgwe Hospital, Botswana

Researcher: Mr A Madondo
Supervisor: Prof U MacIntyre
Co-supervisor: Busi Ntuli-Ngcobo
Department: Public Health
School: Health Care Sciences
Degree: MPH

DECISION OF THE COMMITTEE:

MREC approved the project.

DATE: 09 September 2010

PROF GA OGUNBANJO
CHAIRPERSON MREC

> **Note:**
> i)   Should any departure be contemplated from the research procedure as approved, the researcher(s) must re-submit the protocol to the committee.
> ii)   The budget for the research will be considered separately from the protocol.
> PLEASE QUOTE THE PROTOCOL NUMBER IN ALL ENQUIRIES.

Appendix G

MINISTRY OF HEALTH
PRIVATE BAG 0038
GABORONE

REPUBLIC OF BOTSWANA

REFERENCE No: PPME 13/18/ 1 PS Vol VI (141)   4 November 2010

Health Research and Development Division

Notification of IRB Review: New application

Mr A. Madondo
P O Box 1432
Francistown

Protocol title:

Socio-demographic   characteristics   of
caregivers and clinical profile of under-
nourished five year old children admitted in
Nyangabgwe Referral Hopsital, Botswana

HRDD Protocol number: HRU 00659

Sponsor: Self Sponsored.

HRDD Review Date: 3 November, 2010
HRDD Review Type: HRDD reviewed
HRDD Review Determination: Approved
Risk Determination: Minimal risk

Dear Mr Madondo

Thank you for submitting an application for the above referenced protocol to Health
Research and Development Division (HRDD) for review and approval. We have noted
that all HRDD concerns had been addressed satisfactorily.

Permission is therefore granted to conduct the above mentioned study. This
approval is valid for a period of 1 year effective November 4, 2010.

This approval includes the following:
    1. Application form
    2. Consent forms
    3. Protocol
    4. Data collection tools

The permit does not however give you authority to collect data from selected sites
without prior approval from the management. Consent from the identified individuals
should be obtained at all times.

The research should be conducted as outlined in the approved proposal. Any changes

Furthermore, you are requested to submit at least one hard copy and an electronic copy of the report to the Health Research and Development Division, Ministry of Health within 3 months of completion of the study. Copies should also be submitted to all other relevant authorities.

If you have any questions please do not hesitate to contact Mr. P. Khulumani at pkhulumani@gov.bw, Tel +267-3914467 or Mary Kasule at mkasule@gov.bw or marykasule@gmail.com Tel +267-3632466 or Mr. Lemphi Moremi at lamoremi@gov.bw or lemphim@yahoo.com Tel +267-3632464.

Continuing review
In order to continue work on this study (including data analysis) beyond the expiry date, submit a Continuing Review Application Form for approval at least three (3) months prior to the protocol's expiration date. The Continuing Review Form can be obtained from the Health Research and Development Division office (HRDD), office No. 9A.10 or Ministry of Health website: www.moh.gov.bw or can be requested via e-mail from Mr. Kgomotso Motlhanka, e-mail address: kmotlhanka@gov.bw As a courtesy, the HRDD will send you a reminder e-mail about eight (8) weeks before the lapse date, but failure to receive it does not affect your responsibility to submit a timely Continuing Review Form.

Amendments
During the approval period, if you propose any change to the protocol such as its funding source, recruiting materials, or consent documents, you must seek HRDD approval before implementing it. Please summarize the proposed change and the rationale for it in the amendment form available from Health Research and Development Division office (HRDD), office No. 9A.10 or Ministry of Health website: www.moh.gov.bw or can be requested via e-mail from Mr. Kgomotso Motlhanka, e-mail address: kmotlhanka@gov.bw . In addition submit three copies of an updated version of your original protocol application showing all proposed changes in bold or "track changes".

Reporting
Other events which must be reported promptly in writing to the HRDC include:
- Suspension or termination of the protocol by you or the grantor
- Unexpected problems involving risk to subjects or others
- Adverse events, including unanticipated or anticipated but severe physical harm to subjects.

