RISK FACTORS FOR SEVERE ACUTE MALNUTRITION

AMONG CHILDREN AGED 6-59 MONTHS ADMITTED AT LUBANGO PEDIATRIC HOSPITAL, ANGOLA

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Risk Factors For Severe Acute Malnutrition Among Children Aged 6-59 Months Admitted At Lubango Pediatric Hospital, Angola

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DECLARATION

I, Ketha Francisco, declare that this thesis is my own original work and has not been presented for a degree in any other University/Institution.

Signature……..... Date ……

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This dissertation has been submitted for examination with our approval as the University's Supervisors.

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DEDICATION

This work is affectionately dedicated to my wife Natalia Francisco, my son Hailton Kelly and daughter Kellya Silvia, for their love and support during the study. I am greatly indebted to them who in various ways, their insightful comments and encouragement led to this success. I thank my wife who encouraged me as I left home to pursue my study. The joy and enthusiasm she had for this study was motivational for me during tough times.

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LIST OF ABBREVIATIONS AND ACRONYMS

CI	Confidence Interval
CFR	Case fatality rates
Ecoli	Escherichia coli
ERC	Ethics Review Committee
HIV	Human Immunodeficiency syndrome
ICU	Intensive Care Unit
JKUAT	Jomo Kenyatta University of Science and Technology
KEMRI	Kenya Medical Research Institute
MAM	Moderate Acute Malnutrition
MDG	Millennium Development Goals
MUAC	Mid Upper Arm Circumference
NCHS	National Centre for Health Statistics
OR	Odds Ratio
SAM	Severe Acute Malnutrition
SD	Standard Deviation
SPSS	Statistical Package for Social Sciences
SSA	Sub Sahara Africa
UNICEF	United Nations for children Education Fund
WHO	World Health Organization

DEFINITION OF TERMS

Conceptual framework: Used in research to outline possible courses of action or to present a preferred approach to an idea or thought.

Severe Acute Malnutrition (SAM): Weight for height less than -3SD and/or visible severe wasting and/or edema of feet (excluding other causes of edema), Mid Upper Arm Circumference less than 11.5 cm (in infants more than 6 months of age)

Case Fatality Rate (CFR): The proportion of deaths within a designated population of "cases" (people with a medical condition), over the course of the disease.

Moderate Acute Malnutrition (MAM): Is defined as a weight-for-age between -2 and -3 z-scores below the median of the WHO child growth standards.

Well-nourished child: Child with weight for height Z score between -2 SD and +2SD

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ABSTRACT

About 9% of Sub Sahara Africa (SSA) children have moderate acute malnutrition and 2% of children in developing countries have Severe Acute Malnutrition (SAM). There is no such information about children to allow planning and implementation of nutrition interventions in Angola. The purpose of this study was to determine clinical, complementary feeding practices and socio-demographic risk factors associated with SAM among children admitted at Lubango Pediatric Hospital-Angola. The study adopted a case control study design and data was collected using an interviewer administered questionnaire, clinical examination and anthropometric measurements of the admitted children. In a matched case control study conducted between August 2014 and October 2014 a total of 163 participants (caregivers-child pairs) were recruited. A total of 53 severely malnourished cases aged between six months and five years and110 controls were concurrently recruited. The controls were age and sex matched and without severe acute malnutrition. The majority (52.7%) of the caregivers were single, lived in an urban setting 73.7% (120), were Christian 62.7%, while 55.2% accessed information from a Television (T.V) and 16.5% had no education with 58% getting an monthly income of more than 50USD. The children whose caretakers were single were 2.9 times more likely to have SAM compared to those whose caregivers were married (95% CI 1.50 – 6.15; p value =0.002), Children whose caregivers lived in urban settings when compared to those living in a rural setting, had significantly decreased odds of SAM (OR 0.16; 95% CI 0.08 – 0.35; p value<0.001). However, children from households that got food from the market had an increased odds for SAM of 1.75 times (95% CI 0.74 – 4.15).The children with a previous diagnosis of pneumonia, diarrhea and malnutrition had a significantly increased odds for SAM of 2.17 (95% CI 1.06 – 4.45; p value =0.035), 7.66 (95% CI 3.59 – 16.37; P<0.001) and 11.59 (95% CI 3.14 – 42.83; P<0.001) times respectively. There is need to explore the various socio - demographic characteristics such education level of caregivers among SAM children as well as a need to strengthen adequate availability and quality of foods from the rural settings. Further clinicians need to be proactive in making the accurate diagnosis and ensuring follow-up for children previously admitted for SAM and assessing their risk of malnutrition. For children with recurrent admissions, an assessment of malnutrition and family socio demographic status should be explored. The results findings serve as baseline data for health, policy makers and all stakeholders for designing interventions that can address the impact of SAM in Angola.

CHAPTER ONE

INTRODUCTION

1.1 Background of the Study

The nutritional status of children is the best indicator of the well-being of children. Issues that cause a decline in the nutritional status of children are multidimensional and difficult to understand (Horton, 2006). SAM is defined as weight for height less than -3SD and/or visible severe wasting and/or edema of both feet (excluding other causes of edema), mid arm circumference less than 11.5 cm (in infant more than 6 months of age) (Philips & Wharton, 1968). Malnutrition causes about 5.6 million of the 10 million child deaths per year, SAM contributing to about 1.5 million of these deaths (Horton, 2006).

Worldwide there are about 60 million children with moderate acute malnutrition (MAM) and 13 million with SAM. About 50% of the 10-11 million children fewer than five years of age die due to preventable causes. According to the national survey in India, 6.4% of children below 5 years were sufferings from SAM with a median Case Fatality Rate (CFR) of 23.5%. This can be reduced by appropriate prevention and management of SAM. In developing countries malnutrition among children is responsible for 60% of the 10.9 million annual deaths among children under 5 years (De Onis et al, 2000). Over 2/3rd of these deaths are associated with inappropriate feeding practices during the 1st year of life (Heinekens et al, 2008). About 9% of Sub Sahara Africa (SSA) children have MAM and 2% of children in developing countries have SAM. Of all the children that die for SAM worldwide, 99% are in the developing world (Ashworth, 2004). And the CFR of SAM in hospitals remains at 20-30% as coverage of those affected remains low principally in Africa (Ashworth, 2000). Under nutrition is associated with high morbidity and is responsible of more than 50% of all childhood mortality in resource-poor settings (Chen, 1980). It is known that the risk of dying from any cause increases 8 times in a child with severe underweight (De Maayer and Saloogie, 2011). The majority of children with SAM should be managed in hospitals as the alterations in their

physiological and metabolic functions predispose them to complications including hypoglycemia, hypothermia, electrolyte imbalance, heart failure and infections but still misdiagnosis and poor management continue to contribute to a CFR of over 30% in some Hospitals (Collins el al, 2006).

The socio-demographic background in developing countries is that majority of caregivers were single mothers (Phillips &Wharton, 1968; De Maayer and Saloogie 2011). They are from low-income households, large families (>5 members) and from rural areas (Duncan et al 2000). But the mortality was related to the severity of the malnutrition, where severe wasting had a mortality rate of 73- 187 per 1000 children per year (Chakroborty et al, 2006). The poor hospital care of SAM in developing countries is another contributor to the high mortality rates with a CFR in hospitals of about 20-30% and has changed little since the 1950s (Ashworth,2004).

1.2 Statement of the problem

Globally, SAM is a human disaster on a vast scale especially among children under five years of age living in Africa. Malnutrition accounts for the death of more than 3 million children and more than 100,000 mothers annually (Heinkens et al, 2008). SAM cripples the immune system, making children much more at risk and susceptible to disease. It prevents proper brain development, which means children are less able to start school when they should and are less able to learn and perform. Academically adults who had SAM in childhood contribute less to economic growth and reduce Gross Domestic Product in every country across the globe. SAM arises from causes such as family size, parental illiteracy, lack of exclusive breast feeding, late initiation of complementary diet, bottle feeding, inadequate dietary intake and disease. The operating household environments, including food insecurity, inadequate child's care and lack of health services are also critical. Ultimately, these factors are determined by the larger political, economic, social and cultural environment.

In the hospital setting, Malnutrition is associated with many adverse outcomes including depression of the immune system, impaired wound healing, muscle wasting, longer

length of hospital stay, higher treatment cost and increased mortality (Amsala and Tigabu, 2008).

The study contributes to establish clinical, complementary feeding practices and socio-demographic risk factors associated with SAM among children admitted at Lubango pediatric Hospital-Angola.

1.3 Study justification

It is true that SAM increases the risk of death among children admitted in the hospital irrespective of the underlying disease/health condition and the relevant disease management.

The period below 5 years of age is the critical time for the promotion of optimal growth and development but SAM has significant health and economic consequences, the most serious being increased risk of death, principally among admitted children below five years of age. This calls for a multi sectoral approach and action at the community level and health facilities to effectively address SAM in the short and long term.

This study will facilitate these, by documentation of the clinical and socio-demographic risk factors as well as feeding practices associated with SAM among children admitted at Lubango pediatric hospital-Angola. It is noted that there is no such information for planning and implementation of nutrition interventions among children admitted in hospitals in Angola. The results will also serve as baseline data to facilitate formulation of policies and recommendations for the prevention and management of SAM at Lubango pediatric hospital and in other pediatric hospitals in Angola as well as at the division of nutrition in the department of public health.

1.4 Objectives

1.4.1 Main objective.

The main objective of this study is to establish the risk factors associated with SAM among children admitted at Lubango Pediatric hospital-Angola**.**

1.4.2 Specific objectives

The following are the four specific Objectives

1. To establish the socio demographic factors associated with SAM among caretakers and children aged 6-59 months admitted at Lubango Pediatric hospital, Angola.
2. To determine the clinical risk factors associated with SAM among childrenaged 6-59months admitted at Lubango Pediatric hospital.
3. To establish the complementary feeding practices associated with SAM among children aged 6-59 months admitted at Lubango Pediatric hospital, Angola.
4. To determine the association between clinical and socio-demographic risk factors Among SAM children aged 6-59 months admitted at Lubango Pediatric hospital.

1.5 Research questions

The following are the four study questions:

1. What are the socio demographic factors associated with SAM among caretakers and children aged 6-59 months admitted at Lubango Pediatric hospital, Angola?
2. What are the clinical risk factors associated with SAM among children aged 6-59 months admitted at Lubango Pediatric hospital?
3. What are the complementary feeding practices associated with SAM among children aged 6-59 months admitted at Lubango Pediatric hospital, Angola?
4. What is the association between clinical and socio-demographic risk factors among SAM children aged 6-59 months admitted at Lubango Pediatric hospital?

1.6 Hypothesis

1.6.1 Null Hypothesis

The socio-demographic characteristics, complementary feeding practices and clinical risk factors are not associated with SAM among children aged 6-59 months admitted at Lubango Pediatric hospital

1.6.2 Alternate Hypothesis

Socio-demographic characteristics, complementary feeding practices and clinical risk factors are associated with SAM among children aged 6-59 months admitted at Lubango Pediatric hospital.

