

**INVESTIGATION ON THE FACTORS ASSOCIATED WITH UNDERNUTRITION
AMONG CHILDREN UNDER 5 YEARS IN ENGELA DISTRICT HOSPITAL,
OHANGWENA REGION, NAMIBIA**

**A THESIS SUBMITTED IN ACCORDANCE WITH THE PARTIAL FULFILMENT
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Abstract

Undernutrition as a problem in sub-Saharan Africa is a strong indicator of retarded growth, and leads to more than 30% of deaths in children under five annually (Mtambo, Katoma, & Kazembe, 2016). Namibia has almost twice the percentage of moderately undernourished children and three times the percentage of severely undernourished children than what is expected for a country with its level of economic development (Sengupta & Syamala, 2013). Undernutrition is a physical state whereby an individual has a low weight for their age or height. This often leads to various forms of impaired bodily performance, which hinders normal physical activity, growth and resistance to diseases recovery. The Demographic Health Survey (DHS) conducted in Namibia (2008-2013) revealed that Ohangwena is amongst the regions that have a high prevalence of undernutrition. Engela district has a high number of undernutrition cases in the region according to the Health Information System reports.

A case-control study was conducted at Engela district hospital, to determine socio-economic, nutritional and medical related risk factors for Undernutrition in children aged 6 months to 5 years. The researcher administered a structured questionnaire to the parents and guardians of children to collect data on the aforementioned risk factors. The study found an association between starting complementary feeding at the age of four to five months and developing undernutrition. Furthermore, children who were not taken care of and fed by mothers were 2.0 times more likely to develop undernutrition. The study also revealed an association between being born at home and developing undernutrition. The study also showed statistically significant associations between the child immunization status, caregivers'

employment status and attendance of growth monitoring and the development of undernutrition in children.

However the mother's age, caregivers' educational level, breastfeeding and staying with the mother or not staying with the mother were not associated with being undernourished.

The researcher recommended mothers to create employment opportunities for themselves, to delay complementary feeding at least until the child is 6 months where possible, to care for their children until they are 5 years and older, strengthen the importance of hospital deliveries, strengthen the importance of growth monitoring attendance at health facilities and to strengthen immunizations for children and health education to mothers and expectant mothers.

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Dedication

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Declaration

I, Ertha Ngondjodi Haludilu, declare hereby that this study is a true reflection of my own research, and that this work, or part thereof has not been submitted for a degree in any other institution of higher education.

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..... Date.....

[Ertha Ngondjodi Haludilu]

Abbreviations and acronyms

AIDS	Acquired Immune Deficiency Syndrome
BMI	Body Mass Index
CI	Confidence Interval
DCC	District Coordinating Committee
DHS	Demographic Health Survey
DS	Disease Surveillance
HIS	Health Information System
HIV	Human Immunodeficiency Virus
IBFAN	International Baby Food Action Network
IPD	In-Patient Department
LBW	Low Birth Weight
MDG	Millennium Development Goals
MUAC	Middle Upper Arm Circumference
NACS	Nutritional Assessment Counselling and Support
OR	Odd Ratios
PHC	Primary Health Care

RMT	Regional Management Team
SSA	Sub-Saharan Africa
TB	Tuberculosis
UNICEF	United Nations Children's Fund
WHO	World Health Organisation

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CHAPTER 1: ORIENTATION OF THE STUDY AND OVERVIEW OF THE STUDY

1.1 Introduction and background

Childhood undernutrition has severe adverse growth effects on a child. An undernourished child is more likely to be sick and die immediately. Undernutrition as a problem in Sub-Saharan Africa (SSA) is a strong indicator of retarded growth. More than 30% of annual deaths in children below five years in SSA are attributed to undernutrition (Mtambo et al., 2016). Poverty is among the leading causes of morbidity and mortality worldwide. Many people still do not have access to balanced diets, or adequate food to maintain normal bodily function. . One result of poverty is undernutrition, which affects many people living in poverty, including children under 5 years (Cercle & Region, 2008).

Undernutrition is a major public health problem in Namibia which affects children in most health districts (Sengupta & Syamala, 2013). While the percentage of children who are underweight has declined in the last two decades, stunting (too short for age) and wasting (too thin for height) have increased. With one out of three children under 5 years undernourished, Namibia has almost twice the percentage of moderately undernourished children and three times the percentage of severely undernourished children than what is expected for a country with its level of economic development (Sengupta & Syamala, 2013). Undernutrition is a physical state whereby an individual has a low weight for their age or height. This often leads to various forms of impaired bodily performance, which hinders normal physical activity, growth and resistance to diseases recovery. Undernutrition has two different types which are all common; these are kwashiorkor (nutritional oedema) and marasmus (excessive wasting of muscles) (Department for International Development, 2009). Several factors influence the prevalence of risks of undernutrition worldwide; among which are types of patients, (case mix, within the different hospital settings) and the methods used to

measure nutritional status. Oncological, gastrointestinal and lung diseases are associated with the highest prevalence of undernutrition worldwide (Westergren et al., 2009).