Thank you for your cooperation and your commitment to the protection of human subjects in research.

Yours sincerely

P. Khulumani
For Permanent Secretary

PERMANENT SECRETARY
MINISTRY OF HEALTH
RESEARCH UNIT

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Appendix H

Ethical Review of proposed study: **Socio-demographic characteristics of caregivers and clinical profile of undernourished under five children admitted in Nyangabgwe Referral Hospital, Botswana.**

Name of Applicant: Mr. Andrew Madondo

Name of Site: Nyangabgwe Referral Hospital

Reviewers: Dr. Jengela

Decision: **Approved**

Date of decision 28th January 2011

The above named study protocol outlines two research stages; the first stage is a pilot study involving eight paired participants to validate a self developed questionnaire. This stage has been completed with minor amendments to the study protocol.

Risk Classification: More than minimal risk research- it involves a vulnerable population (malnourished children). There is patient participation, however it is a non-therapeutic research and does not involve the use of devices or procedures for which there is limited knowledge. There are significant ethical issues of patient privacy and confidentiality with this study. The protocol displays the desired sensitivity to these concerns; adequate informed consent, designated private interviewing area and ensuring data can not be traced back to participants.

The knowledge that the study seeks to generate has a significant scientific value in that it will inform the care of malnourished children in Nyangabgwe Referral Hospital, Botswana.

General Follow-up Requirements.

The following standard requirements as pertain to the responsibilities of the researcher during the conduct of the study should be noted:

1. The need to notify the committee in cases of protocol amendments (other than amendments involving only logistical or administrative aspects of the study).
2. The need to report to the Hospital Superintendent of Nyangabgwe referral Hospital any serious and any unexpected adverse event related to the conduct of the study immediately.
3. Reasons for premature termination or suspension of the study should be communicated to the Ethics and Research Committee.
4. Nyangabgwe Referral Hospital Superintendent should receive notification from the applicant at the time of study completion.
5. 2 final copies (1 hard copy and 1 electronic copy) of the study report must be submitted to the Hospital Superintendent of Nyangabgwe Referral Hospital within 1 month of study completion.
6. All other requirements as outlined in document reference no. PPME 13/18/ 1 PS Vol VI (141); Health Research and development Division, Ministry of Health.

Signed ....

Dr. M. I. Jengela (for Research and Ethics Committee, Nyangabgwe referral Hospital)

Appendix I

The Hospital Superintendent
Nyangabgwe Referral Hospital
Research Ethics Committee
Francistown
Botswana

09 November 2010

Dear Sir/Madam

RE: ETHICAL CLEARANCE AND PERMISSION TO CONDUCT STUDY AT NYANGABGWE REFERRAL HOSPITAL

I am studying for a Master of Public Health at the School of Health Care Sciences, University of Limpopo, Medunsa Campus in Pretoria, South Africa. I am required to submit a research report as part of the course. For my research I would like look into the:

Sociodemographic characteristics of caregivers and clinical profile of under-nourished under-five year old children admitted in Nyangabgwe Referral Hospital, Francistown

A researcher administered questionnaire, medical record data collection tool and anthropometric measurements will be used to collect information from study participants. An explanation about the research project including title, aims, objectives, benefits to society and study participants, the voluntary nature of the research and guarantee of participant privacy will be given to the study participants in the study and the questionnaire will be administered to those who consent to be in the study.This kind of study has not been done before at this hospital and the hospital will benefit from the outcome of the research as it will provide important baseline information on which to focus on in tackling under-nutrition, since the determinants of malnutrition vary from region to region and country to country.The study proposal has been reviewed by the Medunsa Research Ethics Committee of the University of Limpopo and the Ministry of Health, Botswana, Research Unit; please find enclosed the proposal and the relevant clearance certificates. I would be grateful if you would give your permission for me to conduct this study at Nyangabgwe Referral Hospital.

Yours sincerely

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Mr Andrew Madondo