CHAPTER TWO

LITERATURE REVIEW

2.1. Overview of Severe Acute Malnutrition

Efforts to prevent child deaths need to be stepped up in order to meet the target set by the third sustainable development goal, which is tailored towards universal health care and reducing the mortality rates among under-fives, but the challenge is how to reduce morbidity and mortality among children with SAM, principally in SSA where the nutritional and health situation is worsening, (Baur et al, 1996). Despite the improved understanding of the pathophysiology and clinical management of SAM, the CFR among admitted children with SAM in SSA has remained between 20- 30% (Ashworth, 2004).

2.2 Clinical risk factors among severely malnourished children

The lack of exclusive breast feeding, early introduction of complementary feeds, feeding diluted feeds containing fewer nutrients, repeated enteric and respiratory tract infections, ignorance, poverty are the risk factors for SAM. Lack of birth spacing, lack of maternal nutrition during lactation, high birth rate, low birth weight, pre-lacteal feeds, early and late weaning are other additional factors for SAM, principally in low income regions of the world (Michael, 2012).

Breastfeeding enhances neurological, visual and motor development and protects the infants against allergies, skin disease, asthma, chronic conditions such as obesity and diabetes (UNICEF, 2011). Exclusive breastfeeding also contributes to the health and well-being of mothers; it reduces the risk of ovarian and breast cancer and leads to more rapid maternal weight loss after birth. It is also a method of birth control called lactation amenorrhea that helps in spacing pregnancies (Rollins *et al*, 2016). Making it one of the best methods to promote health and reduce maternal and child morbidity and mortality.

The severely malnourished children have infective and non-infective complications such as diarrhea with dehydration, acute lower respiratory infection, tuberculosis, candidiasis,

meningitis, keratomalacia, anemia, hypothermia, jaundice and hypoglycemia (Mahgoup el al, *2*006).

De Maayer and Saloojee (2011) revealed a 51% HIV prevalence among malnourished patients in hospital settings and reported poor appetite among hospitalized HIV-infected children, with appetite being 26% poorer than that of uninfected children. Furthermore, the appetite, morbidity and recovery of HIV-infected children were improved by multi-micronutrient supplementation (Collins et al, 2006).

Often severely ill SAM children who require admission receive inadequate triage, treatment, insufficient monitoring and faulty case management in resource-poor settings, as stated by Black et al (2013), leading to a SAM associated high morbidity and a more than 50% mortality in some of these countries (Chen, 1980). As it is known from a study by De Maayer and Saloojee (2011), the risk of death from any cause increases eight times among the underweight.

Many children with SAM should be managed in hospitals as the alterations in their physiological and metabolic functions predispose them to complications including hypoglycemia, hypothermia, electrolyte imbalance, heart failure and infections, but misdiagnosis and poor management of SAM continue to contribute to a CFR of over 30% in some Hospitals (Collins et al, 2006).

2.3 Classification and epidemiology of Malnutrition

SAM is characterized by severe body wasting (marasmus) and/or nutritional edema (kwashiorkor). In 1956, Federico Gomez described an indicator (weight-for-age) to classify varying degrees of malnutrition linked to prognosis, or risk of death. The ‘‘Gomez classification’’ (using a reference population and different cut-off points, i.e., 80%, 70% and 60% of median weight) was used to classify children for clinical referral as suffering from SAM or marasmus (< 60% of the reference weight for age), moderate malnutrition, or mild malnutrition (Myatt, Khara and Collins 2006).

Subsequently, weight-for-age has shown to be a poor discriminator between severely stunted children (with short stature) and severely wasted (with recent weight loss)

(Owor, Tunwine and Kikafunda 2000). The indicators such as visible severe wasting, low weight for height score and bipedal edemas, were associated with increased mortality.

Mostly, health care professionals diagnose SAM when the Mid Upper Arm Circumference (MUAC) of a child is less than 115 mm as shown by Radebe *et al* (1996) and Study findings reveals that MUAC is a precise, accurate, sensitive, simple, cheap, acceptable and specific indicator for the identification of SAM (Radebe *et al*,1996). This has led the WHO to conclude that MUAC < 115 mm could be used as an independent criterion for admission to therapeutic feeding programs for children (Ruwan, Casie, and Mark 2012).

Approximately 2%, which is equivalent to 13 million children living in developing countries suffer from SAM according to Senbengo (2009) and in almost all hospitals in a developing countries, SAM among children contributes significantly to pediatric deaths (Shinjini et al, 2009).

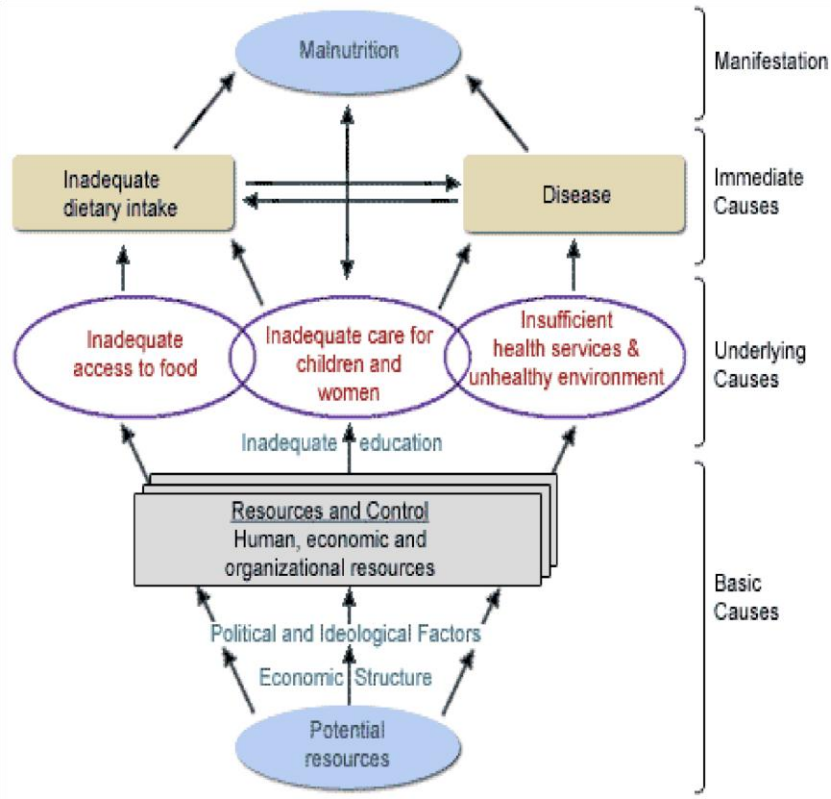


Figure 2.1: Conceptual framework for malnutrition (UNICEF, 1998)

The model was developed "to clarify" our understanding of the factors involved in the family's healthy children in order to provide a foundation for formulating health policies and structures. This model shows how factors influence the survival of children in developing countries. They sought to merge the traditional approaches of social scientists with those of medical researchers. The framework has various components such as disease manifestation, underlying immediate and basic causes of SAM.

2.4 Nutritional status of children

Globally, over 1.4 million young children die before they reach the age of five years due to poor feeding practices (Black *et al*., 2008). Up to 161 million under-five children are stunted, 17 million are wasted and 99 million are underweight worldwide (UNICEF,

WHO & World Bank, 2014). In Africa, the problem of malnutrition continues to persist, the estimated 60% of children less than five years are undernourished (UNICEF, 2014). Malawi findings revealed that 37% of the under-five children were chronically malnourished (stunted), 3% had acute malnutrition (wasting) and 12% were underweight (NSO & ICF-International, 2016). The poor diversity in complementary food among children aged six to 23 months was also reported in Malawi, as about 93% of the children who were introduced to complementary foods at six months were given foods from grains and plant based sources, which do not sufficiently provide micronutrients such as iron, vitamin A and calcium (WHO/UNICEF, 1998; NSO & IFS Macro, 2011).

2.4.1 The parental involvement on malnutrition among children

Adequate nutrition knowledge, positive attitudes and good feeding practices and parental efforts contribute to child survival (Kehler, Chaput and Tough, 2009). The relatives and household heads play a role to improve women's and children's nutrition status (Kehler, Chaput and Tough, 2009).The parental involvement in children feeding plays a significant role in the nutritional status and the child's mothers should be targeted with information on child health and nutrition (FAO, 2015). Some studies in Europe, America and Africa suggest that involvement of both parents in child feeding improves the nutrition status of children (Kehler, Chaput and Tough, 2009; FAO, 2015). Making it essential for the mothers and fathers to have appropriate nutrition knowledge, positive attitudes and perceptions to improve the feeding practices (De Onis et al, 2000).

Because it has been proved that the period from conception to 24 months in children is critical for their growth and development by the WHO (2009), it is then important that adequate nutrition is provided during pregnancy and in the child's first two years of life (De Onis et al, 2000; WHO, 2016).

In Kenya for example, fathers and grandmothers have influence on mothers' decision-making to attend antenatal clinics, breastfeeding, complementary feeding and food types to provide to the child.

2.5 Socio-demographic characteristics among caretakers of children

The socio-demographic background for SAM in developing countries is that majority of caregivers were single mothers from low-income households, large families (>5 members) and are from rural areas (De Maayer and Saloojee, 2011; Duncan et al, 2000). In contrast to studies by Chakraborty *et al* (2006) which reported no association between poor educational background of the caregiver and child under nutrition, mother's nutritional knowledge attitudes and practices were associated with children's nutritional status in a study conducted by Abubakar *et al* (2011) and another one by Gomez & Ramos (1956). The South African National Food Consumption Survey revealed the national prevalence of malnutrition to have decreased with high levels of maternal education, while in Uganda and Zambia formal education never influence the nutritional status of children (Gima and Genebo, 2002; Glewwe,2005). Studies by Odunayo and Oyewale (2006) in Uganda, in the Democratic Republic of Congo by labadarios (2005) and by Glewwe (2005) in Zambia suggested that under nutrition was more prevalent among boys than girls and a study in a Sudan hospital by Mahgoub and Adam (2012) concluded that there were no difference in the CFR between boys and girls

2.5.1 Mother's characteristics among severely malnourished children

The maternal illiteracy is the most common cause for SAM followed by monthly income less 50 USD, parental illiteracy, lack of exclusive breast feeding, family size and complementary feeding (labadarios, 2005). Other additional factors are nutritional status of the lactating mother, birth spacing, smaller than average size of the baby at birth, gestation (Tupasi et al 1990).

The maternal malnutrition has irreversible effects on the child's physical and mental development as a poor nutrition during pregnancy can lead to miscarriages, low birth weight and damages to the new born (Horton *et al*., 2006). The low birth weight babies have a high risk of impaired cognitive development, mortality and morbidity (Mahgoub and Adam, 1999; DFID, 2012). The children who receive adequate nutrition from conception have a less likelihood of mortality and morbidity (WHO, 2009).