Globally, undernutrition affects more than 900 million people. Undernutrition causes about 3.5 million deaths in children under five years. Stunting, low weight and low birth weight (LBW) account for 2.2 million deaths among children under five years worldwide (Martins, Florê, Santos, Vieira, & Sawaya, 2011).

In Africa, stunting is a major neglected public health problem which affected 36% of children under five years of age was 36% in 2011 (UNICEF, World Health Organization, & The World Bank, 2012).

More than 90% of the world's stunted children live in Africa and Asia. Even though the prevalence of undernutrition among children under five years of age worldwide has decreased since 1990, overall progress is insufficient and millions of children remain at risk of undernutrition (UNICEF, World Health Organization, & The World Bank, 2012).

Although the first Millennium Development Goal (MDG) targeted to eradicate extreme hunger and poverty by 2015, this goal has not yet been achieved as is evidenced by the number of undernutrition cases, particularly among children under 5 years still reported in Namibia to date.

Nonetheless, the Namibian government has made initiatives to help combat undernutrition in the country which include the introduction of feeding programmes in government schools and introduction of the nutritional assessment counselling and support (NACS) programme in 2012. The NACS programme is aimed at providing nutritional supplements to underweight

children and adults to help them gain their intended weight for age/height and is functional among all the 35 Namibian health districts.

The following table (Table 1) shows the percentage of different forms of undernourishment among the under 5's in Namibia (IBFAN – International Baby Food Action Network, 2011)

Table 1.1: Percentage of children under five with undernutrition

Type of undernutrition	Percentage
Underweight (moderate and sever)	17% (4% severe)
Wasting (moderate and severe)	8%
Stunting (Moderate and sever)	29%

The Demographic Health Survey (DHS) conducted in Namibia (2008-2013) revealed that, Ohangwena is amongst the regions that have a high prevalence of undernutrition in the Namibia. The following are the prevalence of undernutrition in Ohangwena region for the indicated years: 2008: 10%, 2009: 13.3%, 2010: 15.6%, 2011: 12.4%, 2012: 13,7% and 2013 with 14,8% (The Namibia Ministry of Health and Social Services (MoHSS) & ICF International, 2014).

Engela district is situated in Ohangwena region and is part of the three health districts in the region. According to reports from the health information system (HIS) reports, Engela district has a high number of undernutrition cases in the region. A high percentage of undernutrition may be associated with numerous implications such as increased mortality and morbidity rate due to undernutrition in the district. Furthermore, undernutrition leads to the impaired growth in the children that suffer from the condition. A high allocation of resources and personnel are distributed to the treatment rather than preventative control measures Undernourished

children may be prevented from growing and developing into productive individuals which may hamper the economy of the country.

The residents of Engela district and the surrounding area mostly produce their own food through various farming activities that include cultivating of the fields and herding of animals (cattle, goats, donkeys and sheep). Most household grow and harvest various food items such as mahangu, maize, beans and sorghum to feed their families until the next rainy season. The animal farming activities produce milk that can be consumed and these animals are slaughtered for meat and used for human consumption. These animal and crop products are also sold to generate money used to purchase other food items and cover household expenses such as medical costs many more. Although Engela district residents produce their own food, there are some children with under nutritional problems. Thus this study was conducted to analyse the problem.

1.2 Problem statement

Engela district has reported an increasing number of undernutrition cases between the years 2008-2013. Even though this data is available on the district (HIS) and Disease Surveillance (DS), only a few variables are available in the system. The HIS and DS records show the total number of cases that occurred by place, person and time. No proper analysed data is available on the condition within the district. Although several studies have been conducted to determine the factors associated with increased number of undernutrition cases, these studies were broad in spectrum and did not target specific age groups and sites. Ohangwena region, where Engela district is situated, is the second highest region with a high number of undernutrition cases. The trends of undernutrition were recorded as follow: 2008: 10%, 2009: 13.3%, 2010: 15.6%, 2011: 12.4%, 2012: 13,7% and 2013 with 14,8% respectively as per

Demographic health survey, Namibia [DHS] 2008-2013 (The Namibia Ministry of Health and Social Services (MoHSS) & ICF International, 2014).

No analytic studies have been done to determine factors associated with undernutrition within Engela hospital. Factors associated with this condition need to be identified in order to address undernutrition problems and prevent morbidity and mortality due to this condition. Although some factors are known to be contributing to malnutrition in general, it is not known if these are the same contributing factors to malnutrition in Engela district. Some of the contributing factors include: poverty, economic status, educational level, weaning processes, etc. It was therefore important to conduct this study to document factors associated with undernutrition. Findings from this study may be used to design appropriate interventions to control undernutrition and reduce the high burden of this condition in Engela Health District.

1.3 Purpose of the study

The purpose of this study was to investigate the factors associated with undernutrition in children under 5 years admitted to Engela hospital in order to generate information that might help prevent and address future occurrences of undernutrition and possibly contribute to future control measures on the problem.

1.4 Objectives

1.4.1 General objective

The general objective for the study was to determine the factors associated with undernutrition among under 5 children admitted in Engela Hospital during the study period.