2.6 Breastfeeding among severely malnourished children

Breastfeeding is important for the infants to achieve optimal growth as it gives benefits to the child and the mother. There are reduced infections and mortality among infants, improves mental and motor development (Baver et al, 1996).

The World Health Organization (WHO) and the United Nations International Children's Fund (UNICEF) formulated the global strategy to promote optimal breastfeeding and the provision of safe complementary foods (introduced at six month) to improve the child's growth (WHO, 2003; WHO, 2016). About 39% of infants in the developing countries and 25% in Africa are exclusively breastfed in the first six months according to Senbanjo *et al* (2013) while 6% of infants in developing countries are never breastfed (Lauer *et al*., 2004). In Malawi, exclusive breastfeeding time improved from as low as 53% in 2004 to 71% in 2010, but complementary feeding is still a problem (Millar and Maclean, 2005).

2.6.1 Exclusive breastfeeding among children

It is important that infants be fed on breast milk alone during the first six months of life. The breast milk alone with no water provides all the nutrients, antibodies and other immune factors for infants, hence reducing the risk for child morbidity and mortality (WHO, 2003). Breastfeeding has to be done on demand and done eight to 12 times in a 24 hour period (WHO, 2009).

2.6.2 Benefits of breastfeeding

The early initiation of breastfeeding within one hour after birth, protects the new born from acquiring infections and reduces new born mortality (WHO, 2015). It prevent up to 22% of neonatal deaths (Senbanjo *et al*, 2013). In Nepal approximately 19.1% of all neo-natal deaths could be avoided by first hour breastfeeding as shown by Emina, Kandala and Inunger (2009) as breast milk carries antibodies to protect babies from diarrhea and acute respiratory infections (Filmer, Friedman and Schady, 2009). Furthermore, early initiation of breastfeeding also serves as the starting point for a bond between mothers and newborns (WHO, 2010).

2.6.3 Complementary feeding practices among children

The complementary feeding should be introduced since exclusive breastfeeding is no longer sufficient to meet the infant's energy and nutrient requirements. However, breastfeeding should continue with complementary feeding up to two years of age or beyond for high quality nutrients (WHO, 2003; WHO & UNICEF, 2008). The appropriate feeding practices lower morbidity and mortality among children and reduces risk of chronic diseases (WHO, 2015). The early initiation and exclusive breastfeeding during the first six months, as well as the introduction of safe and adequate complementary foods is critical (UNICEF, 2011). The optimal breastfeeding is a preventive intervention for child survival (Collins *et al*., 2006). Further breastfeeding and appropriate complementary feeding have been shown to have a more positive impact on the child's health than that achieved with immunization, safe water and sanitation (Collins *et al*, 2006).

At the age of six months, infants enter a period of complementary feeding during which they make a gradual transition to eating family foods (De Maayer and Saloojee, 2011). Due to inadequate complementary feeding practices, this period is often characterized by a decline in children's nutritional status, especially in low and middle-income countries and of course the deficits that occur are difficult to compensate for later in life (FAO, 2015). The inadequate complementary feeding practices and infectious diseases are the proximate causes of malnutrition during the first two years of child's life (WHO, 2009).

2.6.4 Feeding practices among children

The infants are susceptible to malnutrition if complementary foods are of low nutrient density, low bioavailability of micronutrients and are introduced too early/ late or in inadequate amounts (WHO, 2003). The optimal complementary feeding depends on what is fed and on how, when, where and by whom the child is fed (De Maayer and Saloojee, 2011). It is the caregiver's responsibility to watch for and respond to an infant's cues for hunger and to be responsive to the infant's cues for satiety. The infants should be fed until they indicate that they are full and never be forced to eat. The child

should be fed slowly and patiently and if they refuse many foods, the caregiver has to experiment with different food combinations (WHO, 2003; WHO, 2005). During the transition the food has to be hygienically prepared, stored and fed with clean hands, using clean utensils and not bottles and teats. It's important for the child to feed consistently and properly with their signals of appetite and satiety and the child caretaker must keep in mind that meal frequency and feeding method should be suitable for the child's age (WHO, 2003; WHO, 2005).

2.7 Meal frequency and energy density among children

The appropriate feeding relies upon the energy density of the foods and the amounts consumed during feeding. The complementary meals should be provided two to three times per day from six to eight months of age, and increasing to three to four times from nine to eleven months. The snacks such as fruits, bread with peanut paste are convenient, easy to prepare and self-fed by the child (WHO, 2003). For non-breastfed infant, other food combinations of milk should be provided four to five times daily with additional nutritious snacks and this depends on energy density of the food. For low energy density, more frequent meals are required (WHO, 2005).

2.8 Food consistency among children

The food consistency and variety should be increased as the infant gets older through adaption of infant's requirements and abilities. Infants can eat mashed and semi-solid foods at six months and finger foods by eight months. Basically, at 12 months, most children can eat the same types of food consumed by the rest of the family, while ensuring that the food provided is nutrient dense to ensure nutritional needs are provided (WHO, 2005; WHO, 2009).

2.9 Nutrient rich foods among children

There is rapid rate of growth and development among children during the first two years of life, nutrient needs per unit body weight of infants and young children are very high. The child needs to eat meat, poultry, fish or eggs daily. The milk and milk products are

rich sources of calcium though animal source foods cannot meet the entire child's nutrients requirement (WHO, 2003; WHO, 2005). Other foods such as soybeans, cabbage, carrots, papaya, dark green leafy vegetables, guava and pumpkin are also useful additional sources of calcium (WHO, 2003; Owor *et al*., 2000). The child's daily diet should include vitamin A and vitamin C rich foods to enhance iron absorption (WHO, 2003).

2.10 Other complications of malnutrition among children

For the children less than six months having acute gastroenteritis and SAM, Enteropathogenic E–coli strains is associated with high risk of mortality and the most common sites of infection are skin, alimentary tract, respiratory and urinary tracts (NCHS, 2014). A study in Bangladesh by Bowelle *et al* (2015) showed that 56% of children deaths were attributable to malnutrition's effects, because all SAM children are at risk of hypoglycemia, hypothermia (due to impairment of thermoregulatory control). Making it even worse is the fact that hypoglycemia, hypothermia, vitamin and mineral deficiencies are considered markers of severe infection (Odunayo and Oyewale, 2006).

CHAPTER THREE

MATRIALS AND METHODS

3.1 Study site

The study was conducted in Lubango Paediatric hospital in Angola (Figure 3.1).

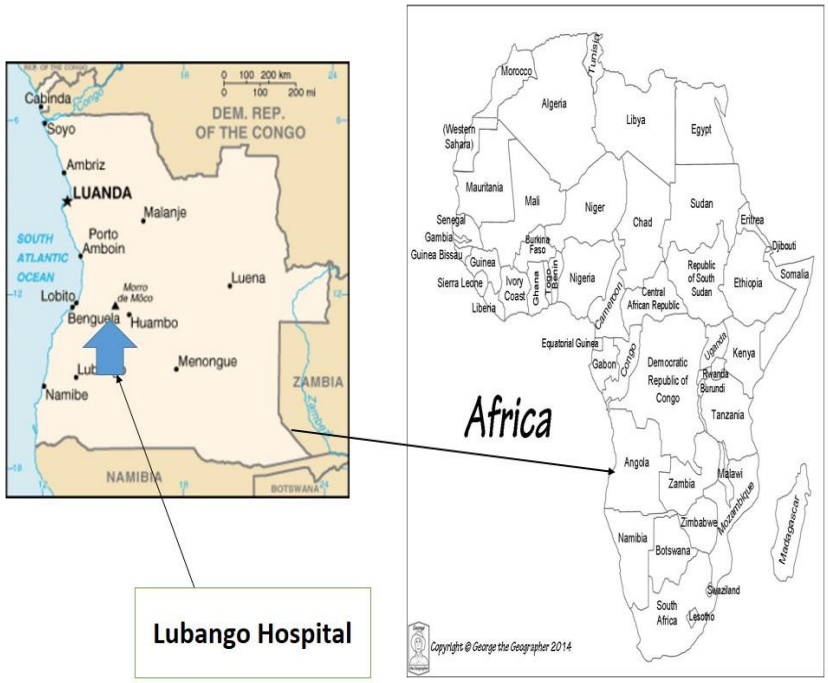


Figure 3.1: A map of Angola showing Lubango Paediatric Hospital

Figure 3.1 shows Lubango Pediatric Hospital. It is located in LUBANGO/ ZONE HELDER NETO, the core of the city. It occupies an area of1998-meter square and has a capacity150 beds. The hospital admits about 6783 children annually from which approximately 880 (12.9 %) have severe acute malnutrition (Lubango pediatric Hospital medical records and patients' files, 2011 - 2012).

3.2 Study design

The study design was case-control where cases were compared for weight for height with age and sex matched controls.

3.3 Study population

In the study, this consisted of children aged 6 – 59 months admitted at Lubango Pediatric Hospital.

3.3.1 Inclusion criteria

i. All children admitted at Lubango Pediatric Hospital aged 6- 59 months during the period of study.

ii. Children of guardians/caretakers who gave consent to participate in the study.

Inclusion of cases was based on SAM as defined by WHO as follows:

i. Weight for Height Z-score less than -3SD and/or

ii. Visible severe wasting and/or

iii. Edema of both feet and/or

iv. Mid arm circumference less than 11.5cm (in Infants > 6months)

Inclusion of Control children

In the study children aged 6 month to 59months without SAM admitted at Lubango hospital.

3.3.2 Exclusion criteria

i. Children admitted at Lubango pediatric hospital whose caretakers declined to give an informed consent.

ii. Children less than 6 months and more than 59 months of age.

iii. Abandoned children.

iv. Children admitted in the intensive care unit (ICU) at Lubango Paediatric Hospital.

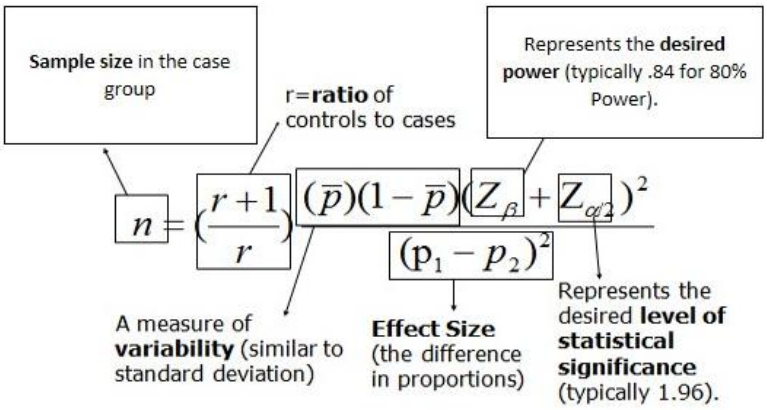
v. Children with chronic conditions that may cause edema namely malignancy, renal, heart or chronic lung disease, malabsorption, cerebral palsy and secondary malnutrition

3.4 Sampling

3.4.1 Sample size determination

Specifying an effect size of 4 means that we were interested in detecting strong effects. An informed guess is that, 20% of controls had SAM previously. We can use the informed guess about the proportion that are exposed to the risk factor in the control group P2=20% and the size of the effect that we want to be able to detect to calculate the proportion that will be exposed to the risk factor in the case group P1 assuming OR=4.0

For 80% power, Z_β=.84



For 0.05 significance level, Z_α=1.96

r=1 (equal number of cases and controls)

The proportion exposed in the control group is 20%

To get proportion of cases exposed:

$$p_{case\exp} = \frac{ORp_{controls\exp}}{p_{controls\exp}(OR-1)+1}$$

4(0.2) = 0.8 =0.5

0.2(4-1)+1 1.6

To calculate the mean exposure proportion

Mean proportion exposed= P exposed in case group + P exposed in control group

2

= 0.5+0.2= 0.35

2.0

To calculate the required number (n) of cases

$$n = (\frac{r+1}{r})\frac{(\bar{p})(1-\bar{p})(Z_{\beta}+Z_{\alpha/2})^2}{(p_1-p_2)^2}$$

n= (3) x 0.35(1-0.35)10.5 =40

2 (0.5-0.2)^2

Number of controls required=2x40=80

3.4.2 Sampling procedure

Cases

All children who met the inclusion criteria for cases were sampled from the study population.

The expected minimal sample size was about 40 children or more.

Controls

All children who met the inclusion criteria for controls were sampled from the study

population.

The expected minimal sample size was about 80 children or more

3.5 Data collection

3.5.1 Data collection tools and equipment

a) Data was collected using an interviewer administered structured questionnaire (Appendix 11). The respondents were the mothers/caretakers/guardians of children admitted at Lubango pediatric hospital.

b) Type and duration of illness and categorizing symptoms such as fever and cough among others

b) Anthropometric measurements such as weight, height/length and MUAC was also obtained from the study subjects. This was conducted using weighing scale, heightometer and pediatric MUAC tapes.

c) A pre- HIV test counselling was done to the caretakers and the ones who give consent, A HIV antibody test was conducted for the child using Determine and unigold followed by a post-test counselling for both the HIV positive and HIV negative children.

d) For children who had been admitted in the same Hospital, the file was found for confirmation of the diagnosis of the previous admission(s).

3.5.2 Recruitment and training of research assistants

Three nurses working in the nutrition departments at Lubango pediatric hospital were trained for two weeks on how to obtain an informed written consent, administer the study's questionnaire and reinforce their capacity to take anthropometric measures from the study participants and to collected data as research assistants.

3.5.3 Pre-testing questionnaire

The pretesting of the structured questionnaire was done among the subjects of similar characteristics in another hospital (Matala County's hospital) but the results were not included during the analysis.

3.5.4 Data collection procedures

Administration of the questionnaire

The principal investigator and research assistants conducted the study from Monday to Friday between 9 am to 4pm during the study period.

Anthropometric measurements

Anthropometric measurements were taken and analyzed as per criteria described by WHO 2006 as shown in table 3.1.

3.5.4.1 Height / Length

Measuring length

The equipment used for measuring length was Seca 210 mobile measuring mat from GYMO medical supply that has a measuring mat with a fixed headpiece and an easy slide foot piece. The measuring range is 10 99 cm with a precision of 5 mm. The length of children aged 6 - 23 months was measured recumbent. A suited place with an even surface was chosen to put the measuring mat on. The baby's head was put against the head top of the measuring mat and the baby's legs stretched out by pressing its knees down to the mat. The foot stop on the mat was then pushed up to the soles of the baby's heals, making it possible to record the body length to the nearest 0.5cm.

Measuring height

The equipment used for measuring height was KaWe Medizintechnikseit 1890. The height measurer has a moveable headpiece and can measure up to 200 cm with a 1mm increment. The height measurer was fixed at the top of a 200 cm long yardstick. The Height of children in the age 24-59 month was measured standing. The yardstick was

put against a flat and steady surface. The heels, buttocks, shoulder blades and head were pressed against the yardstick and the shoulders were level with both hands at the side. When the position is right, the headpiece was pushed down until it reached the head.
The measurement was recorded to the nearest 0.1cm.

Adjustments of length/height

In general, standing height is about 0.7 cm less than recumbent length. This difference was taken into account. Therefore, if a child less than 2 years could not lie down for measurement of length, standing height was measured instead and added 0.7 cm to convert it into length. If a child was 2 years or older could not stand, recumbent length was measured and converted into height (- 0.7 cm)

3.5.4.2 Mid Upper Arm Circumference

The researcher used a non- stretch measuring MUAC tape to the nearest 1 mm to measure MUAC. The child stood straight with the arms alongside the body. The left arm was bent at the elbow. The distance of the upper arm between the point of the bent elbow and the knob at the top of the shoulder was measured. The middle point of this distance was calculated and a mark made on the skin of the upper arm. At this mark, the circumference of the upper arm was measured with the arm relaxed on the side of the body. The measuring tape was fitted tightly but did not make a dent in the upper arm.
The measurement was recorded to the nearest 0.1cm (1mm)

3.5.4.3 Measuring weight

The equipment used for measuring weight was a Uniscale Seca 877 Floor Scale. The scale has adjustable feet so if the surface was uneven, the feet could be adjusted to make the scale straight. A window on the scale showed if the scale was level or not and there was a liquid, an air bubbles and a drawn circle. If the air bubble was inside the circle this was an indication that the scale was level, but if the air bubble was outside the circle the scale would not level and required to be adjusted. The weighing scale was put on a

suitable flat, even hard surface away from direct sunlight. Children who were< 2 years old or unable to stand were weighed by tarred weighing (WHO, 2006). First the mother was weighed and asked to remain in standing position on the scale. Then the scale was zeroed off by pressing the tare button. When zero appeared in the display, the child was given to the mother and the weight of the child appeared in the display. The weight was recorded to the nearest decimal fraction.

Children >2 years were measured alone standing on the scale with limited clothing and without shoes.

3.5.4.4 Administering questionnaire

The trained research assistants were introduced to the caretakers/guardians of the admitted children and a written consent was obtained in order to participate in the study. The caretaker was explained that a questionnaire would be administered and it would not take a long time but is not mandatory and a decline to participate in the study was not to affect the quality of care. During the interview a high level of confidentiality and privacy was observed.

3.5.4.5 Clinical assessment

A detailed medical history of the child and the family including prenatal, birth, post-natal, nutritional, development, family social, past medical, past and current symptom and duration was taken followed by a complete clinical examination from the general examination to the system by system examination as described by Swash and Glynn (2010) Which includes inspection, palpation, percussion and auscultation.

3.6 Data quality assurance

3.6.1 Reliability and accuracy

Reliability and accuracy of the questionnaire was ensured through a well-designed questionnaire and instruments were piloted. The pilot study was done in another referral hospital. This was done on 10% of the sample size. The research assistants were trained and

supervised to ensure completeness of questionnaires during collection and entry. The anthropometric measurement (weight, height and MUAC) were done correctly during pretesting of tools and thereafter during the study and data entry was done using unique identifiers in duplicate for validation and data collection was done in the database to ensure consistency.

3.6.2 Internal validity

The pretesting was done among the subjects of similar characteristics in another hospital (Matala County's hospital) to assess the validity of anthropometric measurements and administration of questionnaires.

3.6.3 External Validity

The validity of generalized (causal) inferences was not addressed as this was not causal effect relationship study.

3.7 Data management

3.7.1 Data entry and storage

Data entry was done in Microsoft access using unique identifiers in duplicate for Validation (double entry) and exported to SPSS version 21. The data wascleaned, cross-checked for entry errors and range checked. Data storage was done in flash disks and desktops while questionnaires sheets were kept in a drawer under lock and key.

3.7.2 Data analysis

The data was analyzed using SPSS Version 21 and descriptive statistics described the variables while categorical variables were compared using Chi square test. The bivariate statistics was done to establish association between SAM and the explanatory factors using Odd Ratio while logistic regression was used to determine the predictors of SAM. Logistic regression was performed on multiple variables hypothesized to explain association between clinical risk factors and SAM. Variables with $P < 0.05$ in the logistic regression were considered to have a significant association with SAM.A child

was classified as having SAM if they satisfied any of the WHO criteria as outlined below.

Table 3.1: The WHO Criteria on SAM (Anthropometrics measures)

Method	Criteria
MUAC	< 11.5cm
Weight-Height Z score	< -3SD
Clinical examination	Visible severe wasting Oedema of malnutrition

Table 3.2: Clinical Assessment Tool

Respiratory rate		Temperature		Pulse rate	
History			Examination		
Length of illness	_____days		In drawing	**Y□ N□ DK□**	
Cough ……..days	**Y□ N□ DK□**		Acidotic breathing	**Y□ N□ DK□**	
Difficulty in breathing	**Y□ N□ DK□**		Wheeze	**Y□ N□ DK□**	
Fever ……..days	**Y□ N□ DK□**		Sunken eyes	**Y□ N□ DK□**	
Diarrhea ……..days	**Y□ N□ DK□**		Bulging fontanel	**Y□ N□ DK□**	
Vomiting	**Y□ N□ DK□**		Stiff neck	**Y□ N□ DK□**	
Convulsions	**Y□ N□ DK□**		Jaundice	**Y□ N□ DK□**	
Difficulty feeding	**Y□ N□ DK□**		AVPU	**A□ V□ P□ U□ DK□**	
Edema	**Y□ N□ DK□**				

3.7.3 Data presentation

The frequency tables were used to present categorical variables. Descriptive statistics including mean, standard deviation, ranges, frequency distribution and proportions was done for different groups.

3.8 Ethical considerations

Ethical clearance was sought and obtained from the Medical Officers in charge of research at Lubango Paediatric Hospital and from the Provincial Ethical committee (Appendix III).

The study was explained to the caretakers/guardians of the admitted children and a written consent was obtained in order to participate in the study **(**Appendix I).

The benefits of the study were clearly explained to the guardians. As there were no anticipated harms, it was explained to the caretaker that participation in the study was important but not mandatory and a decline to participate in the study was not to affect the quality of care. All client information was handled with a high level of confidentiality and privacy and the data was used only for the study. During the interview, privacy and confidentiality was observed.

3.9 Study limitations

Participants were wary about the intent of the study and could be reluctant to divulge information about their life. The limited statistics on malnutrition in Angola was not assumed to be linearly related given the complexity of exposure risks and other contextual factors relevant to SAM. The generalizability of the study findings was limited as sample was limited.

CHAPTER FOUR

RESULTS

A matched case control study design was applied between august 2014 and October 2014 where a total of 163 participants (caregivers-child pairs) were recruited into the study. The cases were (53) severely malnourished children aged between 6 months and 59 months and the controls (110) were recruited concurrently from children admitted with other medical problems that were not clinically associated with malnutrition. The cases and controls were matched for age and sex among the study subjects.