1.4.2 Specific objectives

- To determine socio-economic risk factors associated with undernutrition

- To determine nutritional risk factors associated with undernutrition
- To determine medical risk factors associated with undernutrition

1.5 Significance of the study

The Engela hospital has been experiencing increasing cases of undernutrition, some referred from health facilities within the district. Since undernutrition is now among notifiable diseases/conditions, the findings of this study will be used to intensify surveillance for this condition in Engela district. The study findings will also be used to advice and support appropriate control and preventative measures among children for undernutrition. The study findings may also help to reduce high hospital costs that result from increased numbers of undernutrition cases.

1.6 Definition of concepts

The following concepts are used in the report and are defined below:

Undernutrition

A condition or physical state whereby an individual is having a low weight for their age/ height, which may lead to impaired bodily performance, be it physical activity, growth and resistance to diseases recovery (Department for International Development, 2009).

Stunting/Low height for age

Stunted growth refers to low height-for-age, when a child is short for his/her age but not necessarily thin. Also known as chronic malnutrition, this carries long-term developmental risks (Ahmed, Barnett, & Longhurst, 2015).

Wasting/Low weight for height

Wasted refers to low weight-for-height where a child is thin for his/her height but not necessarily short. This is also known as acute malnutrition (UNICEF(United Nations Children's Fund), 2013).

Weaning

The process of introducing an infant to a full human diet (solid food) and eventually stop the breastfeeding process (Department for International Development, 2009).

Notifiable diseases

Diseases that are considered being of great public health importance. Local, state, and national agencies require that these diseases be reported when they are diagnosed by health professionals or laboratories. (The Namibia Ministry of Health and Social Services (MoHSS), 2011)

Breastfeeding

The child has received breast milk direct from the breast or expressed (Kadima, 2012).

Exclusive breastfeeding

No other liquid or solid from any other source enters the infant's mouth except for the mother's breast milk (Kadima, 2012).

Health facility

This is in general, any location where healthcare is provided (Kadima, 2012).

Economic status

This is an economic and sociological combined total measure of a person's work experience of an individual's or family's economic and social position in relation to others, based on income, education, and occupation (Kadima, 2012)

Immunizations

This process of rendering immunity to the subject. It is also called inoculation or vaccination (Abdelwahab et al., 2014).

Hospital

An institution that is providing medical and surgical treatment and nursing care for the sick or injured people (Department for International Development, 2009).

District

The intermediate administrative unit generally serves a population between 10,000 and 300,000(The Namibia Ministry of Health and Social Services (MoHSS), 2011)

Investigation

The process of gathering evidence about what may have caused an event and use it to select the appropriate control and preventative measures(The Namibia Ministry of Health and Social Services (MoHSS), 2011)

1.8 Chapters layout

The following is the layout of this thesis, in order:

Chapter 1: Orientation and overview of the study

Chapter 2: Literature review

Chapter 3: Methodology

Chapter 4: Research findings

Chapter 5: Discussion, conclusion, recommendations and limitations

1.7 Summary

The chapter being summarised has introduced the concept of undernutrition in the district of study. Background information was provided concerning the rate of malnutrition in the district under study as per sources. The research problem statement, purpose of study, study objectives, significance of the study, research designs and methods and the definition of concepts were presented. The next chapter on literature review will focus on high undernutrition rates; both for developed and developing countries, on a global, regional, national as well as local scale. The conceptual framework will also be addressed in the next chapter.

CHAPTER 2: LITERATURE REVIEW

2.1 Introduction

According to (Bash, 2015), a literature review is an organised written presentation of information on a topic that has already been published by scholars. The purpose of the literature review is to inform the reader of what is already known regarding the topic under study. Considering that undernutrition is a public health concern since it is associated with an increased risk of mortality and morbidity (Manuscript, 2013), several studies on this subject have been conducted using various approaches.

2.2 Overview of undernutrition

Child malnutrition is one of the measures of health status that the World Health Organization (WHO) recommends for equity in health (Bantamen, Belaynew, & Dube, 2014). Globally, protein energy malnutrition continues to be a major health burden in developing countries and is one of the risk factors associated with illnesses and death among young children (Mwangome, Fegan, Prentice, & Berkley, 2011), (Lange, 2010). The World Health Organization has estimated that close to 60% of all deaths among children aged less than five years in developing countries, are associated with malnutrition (Ubesie, Ibeziako, Ndiokwelu, Uzoka, & Nwafor, 2012; Demissie & Worku, 2013). Not only is it important to find out the prevalence of undernutrition, but to gain knowledge too on how well the nutritional interventions are targeted to those at risk of malnutrition (Westergren et al., 2009; Fuchs, Sultana, Ahmed, & Hossain, 2014). The major factors associated with acute malnutrition among children were: older age of the child, undernourished mother, jobless father or father with a low- paying job, low total family income and poorer breastfeeding practices (Amsalu & Tigabu, 2006, Makowske & Feinman, 2005). Undernourished mothers often give birth to low-birth-weight babies, and this is a risk factor for increased childhood malnutrition, morbidity, and mortality (Lange, 2010), (Fao, 2015). Improper or inadequate breastfeeding is

associated with acute malnutrition. Early supplementation with infant formula or cow's milk, early introduction of complementary foods, and inadequate breastfeeding were important risk factors for malnutrition in children (Fuchs et al., 2014) .