4.1 Socio demographic characteristics of the care takers (respondents)

Majority 86(52.7%) of the respondents were single, lived in an urban setting 120 (73.7%), Christian 99(62.7%), self-employed 61(37.7%) and accessed information from a television 90(55.2%) However, 27(16.5%) had no education; majority had primary education while those with secondary education and tertiary education were 54(33.1%) and 5 (3%) respectively. The study subjects with an income of more than 50USD were 95(58%) while majority were self-employed 61(37.7%). Table 4.1

Table 4.1: Socio demographic characteristics of the care takers of the respondents

Characteristic		n(%)
Marital status	married	75(46.0)
	Single	86(52.7)
	Widowed	2(1.2)
Parent Alive	Father	9(6.5)
	Mother	129(93.5)
Residence	Rural	43(26.3
	Urban	120(73.7)
Access to Information	Radio	57(35)
	T.V	90(55.2)
	Others	16(9.8)
Religion	Christian	99(62.7)
	Tradition	59(37.3
Highest education	None	27(16.5)
	Primary	77(48.1)
	Secondary	54(33.1)
	Tertiary	5(3)
Occupation	Unemployed	47(29.0)
	Student	14(8.6)
	Self employed	61(37.7)
	Civil servant	17(10.5)
	Others	24(14.7)
Income	<50USD	68(41.7)
	51USD and above	95(58.3)

4.2 Socio-demographic characteristics of children recruited into the study

Most children recruited into the study were male 109(66.8%) and were not attending any schooling 154(94.4%). They were evenly distributed across the various birth orders with the majority being in the 2nd order 39(23.9%) and the least being those in the birth order of greater than four 24(14.7%). Table 4.2

Table 4.2: Distribution of socio-demographic characteristics of children recruited in the study

Characteristic		n(%)
Sex	Male	109(66.8)
	Female	54(33.2)
Family order	First	34(20.8)
	Second	39(23.9)
	Third	37(22.6)
	Fourth	29(17.7)
	Others	24(14.7)
Schooling		
	No	154(94.4)
	Yes	9(5.59)

4.3 Anthropometrics measurement of the children

The mean MUAC of children recruited was 12 (2) while the mean height and weight were 76 (10) cm and 8 (3) kg respectively. The mean (SD) age was 19(11) months.

Table 4.3: Distribution of anthropometrics measurement of the children

MUAC	Mean (SD)	12(2)
Weight	Mean (SD)	8.0(3)
Height	Mean (SD)	76.0(10)

4.4 Clinical characteristics of children recruited in the study

Among children recruited in the study 115(70.6%) had fever, 51(31.3%) were severely wasted, 8(4.9%) had lymphadenopathy, 72(44.2%) and 40(24.5%) had diarrhea and vomiting respectively and only 2(1.2%) had jaundice**.** Table 4.4

Table 4.4: Clinical characteristics of children recruited in the study

Characteristic		n(%)
Severe wasting	No	112(68.7)
	Yes	51(31.3)
Lymphadenopathy	No	155(95.1)
	Yes	8(4.9)
Jaundice	No	161(98.8)
	Yes	2(1.2)
Stiff Neck	No	144(88.3)
	Yes	6(3.7)
Bulging fontanels	No	146(97.3)
	Yes	4(2.7)
Vomiting	No	123(75.5)
	Yes	40(24.5)
Diarrhea	No	91(55.8)
	Yes	72(44.2)
Dehydration	No	120(73.6)
	Yes	35(21.5)
Fever	No	48(29.4)
	Yes	115(70.6)
Cough	No	40(24.5)
	Yes	123(75.5)
Difficulty feeding	No	101(62.0)
	Yes	62(38.0)

4.5 Child's past medical history

Among children recruited in this study, 90(55.2%) had history of previous admission with the majority, 32(41%) having a past history of two admissions. Of those with

previous admissions, 44(27%) and 46(28.2%) were admitted previously for pneumonia and diarrhea respectively and only 16(9.8%) with past medical admission of SAM.

Table 4.5: Distribution of child past medical history

Characteristic		n(%)
History of previous admission	Yes	90(55.2)
	No	73(44.8)
Past admission with pneumonia	Yes	44(27)
	No	119(73)
Past admission with malaria	Yes	33(20.2)
	No	130(79.8)
Previous admission with diarrhea	Yes	46(28.2)
	No	117(71.8)
Previous admission with anemia	Yes	7(4.3)
	No	156(95.7)
Previous admission with malnutrition	Yes	16(9.8)
	No	147(90.8)
If previous admission how many	1	25(34)
	2	32(41)
	3	10(14)
	4	3(4)
	>4	3(4)
HIV Test	Negative	147(94.8)
	Positive	8(5.1)

4.5.1 Distribution of diagnosis at admission among the children

Findings from the study indicate100(86.2%)of children admitted in the study had severe pneumonia, 14(12.1%) had unclassified pneumonia while 76(78.4%) and 90(75.6%) had mild skin lesions and mild anemia respectively

ole 4.6: Distribution of diagnosis at admission among children

Diagnosis at admission	Classification	n(%)
Pneumonia	Very severe	2(1.7)
	Severe	100(86.2)
	Unclassified	14(12.1)
Skin Lesion	Mild	76(78.4)
	Moderate	12(12.4)
	Severe	9(9.3)
Anemia	Mild	90(75.6)
	Moderate	19(16.0)
	Severe	10(8.4)

4.5.2 Immunization among the children

Majority of the children 99 (60.7%) were immunized as per the expanded program for immunization (EPI) schedule, while 31(47%) had missed measles vaccine, 19(28.8%) missed pentavalent and 16(24.2%) missed oral polio.

Table 4.7: Immunization among the children

Immunization up to date	n(%)
No	64(39.3)
Yes	99 (60.7)
Missed Immunization	
Oral Polio	16(24.2)
Pentavalent	19(28.8)
Measles	31(47.0)

4.6 Complementary feeding practices among the children

4.6.1: Distribution of main foods introduced among children

Majority of the children 81(51.5%) consumed fruits while 71(43.6%) had mashed potatoes. The least types of complimentary feeds used were cow's milk and porridge at 4(2.5%).

Table 4.8: Distribution of main foods introduced among children

Main foods introduced	n(%)
Cow's milk	4(2.5)
Mashed Potatoes	71(43.6)
Porridge	4(2.5)
Fruits	81(51.5)

4.6.2: Number of meals among the children

The study findings indicate that 124(76.1%) of children received three meals in a day while those who received two meals and one meal a day represented 21(12.9 %) and 4(2.5%) respectively.

Table 4.9 Number of Meals among the children

Number of meals	n(%)
One	4(2.5)
Two	21(12.9)
Three	124(76.1)
Four	7(4.3)
Five or more	7(4.3)

4.6.3: Age at breastfeeding stoppage among the children

Majority 51(31%) of the children recruited in the study stopped breastfeeding at 25- 40 months while those who stopped at 7-12 months and less than 6 months were 47(28.8 %) and 12(7.4%) respectively

Table 4.10: Distribution of child's age at stoppage of breastfeeding

Age at stoppage of breastfeeding (months)	n(%)
<6	12(7.4)
7-12	47(28.8)
13-18	26(16.0)
19-24	27(16.6)
25-40	51(31.3)

4.7: Food sources and consumption among caretakers of children

4.7.1 Food sources among caretakers of the children

Majority 132(83.5 %) of the study participants got food stuffs from the farms while 26(16.5%) obtained foods from the markets.

Table 4.11: Distribution of food sources among caretakers of the children

Source of food	n(%)
Farm	132(83.5)
Market	26(16.5)

4.7.2: Consumption of Nuts and seed foods grown among the children

The study findings indicate that majority 44(27.8%) of the children were consuming other nut pastes while 36(22.8%) and 23(14.6%) were taking groundnut paste and Soaked or germinate seeds such as sesame respectively with a small number of children 6(3.8%.) were given sunflower

Table 4.12: consumption of nuts and seed foods among children

Nuts and seeds groups	n(%)
Groundnut paste	36(22.8)
Melon seeds	13(8.2)
Other nut pastes	44(27.8)
Pumpkin	36(22.8)
Soaked or germinate seeds such as sesame	23(14.6)
Sunflower	6(3.8)

4.7.3: Consumption of Protein foods among the children

The most common reported source of protein foods was Chickpeas 41(27 %) and cow peas 29(19.1%) while the least reported proteins consumed was kidney 6(3.9%).

Table 4.13: Consumption of Protein foods among the children

Food	n(%)
Chickpeas	41(27.0)
Beans	19(12.5)
black-eyed peas	23(15.1)
cow peas	29(19.1)
Kidney	6(3.9)
Lentils	11(7.2)
lima beans	23 (15.1)

4.7.4: Consumption of Fruits among children

The most commonly consumed fruits reported were bananas, orange and papaya at 52(32.7 %), 51(32.1%) and 27(17.1%) respectively.

Table 4.14: Consumption of Fruits among children

Fruits	n(%)
Banana	52(32.7)
Mango	24(15.1)
Orange	51(32.1)
Papaya	27(17.0)
Peach	5(3.1)

4.7.5: Consumption of Green leafy and yellow colored vegetables among children

Majority of children admitted in the study 46(29.1 %) could take pumpkins at least once a week while 34(21.5%) and 30(19 %) were taking chard and sweet potatoes respectively

Table 4.15: Consumption of Green leafy and yellow colored vegetables among children

Green leafy and yellow colored vegetables	n(%)
Broccoli	13(8.2)
Carrots	19(12.0)
Chard	34(21.5)
Pumpkin	46(29.1)
Spinach	16(10.1)
Sweet potatoes	30(19.0)

4.7.6. Consumption of milk products among children

Majority of children from our study 71(44.1 %) could get cow's milk while 60(37.3%) consumed yoghurt, 28(17.4%) received other milk products and only 2(1.2 %) could get cheese.

Table 4.16: Consumption of milk product s among children

Type of milk	n(%)
Cheese	2(1.2
Cow Milk	71(44.1)
Other milk products	28(17.4)
Yoghurt	60(37.3)

4.7.7: Consumption of starchy foods, roots and cereals among children

Majority 80(49.4 %) of the children among the study participants could consume breadfruit, 123(75.9%) were getting potatoes and 90(55.6%) consume rice from the cereals category.

4.17: Consumption of starchy foods, roots and cereals among children

Starch foods		**n(%)**
	Breadfruit	80(49.4)
	Plantain	67(41.4)
	Animal	14(8.6)
	Non	1(0.6)
Roots		
	Cassava	37(22.8)
	Arrow roots	2(1.2)
	Potatoes	123(75.9)
Cereals		
	Rice	90(55.6)
	Maize	5(3.1)
	Millet	35(21.6)
	Quinoa	16(9.9)
	Wheat	16(9.9)

4.7.8: Consumption of flesh among children

Majority of the children 64(39.7%) consumed meat, 44(27.3%) could get chicken at least one a week, while 28(17.4%) only could consume liver from the flesh category.

Table 4.18: Consumption of flesh among children

Flesh	n(%)
Chicken	44(27.3)
Eggs	25(15.5)
Liver	28(17.4)
Meat	64(39.7)

4.8 Bivariate logistic regression among the various variables and severe acute malnutrition

4.8.1 Socio-demographic factors associated with severe acute malnutrition

In the bivariate analysis, children whom their caretakers were single had 3 times increased odds of SAM (95% CI 1.50 – 6.15; P =0.002) compared to those who were married. Children whose respondents lived in urban settings when compared to rural ones had decreased odds of SAM (OR 0.16; 95% CI 0.08 – 0.35; P<0.001). All other socio-demographic factors were not significantly associated with severe malnutrition.

Table 4.19: Association between socio-demographic factors and SAM

		Severe (n=3)	Non-severe(n=110)	Odds ratio	95%Cl		P value
Marital status	Married	15(28.3)	60(54.5)	1.00			0.002
	Single	38(71.7)	50(45.5)	3.04	1.50	6.15	
Parent alive	Father	2(4.2)	7(7.8)	1.00			0.397
	Mother	46(95.8)	83(92.2)	1.94			
					0.39	9.73	
	Rural	27(50.9)	16(14.5)	1.00			<0.001
Residence	Urban	26(49.1)	94(85.4)	0.16			
					0.08	0.35	
	Radio	17(32)	40(36.3)	1.00			0.426
Access to information	TV	33(62.2)	57(51.8)	1.40			
	Others	3(5.6)	13(11.8)	0.68	0.68	2.89	
					0.17	2.77	
	Christian	37(72.5)	62(57.9)	1.00			0.072
Religion	Traditional	14(27.5)	45(42.1)	0.52			
					0.25	1.08	
	None	10(18.8)	17(17)	1.00			0.117
Highest education	Primary	30(56.6)	47(42.7)	1.02			
	Secondary	13(24.5)	41(37.2)	0.47	0.14	2.55	
	Tertiary	0(0.0)	5(4.5)	1.00	0.17	1.30	
	Unemployed	16(30.1)	31(28.1)	1.00			0.900
Occupation	Student	6(11.3)	8(7.2)	1.45			
	Self employed	18(33.9)	43(39)	0.81	0.43	4.91	
	Civil servant	6(11.3)	11(10)	0.81	0.36	1.84	
	Others	7(13.2)	17(15.4)	0.85	0.24	2.69	
	<50USD	25(47.2)	43(39.1)	1.00	0.29	2.48	0.328
Income	60 – 100USD	28(52.8)	67(60.9)	0.72	0.37	1.39	

4.8.2: Association between children characteristics and severe acute malnutrition

There was a significant association between family order and the risk for SAM. The second order children had increased odds of SAM by 3.47 times (95% CI 0.1.25 – 9.62;

P =0.053).All other children characteristics were not significantly associated with severe malnutrition.

Table 4.20: Association between children characteristics and SAM

		SAM (n=53)	No SAM(n=110)	Odds ratio	95%Cl		P value
Sex	Male	34(64.1)	75(68.1)	1.00			0.661
	Female	19(35.8)	35(31.9)	1.17	0.58	2.37	
Family order	First	8(15.1)	26(23.6)	1.00			0.053
	Second	20(37.7)	19(17.2)	3.47	1.25	9.62	
	Third	11(20.8)	26(23.6)	1.38	0.47	3.99	
	Fourth	6(11.3)	23(20.9)	0.85	0.26	2.84	
	Others	8(15.1	16(14.5)	1.67	0.52	5.37	
Schooling	No	52(98.1)	102(92.7)	1.00			0.123
	Yes	1(1.9)	8(7.3)	0.25	0.03	2.01	
Breastfeed duration	Mean (SD)	14(6)	15(7)	0.96	0.91	1.02	0.153

4.8.3 Nutritional factors associated with severe acute malnutrition among children

There were no nutritional factors that were significantly associated with SAM. However, compared to households that got their food from the farm as the reference group, children from households that got food from the market had an increased odds of SAM by 1.75 times (CI= 95% 0.74 – 4.15).

Table 4.21: Bivariate logistic regression for nutritional factors associated with SAM

		Severe (n=53)	**Non-severe(n=110)**	**Odds ratio**	**95%Cl**		**P value**
Food	Cow's milk	6(11.5)	7(6.5)	1.00			0.509
	Mashed potato	34(65.4)	68(63.6)	0.58	0.18	1.87	
	Porridge	12(23.1)	30(28.0)	0.47	0.13	1.68	
	Fruits	0(0.0)	2(1.9)	-			
Number of meals / day	One	3(5.7)	1(0.9)	1.00			0.266
	Two	5(9.4)	16(14.5)	0.10	0.01	1.24	
	Three	43(81.1)	81(73.6)	0.18	0.02	1.75	
	Four	2(3.8)	5(4.5)	0.13	0.01	2.18	
	>five	0(0.0)	7(6.4)	-			
Food source	Farm	39(78.0)	93(86.1)	1.00			0.210
	Market	11(22.0)	15(13.9)	1.75	0.74	4.15	

4.8.4 Clinical risk factors associated with sever acute malnutrition

Of the clinical risk factors studied, only immunization status, previous diagnosis of malaria and anemia were not significantly associated with severe acute malnutrition. The HIV test results were significantly associated (P<0.015) with SAM. With negative results as the reference group, children who tested positive had increased odds of up to 6.38 times (95% CI 1.24 – 32.82). When compared to those who reported no previous diagnosis as the reference group, children with a previous diagnosis of pneumonia, diarrhea and malnutrition had a significantly increased odds of severe malnutrition by 2.17 (95% CI 1.06 – 4.45; P =0.035), 7.66 (95% CI 3.59 – 16.37; P<0.001) and 11.59 (95% CI 3.14 – 42.83; P<0.001) times respectively.

Table 4.22: Association between clinical risk factors and sever acute malnutrition

		Severe (n=53)	Non-severe(n=110)	Odds ratio	95%Cl		P value
Immunization up to date	No	23(43.4)	41(37.3)	1.00			0.455
	Yes	30(56.6)	69(62.7)	0.78	0.40	1.51	
HIV test result	Negative	47(88.7)	100(90.9)	1.00			0.015
	No	0(0.00)	8(7.2)	-			
	Positive	6(11.3)	2(1.8)	6.38			
	Yes	8(15.1)	25(22.7)	0.60	1.24	32.82	0.247
Malaria	No	45(84.9)	85(77.3)	1.00	0.25	1.45	
	Yes	20(37.7)	24(21.8)	2.17			0.035
Pneumonia	No	33(62.3)	86(78.2)	1.00	1.06	4.45	
	Yes	30(56.6)	16(14.5)	7.66			<0.001
Diarrhea	No	23(43.4)	94(85.5)	1.00	3.59	16.37	
	Yes	2(3.8)	5(4.5)	0.82			0.818
Anaemia	No	51(96.2)	105(95.5)	1.00	0.15	4.39	<0.001
	Yes	13(24.5)	3(2.7)	11.59	3.14	42.83	
Malnutrition	No	40(75.5)	107(97.3	1.00			

4.9 Multivariate model for significant predictors of Severe Acute malnutrition

The significant predictors of severe malnutrition were family order, HIV test results, previous history of admission with diarrhea and malnutrition, duration of breast feeding and number of previous admissions.

Table 4.23: Multivariate model for predictors of severe acute malnutrition

		OR	**95%Cl**		**P value**
Family order	First	1.00			
	Second	90.65	2.96	2776.89	0.01
	Third	1.88	0.10	34.86	0.672
	Fourth	6.08	0.13	289.70	0.36
	Others	13.07	0.55	311.37	0.112
HIV Test	Negative	1.00			
	Positive	20.95	1.09	404.42	0.044
Diarrhoea	Yes	1.00			
	No	0.05	0.01	0.44	0.007
Malnutrition	Yes	1.00			
	No	0.01	0.00	0.19	0.003
No. of previous admissions		2.95	1.08	8.08	0.036

CHAPTER FIVE

DISCUSSION

5.1 Socio economic demographic characteristics among the respondents

5.1.1 Socio economic demographic characteristics among the caretakers of children

The study findings indicate that majority of the respondents were single 52.7% (86), lived in an urban setting 73.7% and are Christians 62.7%, similar with data from studies done elsewhere which has shown that in developing countries the majority of caregivers in pediatric wards of public hospitals are often single mothers and from low-income household (Tupasi et al ,1990 ; Turyashemererwa Kikafunda and Agaba, 2009). The results from our study, indicate that marital status and residence were significantly associated with SAM consistent with work done in other developing countries which showed association between being the child of a single mother and SAM among children under 5 years (Shinjini *et al*, 2009). And between SAM and rural dwelling (Tupasi et al, 1990). From the current study findings, the self-employed are 37.7% and those with an income of more than 50USD are 58%, probably because a good number of caretakers in Angola are the mothers of the patient and are not in any formal employment, making it quite challenging for them to estimate their monthly income. Findings from other studies reveal that married women are 1.22 times more likely to initiate breastfeeding and that monthly income is a predictor of breastfeeding outcomes and may be as well a predictor of the nutritional status of the child (Dennis et al , 2002; Millar & Maclean, 2005). Majority of the respondents lived in urban areas and had at least primary education, which we think may be justified by the fact that the hospital is situated in an urban setting and the majority of patient come from the area surrounding the hospital and for some reasons are more educated then the rural dwellers.

In the current study majority of the caretakers had primary education while 16.5% had no education. Maternal education has been associated with a decrease in under-five mortality with children of better educated mothers tending to be healthier as demonstrated in a study by Canagaraja, Ngwafon and Thomas (1997). This might be explained by the fact that a parent who has higher education might have more knowledge of a balanced dietary intake for the family in regard to improving the nutritional status of their children and the family in general. Educational levels of mothers in Ghana and India with severely malnourished children were lower than that of parents with healthy children, showing that female education had a positive and statistically significant effect on a child's nutritional status. Education builds the consciousness among mothers, which increases the mothers and child healthcare seeking behavior. Mothers with post-secondary schooling had fewer malnourished children than mothers with primary and secondary schooling and mothers that were better educated fed their children better, as it was demonstrated in other studies where there was a positive correlation between low maternal education, socioeconomic status and SAM (Radebe *et al*., 1996; Ayele & Peacock, 2003; Glewwe, 2005; Abuya *et al*., 2011; Chakraborty *et al* ., 2006*;* UNHCR 1999).

Findings from this study suggest there was no significant association between maternal education and SAM, however, compared to children of women who had no education, children of mothers who had secondary education had a 50% reduced risk for SAM although this reduction was not significant. We hypothesis that the absence of this association might be linked to limited power in the study due to limited sample size.