Data obtained from another study conducted in Malaysia, (Ghazi, Mustafa, Aljunid, Md. Isa, & Abdalqader, 2013) indicates that family size, sex, age, socio-demographic factors, and the number of children may contribute to a child's nutritional status indirectly and thus affect child health. The study later revealed that, the primary determinants of undernutrition were unsatisfactory food intake, severe and repeated infections, or both. Children's nutritional status can also be affected by socioeconomic and demographic factors, such as parents' occupation and educational levels, marital status, family income, nutritional knowledge of mothers, location of house (urban or rural), gender, and water supply (Ghazi et al., 2013).

2.3 Definition of the term undernutrition

Undernutrition refers to the failure to eat sufficient and well-nourished food and absorb nutrients needed for tissue maintenance and repair in an individual and to produce calories to be able to perform well, be healthy and survive (Pearle & Goldfarb, 2014). The term "sufficient in the definition refers to enough intake of a particular nutrient to be able to meet the individual's bodily needs. According to the Department for International Development, (2009), undernutrition: is when the body contains lower than normal amounts of one or more nutrients i.e. deficiencies in macronutrients or micronutrients. It encompasses stunting, wasting and deficiencies of essential vitamins and minerals that are usually referred to as micronutrients.

2.4 Underlying causes of undernutrition

Various studies that were conducted determine the underlying causes of undernutrition. According to Lange (2010), these underlying causes of undernutrition include insufficient availability and access of household food, inadequate care of children, low education levels and lack of information for the parents/guardians of children, insufficient health care services and an unhealthy environment (lack of sanitation and safe water). Lange (2010) further stated that for malnutrition to reduce there should be specific emphasis on social norms, gender equity and access to education.

2.4.1 Insufficient availability and access of food

Many people worldwide do not have sufficient food to cover for their nutritional needs and those of their families. This may be due to poor production, poor rainfall and increased food prices. A study conducted in Zambia shows that 60 per cent of households cannot afford three meals per day, which leads to inadequate nutrient intake and undernutrition (Masuda et al., 2014). Due to the fact that many children under 5 years are still breastfeeding, if the mother does not get sufficient food to eat, she will not be able to produce sufficient milk to feed her child which can easily result in undernutrition.

Many families especially in the northern parts of the Namibia depend on farming for their food supply, but if the rainfall is insufficient, there is likely a reduction in food production which will influence undernutrition. A study conducted in Iraq shows that environmental factors play an important role in a child's nutritional status. Nutritional status is the result of a complex interaction between the food that is consumed, people's overall health, and the environment in which people live. Food, health, and caring are the three "pillars" of well-being (Abdalqader, Aljunid, Ghazi, Isa & Mustafa, 2013). According to a study conducted in Namibia, (*MALNUTRITION*, n.d.), the most significant contributors to infant and child malnutrition appear to be inappropriate infant and young child feeding practices particularly

lack of exclusive breastfeeding practices. Babies that are not breastfed have been shown to be five times more likely to die of infectious diseases than breastfed infants in the first 2 months of life. Furthermore, babies that are not breastfed are twice as likely to succumb to infectious diseases within the first half year of life, and more likely to suffer from undernutrition compared to breastfed babies. The good benefits of exclusive breastfeeding and adequate complementary feeding are not well-known in the majority of the Namibian population.

The malnutrition study further states that, breast milk meets up to 70% of an infant's energy, protein, calcium, vitamin A, vitamin C, iron folate and zinc requirements in the first 6 months of life and up to 50% in the first year of life. Breastfeeding therefore contributes largely to protecting nutritional and immune status and therefore reducing health costs for both families and the health system in the country.

A certain study conducted in Kenya reveals that lack of money is a driving force to poverty that results in food insufficiency. Most families have a shortage of farmland, leading to an inability to cultivate sufficient food on family farms. In addition to this, the researcher suggested that setting up small community businesses would provide an alternative income source. However they lacked access to the necessary capital to set up a business. They believed these circumstances hampered their ability to feed their children adequately and contributed to severe under nutrition (Manuscript, 2013).

According to Wood (2015) people of low socioeconomic status are most vulnerable to food insecurity since purchasing power serves as a main determinant of the ability-to-afford nutritional food sources. A household that cannot secure nutritious foods due to low or no income is most associated with the inadequate diet and conditions that result in undernutrition. Wood further stated that in the low-income households, the majority of total household income is spent on food therefore even the lowest out-of-pocket healthcare

services can severely diminish the remaining income to be used for food supply. These circumstances further perpetuate the problem of food insecurity.