The present study also differs from study by Ashworth, (2004) where they found that educational level of the parents had a direct impact on the nutritional status of children. In their study they observed that parent education had a significant effect on nutritional status of children.

5.1.2 Demographic characteristics among the children

Among children recruited in this study, the majority were male 66.8% (109) and not attending any schooling94.4% (154)., mainly due to the fact that our study included only children less than 5 years who have more likely not started schooling. Similar results were found in a study conducted in Sudan by Abubaker et al, (2011) among children the same age. Findings from studies in Uganda, Demographic Republic of Congo and another one in Zambia have demonstrate that under-nutrition is prevalent among boys than girls (Olwedo *et al*., 2008; Emina, Kandala and Imungo, 2009). These suggest that boys are probably more vulnerable to malnutrition than girls. Similar results were found in a study in Bangladesh among children younger than 4 years old, where poor nutritional status was directly associated with the gender of the child with more male children being malnourished compared to girls

From this study the majority of the children were the 2nd order 23.9% and the least being those in the birth order of greater than four, which is in concordance with the current trend in modern African's urban society where people tend to use more and more family planning methods and limiting the number of children. Characteristics that were found to contribute to child malnutrition in the different regions ranged from the age of the child or the caregiver, family size and income and the caregivers education underlying clinical conditions (Mahgoub and Adam 2012; Emina, Kandala and Imungo, 2009).

5.1.3 The clinical characteristics of the children recruited in the study

Our findings on fever, severe wasting, lymphadenopathy and diarrhea and vomiting as the common presenting signs and symptoms are in keeping with the epidemiological disease trends in most pediatric hospitals in Angola and Africa in general where the majority of patient in pediatric ward have febrile illness (principally Malaria and Pneumonia) followed by acute diarrheal diseases while very few have enlarged lymph nodes or jaundice.

Among children recruited in this study, 55.2% had history of previous admission, the majority 41% with past history of two admissions, 27% and 28.2% admitted previously

for pneumonia and diarrhea respectively and only 9.8% with past medical admission of SAM. Probably due to the fact that malnutrition may be the cause or the consequence of recurrent admission with children with recurrent admission being prone to malnutrition and malnourished children being at risk of consecutive admissions.

Among children recruited in the study 100(86.2 %) had severe pneumonia,12 % were having unclassified pneumonia while 76 (78.4) had mild skin lesions and 19.0% moderate pallor. The majority of the children 60.7% were immunized as per the Angola National immunization schedule, 47% had missed measles vaccine while 28.8% and 24.2% had missed pentavalent and oral polio respectively. This finding differs with those of Kenya Demographic and Health Survey which reported an overall vaccination of 77% of children aged 12-23 months in Kenya (KDHS, 2014).

5.2 Complementary feeding and dietary practices among children

5.2.1. Dietary practices among children of the caretakers

Majority of the children consumed fruits, mashed potatoes and porridge, reflecting the food types available in the region consistent with findings from other studies, however, while these food types might have been available the quality of the child's diet - how they were introduced or served (as a balanced diet or not) has been reported to be affected by care and physical environment (Girma & Genebo, 2002). Consequently, such dietary practices with low consumption of animal source foods have been shown to contribute to delayed growth in children (Glewwe, 2005). While our findings indicate that 76% of he children had three meals a day, optimal nutrition is often influenced by the quantity and quality of food provided that lead to long-term nutritional benefits resulting to greater protection against malnutrition and disease in the children (Vennemann *et al*., 2009; Bowatte *et al.*, 2015).

A study conducted in Bangladesh showed that children whose frequency of food intake was <3 times/day were more than 5 times as likely to be acutely malnourished. The

mother's knowledge and attitude regarding child feeding might play an important role in child's eating frequency and behavior. Studies from Cambodia and Kenya suggest parallel results. Dietary intake <3 times is associated with SAM, and this is consistent with the findings that optimum feeding of infants and young children is important for health, growth, and development. Good feeding practices prevent malnutrition and early growth retardation and reduce the severity of infections (Ashworth, 2004).

Further, initiating breastfeeding within the first hour of the newborn's life is an important factor for continuous breast feeding (Di Girolamo et al., 2008). The early introduction within the first hour after birth has an impact on maternal infant attachment and breastfeeding duration (Blyth et al, 2002). While findings from other studies reveal that breastfeeding provides optimal nutrition and is associated with a reduction in risk for infections such as acute otitis media and death (Vennemann *et al*., 2009; Bowatte *et al*., 2015). In this study, 28%stopped breastfeeding at 7-12 months while 7.4 % stopped breastfeeding at less than six months. These findings suggest that early termination of breastfeeding with poor dietary practices may be some of the contributing factors for to the high severe acute malnutrition rates seen in Angola. In fact, early breastfeeding cessation has been demonstrated to be a risk factor for SAM (Wiedermann et al, 1996), which led the WHO to recommend exclusive breastfeeding for the first 6 months of life for optimal growth and development (WHO, 1999). However, the Swedish National Food Agency has also stated that parents may offer their infant minor bites of solid food from four months of age, although in such a small amount that it does not interfere with breastfeeding (WHO, 2015).

5.2.2 Food consumed among children

We have demonstrated variation in the access of sources of proteins with a fifth of the children accessing nut pastes, peas and pumpkin seeds while only 3% had access to sunflower oil/seeds. While these findings suggest that the Angola food market offers a significant variety of nuts, it also confirms that food access may be affected by market conditions, but also by cultural and religious practice as has been shown in other

countries with seasonality in malnutrition being reported in most demographic health surveys (IFPRI, 2005). The Food and Agriculture Organization of the United Nations also reports that the availability of Food is affected not only by seasonality but also by other factors related to family culture and socio- economic as well as socio-demographic conditions.

The increased number of children in families place a heavy burden on the scarce household resources, particularly on financial and food; it also reduced the time and quality of care received by the children. Although the third and those born beyond the fourth order had increase odds of severe malnutrition, this increase of 1.38 (95% CI 0.47 – 3.99) and 1.67 (95% CI 0.52 – 5.37) respectively was not significant.

Of the nutritional factors and the complementary feeding practice studied, none were significantly associated with severe malnutrition. However, compared to households that got their food from the farm children from households that got food from the market had an increased odds of SAM. Although it is known from other studies that low consumption of animal sources foods contribute to delayed growth in children (Glewwe, 2005), almost all children recruited in the current study could at least consume foods from each one of the main categories studied, reflecting the large variety and availability of food offered by the current huge modern food market. However, reports from FAO indicate that even if people get enough food to eat, good nutrition requires sufficient, safe and nutritious food supply to meet daily requirement (FAO, 2008).

Findings from this work are consistent with wider literature from developing countries that show that child nutrition outcomes have large rural-urban disparities over the last few decades (Van de Poel, Donnell &Van, 2007). In Ethiopia, increasing SAM is a driven and characterized by the urban-rural differences (Heinkens et al, 2008), as it was the case in the current study

5.3 Clinical characteristics associated with SAM

Of the clinical risk factors studied children with a previous diagnosis of pneumonia, diarrhea and malnutrition had a significantly increased odds SAM. This is consistent

with other studies that report frequent illness undermines child growth, reduce appetite, decrease absorption of nutrient from the intestine and increase metabolic rate. A study conducted by Ruwan, Casie and Mark (2012) showed a significant association between previous for diarrhea and fever with SAM (Mahgoub, Nnyepi and Bandeke, 2006). Recurrent infection may be associated with poor food quality or breastfeeding practice as has been shown in other studies. Good breastfeeding practices provides optimal nutrition and are associated with reduction in risk for infections such as acute otitis media and death (Vennemann *et al*., 2009 ;Bowatte *et al*., 2015). It may as well reduce breast and ovarian cancer for the mother (Vennemann *et al*., 2009) .

In the current study, a significant association was observed between a history of previous admission principally with a diagnosis of pneumonia, diarrhea /dehydration, and HIV positive children and the risk of severe acute malnutrition. Although it is difficult to establish whether the malnutrition led to illness or the illness led to a decline in immunity, decreased appetite, increased basal metabolism and consequently Severe Acute Malnutrition. On the other hand, stunted growth and related immunosuppression may lead to intermittent fever. A study by Ashworth and Khanum, Jackson and Schofield (2006) reported that frequent illness undermines child growth, reduce appetite, decrease absorption of nutrient from the intestine and increase metabolic rate. Similarly a study conducted by Ruwan, Casie and Mark (2012) showed a significant association between diarrhea, fever, SAM and pneumonia (Mahgoub, Nnyepi and Bandeke, 2006).

Conclusion

1. Among the socio demographic factors, poor breastfeeding practice, single mother and living in rural area are risk factors for SAM in children between 6 to 59 months admitted at Lubango Pediatric Hospital.
2. Clinically, previous admission, principally with diarrhea, pneumonia, SAM and HIV positive status were identified as risk factors for SAM in this study.

3. Although a wide variety of food types were available access might be affected by availability in the farms and markets but also the ability to pay more so for a greater proportion of the study population who earned less than 50 dollars.

4. The nutritional education to promote consumption of nutritious food that includes all the food groups and in the right quantities to meet the daily nutritional requirements is essential.

Recommendations

1. There is need to explore the periods of breastfeeding even after weaning and to promote good breastfeed and complimentary feeding practices.

2. There is need to identify the most at risk mothers/caretakers of SAM children who include no or primary level education, income of less than 50 dollars and from a rural setting who might require additional nutritional advice/education.

3. Clinically children who have been previously admitted with diarrhea, pneumonia, SAM and HIV positive status need to be identified to be screened early for malnutrition as a routine practice to avoid deterioration in to SAM.

4. There is need for nutritional education to promote consumption of the right food groups and in the right amounts that supply the required nutritional dietary requirements for optimum growth for infants and young children.

5. Additional research is required to explore the socio-cultural factors and beliefs at the community level that promote good breastfeeding and nutritional practices to help design optimal nutritional interventions.

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APPENDICES

Appendix I: Consent form

Study title:

Risk factors associated with SAM among children admitted at Lubango pediatric hospital-Angola.

Introduction

I am Francisco Ketha from Jomo Kenyatta university of Agriculture and Technology conducting a study concerning risks factors associated with SAM among children admitted at Lubango

pediatric hospital- Angolaand want to offer you the opportunity to be part of it.

Study procedures

Being in the study is your choice

This consent form gives you information about the study, the risks and benefits and the process that will be explained to you. Once you understand the study and if you agree to take part, you will be asked to sign or make your mark on this form and you will be given a copy. Before you learn about the study, it is important you know the following:

Your participation in this study is entirely voluntary.

You may decide to withdraw from the study at any time, without facing any consequences.

Purpose of the study

The purpose of the study is to establish risk factors associated with SAM among children

Admitted at Lubango pediatric hospital-Angola.

The study will involve:

If you are willing to be part of the study, i will ask you some questions about your child.