2.4.2 Inadequate care of children

Adequate nutrition is essential for achieving Millennium Development Goal (MDG) 1, which is to eradicate extreme poverty and hunger, as well as MDG 4, which is to reduce child mortality that was targeted for 2015 (Lutter et al., 2011)

According to Mujjukizi, Adhiambo, & Ruolahti-Virtanen, (2014), a study that was conducted in Uganda, revealed that in many cases child undernutrition does not result from the scarcity of food but is due to the lack of awareness by the parents about a healthy diet. Although food insecurity is a key factor in child undernutrition in Namibia, poor child feeding practices may also be a prominent contributing factor (Activities & Audience, 2010). Most parents are unaware of the fact that children's diet should be versatile. The study's findings further revealed that only 63 percent of children aged less than 6 months were exclusively breastfed. Among all children aged 6-23 months, only 13% were fed in the correct way.

The Department for International Development,(2009) states that, even if the actual amount of food ingested by a child is closely related to food security, it also depends on the care-related feeding behaviours of the child's caretaker or parent such as breastfeeding, complementary feeding and the methods used in food preparation. The study further revealed that the ability of the parents or caretakers to provide care to children depends largely on the quality of the care they themselves receive and the time available for them to offer this.

A study which was conducted in North West Ethiopia reported that diarrhoea is one of the associated risk factors of undernutrition. In the same study, diarrhoea increased the risk of undernutrition to about three times than those that did not have diarrhoea. Hand washing practices of the caregiver is critically important to break the link between foods and drink

intake and development of infections. Caregivers need to wash their hands with clean water and soap before preparing food, before feeding the baby and after visiting a toilet or disposing of child faeces/changing baby nappies (Bantamen, Belaynew & Dube, 2014).

2.4.3 Low education levels of parents/guardians

According to Abdalqader, Aljunid, Ghazi, Isa, Mustafa, (2013), a mother's education is an important factor that contributes to a child's nutrition. Various studies have demonstrated that improvements in secondary school enrolment rates among females are estimated to be responsible for 43% of the total 15.5% decline in childhood undernutrition rates in developing countries around 1970–1995. The father's education also plays an important role in determining the undernutrition status among the under-five children. The study further indicated that children whose fathers had a higher education also had lower levels of undernutrition compared to the non-literate fathers.

Another study conducted in Namibia assessed the nutritional status of women of child bearing age and children under 5 years. This study revealed that when education was examined as a determinant of undernutrition, children whose parents had high literacy rates had less undernutrition rates. The children born to mothers who had received no formal schooling or had less than a primary education were at the highest risk of undernutrition (*MALNUTRITION*, n.d.). According to Lange, (2010), Fuchs, Sultana, Ahmed, & Hossain, (2014) and Lutter et al., (2011), undernutrition is worsened by a lack of nutritional information and knowledge, (especially the parents/care takers' education) which leads to unhealthy dietary habits, poor nutrition related practices and attitudes, perceptions and socio-cultural influences that negatively influence child nutrition. Furthermore, the studies revealed three ways in which school education and knowledge can influence a child's health and nutritional status, namely:(a) formal education contributes largely to improved mothers'

knowledge; (b) knowledge acquired in school by mothers ensures that mothers are capable of identifying health problems that may arise in children; and lastly (c) mothers who have attended school are more aware of various diseases and are aware of where to get help and information.

2.5 Immediate causes of undernutrition

The immediate causes of undernutrition are diseases and infections (be it severe or frequent infections) and inadequate diet (Lange, 2010). Undernutrition may not only result from insufficient food intake but various factors may also contribute to it as many studies have shown. The immediate factors are described below.

2.5.1 Diseases and infections

According to Mueni, Mutua, Onyango & Wakoli (2015), undernutrition can be a consequence of many different health conditions. These may include diarrhoea, tuberculosis and chronic illness such as HIV/AIDS. These diseases and infections can lead to undernutrition due to the decreased nutrient absorption, decreased intake of food, increased metabolic requirements, and direct nutrient loss. Parasitic and respiratory infections can also lead to undernutrition. A similar study conducted in Ethiopia to assess factors associated with undernutrition among the under-fives, showed that infections play a major role in the aetiology of undernutrition. This is because infections result in increased needs and high energy expenditure, lower appetite, mal-absorption and the utilization of nutrients and disruption of metabolic equilibrium. In this study, presence of diarrheal disease in the last two weeks prior to data collection was the major contributing factor for undernutrition (Asfaw, Wondaferash, Taha, & Dube, 2015). According to Lange, (2010), it takes time for an undernourished child to recover from respiratory and diarrhoeal diseases and therefore this poses a risk of an elevated morbidity and mortality rate. Repeated infections contribute to ill health and compromised nutritional status of these children.

2.5.2 Inadequate dietary intake

Inadequate breastfeeding practices lead to undernutrition in infants and children and contribute to an estimated one million children deaths annually worldwide. Consuming a single food item is not sufficient to provide the body with all the necessary nutrients for all bodily functions. This usually results from a lack of education about proper nutrition, or from only having access to a single food source (Mueni,Mutua,Onyango & Wakoli , 2015). According to Lange,(2010), dietary choices are influenced by parents' nutritional ignorance, preference for alternative foods and true or perceived food allergies. Moreover, dietary intake is influenced by various factors including cultural and social practices that lead to the exclusion of certain food items as a result of food taboos, food and dietary advertisements and migration from rural areas to urban areas. Inadequate intake of micro nutrients particularly vitamins A, B, C and zinc is likely to increase levels of morbidity, which may affect physical and mental development and lead to undernutrition in children (Magaju, Etyyang, & Mbagaya, 2013).

2.6 Basic causes of undernutrition

Basic causes are also known as the national or root causes of undernutrition and they include poor availability and control of resources (be it political, social, ideological or economic), environmental degradation, poor agriculture, war, political instability, urbanization, population growth and size, distribution, conflicts, trade agreements, natural disasters, religious and cultural factors (Lange, 2010). The basic causes of undernutrition happen at societal level. These factors also include the status of women in the society, which limit the utilisation of potential environmental, technological and human resources by women (Kadima, 2012). Lange, (2010) further states that factors such as market failures and to economic decline, a reduction in food productions and food price increases due to conflict and political upheavals are among the basic causes of undernutrition. Poverty, vulnerability

and social/cultural attitudes can all contribute to the risk, presence and continuation of child undernutrition.

Mothers are usually the primary caregivers of children and they are responsible for breastfeeding them in the correct manner for the first six months, and subsequent feeding of complementary foods (United Nations Children's Fund (UNICEF), 2013). The empowerment of women is thus an important basic factor of the nutritional status of children. Household gender dynamics can be seen as an aspect of female empowerment that can contribute to whether or not a child is sufficiently nourished (Ahmed et al., 2015).

Women and children are worst affected by natural disaster situations compared to men. Some studies provide evidence of a link between children who were exposed to floods and lack of growth due to poor nutrition. These studies also observed the impact of flooding beyond the initial shock, and found a sustained negative impact on health and nutrition outcomes in children aged under five years (Ahmed et al., 2015), (Bryce, Coitinho, Darnton-Hill, Pelletier, & Pinstrup-Andersen, 2008).

The figure below illustrates the conceptual framework for causes of undernutrition among children aged under five years