Risks and/or discomforts

You will be requested to avail yourself for an interview at a place that you are most comfortable. You may become worried or anxious about discussing the child mmatters. I

will make every effort to protect your privacy and confidentiality while you are participating in the study.

Benefits

Even if you does not directly benefit from this study you will know that your participation in the study will help to improve the quality of life in future.

Cost

Being in the study will be done at no cost to you and no money will be paid to you for participating in this study

Privacy and confidentiality

Every effort will be made to keep the information you provide confidential. You will be identified only by a code and personal information from the interview. If you ever have questions about this study contact: **Principal Investigator**, Francisco from Jomo Kenyatta University of Agriculture and Technology.

Cell phone no: 0774140966 Email:bhaibbyketha@yahoo.fr

Appendix II: Structured questionnaire

A. <u>Socio – Demographic characteristics of the caretaker</u>:

1) Age in ……. years

a) Marital status:

b) Married

c) Single

d) Divorced

e) Widowed

2) How are you related to the child?

a) Mother

b) Father

c) Step mother

d) Sister

e) Maternal grand mother

f) Maternal grand father

g) Others(specify)----------

3) Number of the children ----------

4) Parent alive

a) Father

b) Mother

c) Both

5) Residence

a) rural

b) urban

6) Access to information

a) Radio

b) TV

c) Newspaper

d) Others (specify) ----------

7) Religion:

a) Christian

b) Muslim

c) Traditional

d) Others(specify)----------

8) Highest Education:

a) None

b) Primary

c) Secondary/ Technical

d) Tertiary

9) Occupation:

a) Unemployed

b) Student

c) Self – Employed

d) Civil servant

e) Others(specify)----------

10) What is your income level per month

a) Below 50 USD

b) Above 50 USD

D. Child's Socio-demographic and Anthropometric information

11) Age ----------Months

12) Child's height ---------cm

13) Child's weight --------kg

14) Child's MUAC-------cm

15) Child's weight height Z score-------SD

16) Sex

a) Male

b) Female

17) Family order

a) 1st

b) 2nd

c) 3rd

d) 4th

e) Others (specify) ----------

18) Schooling

a) yes

b) No

19) Immunization upto date per Angola national schedule

a) yes

b) No

20) If no against which immunization

a) Oral polio

b) Pentavalent .

c) Measles

21) Upto what age did you exclusively breastfeed your child _____

22) What were the main foods that you introduce to your child

a) Cows milk

b) Mashed potatoes

c) Porridge

d) Fruits

23) At age did you completely stop breastfeeding _____

24) Where do you get the food served in the family

a) From the farm

b) Buy from the market

25) Number of meals in day that the rest of the family has

a) One

b) Two

c) Three

d) Four

e) >=five

C. Clinical risk factors for Malnutrition among the children

26) Is there visible severe wasting

a) yes

b) No

27) Is there oedema of malnutrition

a) None

b) Foot

c) Knee

d) Face

28) If oedema yes since how long-------days

29) How is the child's appetite

a) None

b) Poor

c) Good

30) Does the child have any skin lesions(broken skin, fissures, flaking of skin)

a) 0 +

b) ++

c) +++ (raw skin, fissures)

31) Eye signs for malnutriton

a) None

b) Bitot's spots

c) Pus/Inflammation

d) Corneal clouding

e) Corneal ulceration

32) Was the child dehydrated at admission

a) yes

b) No

33) Did the child have lymphadenopathy at admission

a) yes

b) No

34) Did the child have pallor at admission/today

a) 0 (None)

b) + (Mild/moderate)

c) ++ (Severe)

35) Did your child have any of the following signs and symptoms at admission?

Circle Y if Yes, N if No and DK if Don't know

Respiratory rate		Temperature		Pulse rate	
History			Examination		
Cough ……..days	**Y□ N□ DK□**		Sunken eyes	**Y□ N□ DK□**	
Difficulty in breathing	**Y□ N□ DK□**		Wheeze	**Y□ N□ DK□**	
Fever ……..days	**Y□ N□ DK□**		Bulging fontanelle	**Y□ N□ DK□**	
Diarrhoea ……..days	**Y□ N□ DK□**		Stiff neck	**Y□ N□ DK□**	
Vomiting	**Y□ N□ DK□**		Jaundice	**Y□ N□ DK□**	
Difficulty feeding	**Y□ N□ DK□**				

36) What are the reasons for the present admission?

a) Malaria; □severe □ non severe □ unclassified

b) Pneumonia; □severe pneumonia □ very severe pneumonia □ unclassified

c) Diarrhoea/dehydration □ some □ severe □shock

d) Anaemia □non-severe □ severe

e) Malnutrition □Marasmus □Kwashiokor □Marasmic-Kwash □Mild □Moderate □ severe

f) Meningitis

g) HIV

37) Has the child ever been admitted in the past?

a) yes

b) No

38) If yes for how long ----------days

39) Number of previous admissions----------

40) What are the reasons for the previous admission?

a) Malaria; □severe □ non severe □ unclassified

b) Pneumonia; □severe pneumonia □ very severe pneumonia □ unclassified

c) Diarrhoea/dehydration □ some □ severe □shock

d) Anaemia □non-severe □ severe

e) Malnutrition □Marasmus □Kwashiokor □Marasmic-Kwash □Mild □Moderate □ severe

f) Meningitis

g) HIV

h) Other (specify)

41. Please tick from items in column B the common (given at least once a week) complimentary foods daily diet the child eats.

Broad food category	**Sub food types (B)**
Staple foods	
	Cereals: rice, wheat, maize, millet, quinoa
	Roots: cassava, potato
	Starchy fruits: plantain, breadfruit, Animal
Animal- source foods	
	Liver, meat, chicken, fish, eggs
Milk products:	
	Cheese, yoghurt, curds (and milk for non-breastfed)
Green leafy and yellow coloured vegetables	Spinach, broccoli, chard, sweet potatoes, carrots, pumpkin
Fruits:	Banana, orange, guava, mango, peach, papaya
Pulses:	Chickpeas, lentils, cow peas, black-eyed peas, kidney beans, lima beans
Nuts and seeds:	Groundnut paste, other nut pastes, soaked or germinated seeds such as sesame, pumpkin, sunflower, melon seeds

APPENDIX III: Ethical approval

REPUBLIC OF ANGOLA
PROVINCIAL GOVERNMENT OF HUILA
PIONEER ZECA PEDIATRIC HOSPITAL
RESEARCH, ETHIC AND TRAINING SERVICES

Dr. Ketha Rubuz Francisco
JOMO KENYA UNIVERSITY OF AGRICULTURE
AND TECHNOLOGY
INSTITUTE OF TROPICAL MEDECINE/NAIROBI/KENYA

RESEARCH PROPOSAL: Risk factors for severe acute malnutrition among children 6 to 59 months admitted to Pioneer Zeca Pediatric Hospital/Lubango/Angola

This is to inform you that the Pioneer Zeca Pediatric Hospital research and ethics department has reviewed and approved your above proposal.
The approval periods are between 10 of May 2014 to 11 of June 2015.This approval is subject to compliance with the following:

a) Only approval document(informed consent, study instrument, ect) will be used
b) All changes (amendment, deviation, violation, ect) are submitted for review and approval before implementation
c) Any changes anticipated or otherwise that may increase the risk or affect safety or welfare of study participant and other or affect the integrity of the research must be reported within 96hours.

Yours sincerely

Incharge of the Research, ethic and Training Services
Conceição da Conceição Fabiana
CONCEIÇÃO FABIANA
//Psychologist//

REPÚBLICA DE ANGOLA
GOVERNO PROVINCIAL DA HUILA
HOSPITAL PEDIATRICO PIONEIRO ZECA
DIRECÇAO PEDAGOGICA

Dr. Ketha Rubuz Francisco
UNIVERSIDADE DE AGRICULTURA E TECNOLOGIA
JOMO KENYA
INSTITUTO DE MEDICINA TROPICAL/NAIROBI/KENYA

PROPOSTA DE PESQUISA: Factores de risco para má-nutriçao severa em crianças entre 6 a 59 meses admitidas no Hospital pediátrico Pioneiro Zeca Lubango-Angola.

Este documento serve para informar-lhe que a comissão de ética e pesquisas revisou e aprovou a proposta acima descrita.
O periodo de aprovação situa-se entre 10 de Maio de 2014 à 11 de Junho de 2015.
Esta aprovação está sujeita a seguintes recomendações:

D. Apenas documentos aprovados (termos de consentimento, instrumento de estudos) serão usados.
E. Qualquer alteração (correção, desvio, violação, etc.) deverá ser submetida a uma revisão e aprovada antes da sua implementação
F. Qualquer mudança antecipada ou diferença poderá aumentar o risco ou afectar a segurança ou o bem-estar dos participantes no estudo e outros, ou afectar a integridade da pesquisa; no caso deve ser anunciada no prazo de 96horas.

Agradecimentos

Chefe da formação Permanente
Maria da Conceição Fabiana
CONCEIÇÃO FABIANA
// Psicóloga //

REPUBLIC OF ANGOLA
PROVINCIAL GOVERNMENT OF HUILA
PROVINCIAL DIRECTION OF HEALTH
RESEARCH, ETHIC AND TRAINING DEPARTEMENT

Dr. Ketha Rubuz Francisco
JOMO KENYA UNIVERSITY OF AGRICULTURE
AND TECHNOLOGY
INSTITUTE OF TROPICAL MEDECINE/NAIROBI/KENYA

RESEARCH PROPOSAL: Risk factors for severe acute malnutrition among children 6 to 59 months admitted to Pioneer Zeca Pediatric Hospital/Lubango/Angola

This is to inform you that Provincial ethics and research department has reviewed and approved your above proposal.
The approval periods are between 10 of May 2014 to 11 of June 2015.This approval is subject to compliance with the following:

a) Only approval document(informed consent, study instrument, ect) will be used
b) All changes (amendment, deviation, violation, ect) are submitted for review and approval before implementation
c) Any changes anticipated or otherwise that may increase the risk or affect safety or welfare of study participant and other or affect the integrity of the research must be reported within 96hours.

Yours sincerely

Provincial Director of Research, ethic and Training Department
Adelina L. Alex
Ana Neves
// Pediatric Cardiologist//

REPÚBLICA DE ANGOLA
GOVERNO PROVINCIAL DA HUILA
DIRECÇÃO PROVINCIAL DA SAUDE
DIRECÇÃO PEDAGOGICA

Dr. Ketha Rubuz Francisco
UNIVERSIDADE DE AGRICULTURA E TECNOLOGIA
JOMO KENYA
INSTITUTO DE MEDICINA TROPICAL/NAIROBI/KENYA

PROPOSTA DE PESQUISA: Factores de risco para má-nutrição severa em crianças entre 6 a 59 meses admitidas no Hospital pediátrico Pioneiro Zeca Lubango-Angola.

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Agradecimentos

Directora Provincial da Pós-graduação
Adelino L. Alex
Ana Nevos
// Cardiologista Pediátrica//