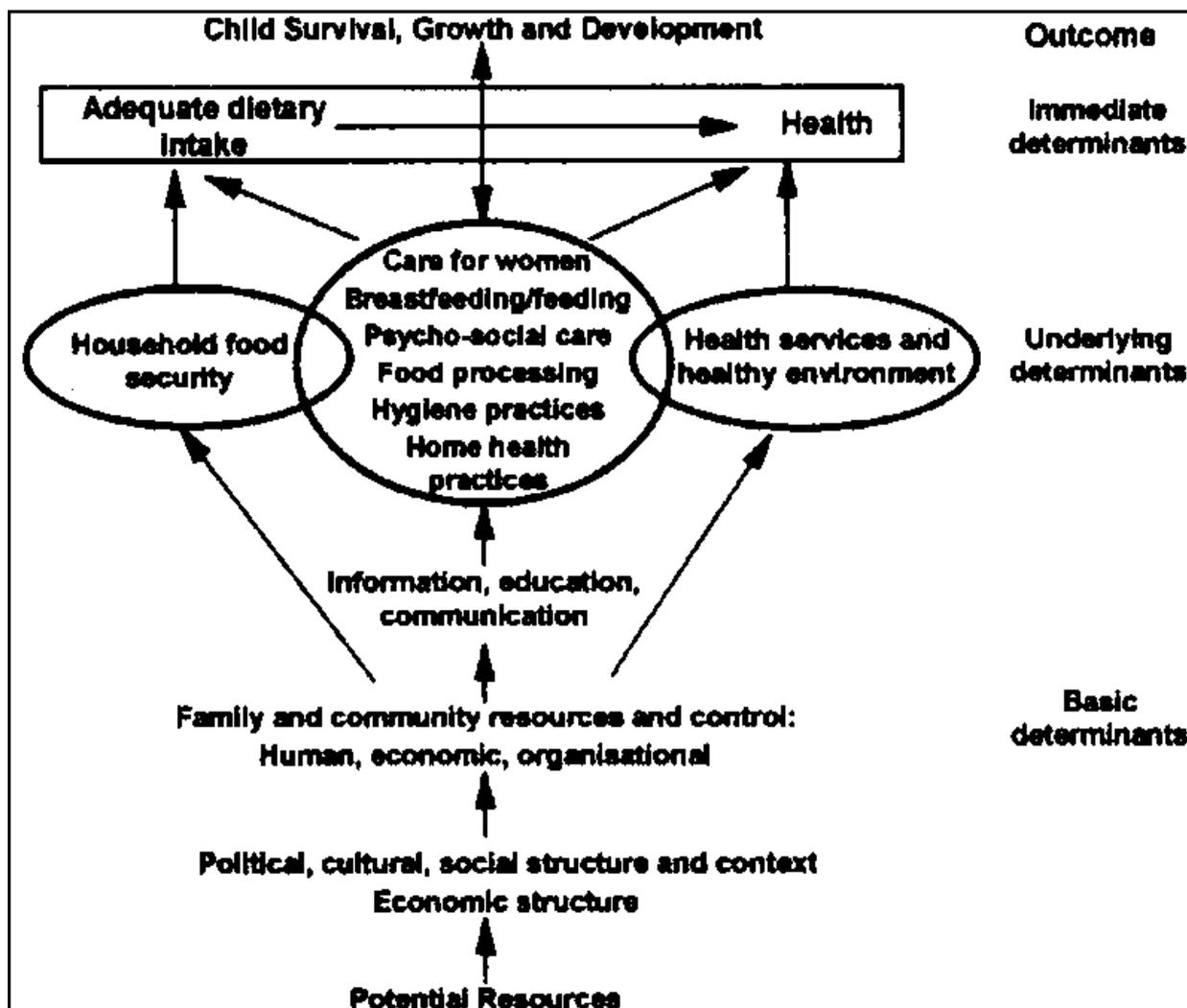


Figure 2.1: Conceptual framework for the causes of undernutrition

(Mueni, Mutua, Onyango & Wakoli, 2015, Lange, 2010 and Kadima, 2012)

The above conceptual framework explains different factors associated with undernutrition and these are categorised into the basic, underlying and immediate factors. In most cases of undernutrition, these are the main contributing factors to the condition. These three categories of factors associated with nutrition were explored in the current study.

2.7 Summary

This chapter presents a discussion on what other researchers have published about factors associated with undernutrition both locally and internationally. The literature review covers factors in three categories namely, underlying factors, immediate factors and basic factors that are associated with undernutrition. The chapter also defined undernutrition and outlined the conceptual framework for factors associated with undernutrition which were investigated in this study.

CHAPTER 3: RESEARCH DESIGN AND METHODOLOGY

3.1 Introduction

This chapter will discuss the design and methodologies that were applied in the study. It further entails and defines the population of the study, the sample size, the research instrument, the sampling method, the participant inclusion and exclusion criteria, the data collection tools and the data analysis method. This chapter will also explain the ethical considerations and the rights of participants during the study.

3.2 Research design

Research design can be thought of as the logic or master plan of a research that throws light on how the study is to be conducted Thomas, (2010). In order to answer the study question, an analytical case control study design was employed using a quantitative approach to assess factors associated with undernutrition among the children under five admitted in Engela district hospital, Ohangwena region, Namibia. According to Schulz & Grimes, (2002) a case-control study is one in which persons with a condition ("cases") are identified, suitable comparison subjects ("controls") are identified, and the two groups are compared. He further states that, since the case-control studies select subjects based on whether or not they have the disease, the design does not provide an estimate of incidence and prevalence of the disease, since the population figures are not available. According to Melorose, Perroy, & Careas, (2015) quantitative data is information that can be measured and analysed numerically.

3.3 Research methods

Data was extracted from the Inpatient registers of the paediatric ward in Engela district hospital for children under 5 years. A line list with different variables was generated from the data collected. A questionnaire was developed and a structured interview was conducted to obtain information from the mothers/fathers/caregivers of the child. During the data

collection the researcher completed the questionnaire herself based on the responses of the parents/caregivers. Some children of the same age group, and from the same community (area) as the cases but who were not ill, were selected and used as a comparison group. The children were selected randomly and used as a comparison group. They were not in the hospital but in the villages or towns where the cases came from. Their parents were interviewed as those of the cases to obtain information on the children. Data was analysed using Epi info7 and excel, and presented as graphs, charts and tables.

3.4 Study population

The study population were the parents and caregivers of children under 5 years and the age group of 6 months to 5 years in Engela district hospital that presented with or were being suspected as being malnourished. Two groups were involved in the study:

The first study population was any child under 5 years admitted in Engela hospital paediatric ward with undernutrition, for the study period.

The controls (comparison group) were children from the same area and same age group as the cases but without undernutrition.

3.4.1 Participant Inclusion criteria

The patients that were included in the study were all the patients aged 6 months to 5 years in Engela hospital paediatric ward that were treated at the facility, and were suspected or diagnosed with undernutrition of any form by the health workers and were registered in the inpatient register at that facility. All the cases of that age group were included within the study, regardless of where they came from within the district, prior to admission.

3.4.2 Participant exclusion criteria

All cases of under nutrition that occurred within the communities and did not report at any health facilities in the district will not be included in the study. Also, the cases of under nutrition that may be residing within the Engela district but were seen or treated at the facilities outside the hospital will not qualify in the study since they were treated at the facilities outside the Hospital, unless referred to the hospital. If a patient was seen at the OPD and later admitted at the IPD, they will not be entered twice, only once because they were first treated as OPD and later referred for further management but of course with the same condition.

3.4.3 Study setting

Engela district is on the western part of Ohangwena region in northern Namibia, and borders Omusati region on the west and Angola on the north. The district has a catchment population of 181,446 of which 27,212 are under five children. The size of the district is 2000 kilometres squared and serves all people in the region, as well as those from Angola mostly since it's the nearest health facility to some of the Angolans closer to the Namibian border, compared to the facilities in Angola itself. The facilities in Engela district provide various services that include:

- Ante natal care services
- Family planning services
- Immunization programmes
- Nutritional assessment and counselling services
- TB and HIV screening services

Engela hospital has a bed capacity of 270 beds and is usually all occupied most of the time. It has 5 wards namely ward A, B, C; D & E. These wards include the paediatric ward, maternity

ward, the male ward, female ward and the TB ward. The district has a District Coordinating Committee (DCC) that is responsible for coordinating all health activities in the district including the district hospital itself. There is also a Regional Management Team (RMT) that helps in coordinating the regional health activities and which heads all regional health services in the region. The district also has a district outreach team that offers various health services to people with limited accessibility to health care services. The services offered include treatment of various conditions at primary health care services level, immunizations, antenatal care services and treatment of chronic conditions e.g. hypertension.

3.5 Sample and sampling procedure

A sample is a group that is chosen from the whole group, on which the study will be conducted on. Sampling is a technical accounting device which is used to rationalise the collection of information and to choose, in an appropriate way, the restricted set of objects, persons or events, known as the sample from which the actual information will be drawn (Bash, 2015). The sampling procedure is the procedure that was followed in order to choose and obtain the study group from the whole population.

3.5.1 Sampling procedures

The sample may be probability sampling or it may be non-probability sampling. Probability sampling is based on the concept of random selection, whereas non-probability sampling is 'non-random' sampling (Kothari, 2004). In this study, all the cases were identified from the In-Patient Department (IPD) register (where all the admission cases are entered into) until the required sample size was met. The information obtained from the inpatient register includes the demographic information of the patient, diagnosis, date of admission and all other information that were used during the study. The cases in the registers acted as a true representativeness of the cases of undernutrition within Engela district hospital, 2016. The random sampling approach was applied to select the appropriate sample out of the

comparison group (controls) whereby controls were selected randomly from the communities where the cases came from. Controls were selected by selecting the third house from a random direction from the case's house and from all these houses, one control (child) was selected per house. The controls were selected randomly from all eligible controls in the house. For the controls, similar anthropometrical information was collected as from the cases to ensure that none of them qualifies to be cases as well. Age, sex, height, weight, oedema and Middle Upper Arm Circumference (MUAC) were used to determine the control's nutritional status. The controls were defined as: any child under 5 years who is neither stunted nor wasted and resides in Engela district.

3.5.2 Sample size

The cases used in this study were all children with under nutrition (under 5 years), aged 6 months to 5 years that were identified for the period of May – August 2016. Sample selection was conducted using Epi Info. There were a total of 132 cases enrolled. The controls enrolled were also 132. Since the cases and controls were children, it was the parents and care givers that were interviewed and therefore it was 1 parent/caretaker per child. The association of factors with under nutrition was determined at a confidence interval of 95%. The confidence interval is used to determine the level of accuracy between two or more variable. It means one is confident enough that if the same study is repeated, the results obtained will be similar or within the same range as the previous results (Series, 2010). The power of that was used for determining the sample size was at 80%. According to (McGready, 2009), the power is a measure of “doing the right thing”, the higher, the power the better (closer to 100%) because if the power is this low, it is difficult to determine the association 2.1.

3.5.3 Data collection instrument and methods

Data on the patients was extracted from the Inpatient registers of the paediatric ward in Engela hospital during the study period. The information obtained from the inpatient register includes the demographic information of the patient, diagnosis, date of admission and all other information that were used during the study. A questionnaire was developed and used to obtain information from the mothers/fathers/caregivers of the cases and those of the comparison group too. The questionnaire consisted of both open and close ended questions. The questionnaire was compiled in the following sections: Demographic and geographic information, Education and economic status of parent/ Guardian, Feeding history, Medical and clinical information. The researcher completed the questionnaire herself based on the responses of the parents/caregivers. The questionnaire was in the local language which is Oshikwanyama (a widely spoken dialect in Ohangwena region). All the children under study (cases or controls) were assessed on their weight and height, (MUAC), and their age and sex were also obtained. Both cases and controls had the same questionnaire which was marked by the researcher to specify whether that specific questionnaire was for a case or a control.

3.6 Pilot study

According to (Thabane et al., 2002), a pilot study is an investigation that is designed to test for the feasibility of methods and procedures for later use on a large scale or to search for effects and associations that may be worth following up in a subsequent larger study. It's important to conduct a pilot study in order to determine the need for adjustment in the final questionnaire. In order to test for the feasibility of the study and the study data collection tools, the researcher conducted a pilot study at Engela clinic with 15 participants. After the pilot study, the following changes were made to the questionnaire:

- This question “**when did the child begin with the weaning process?** Was removed since it was found to be similar to the following question: “**if the child is not breastfeeding, when did they stop?**”
- The question ‘**highest grade passed**’ changed to ‘**Highest grade attended**’.
- The column for height, Middle Upper Arm Circumference (MUAC) and weight were added and the Body Mass Index (BMI) was therefore determined.

The pilot study was conducted on the non-cases (these were not cases or controls just random people used to test the feasibility of the study and were never enrolled in the main study again) who were identified to ensure that there could be no possibility for them to be enrolled as controls in the same study. They were identified by noting their village of origin and the name of household owner was noted. The parents/guardians were also informed that they shouldn’t allow the children to be enrolled in the study again as controls but rather inform the researcher once they are approached for enrolment. The participants were thanked for their participation and urged to ensure not to be enrolled in the main study.

3.7 Validity and reliability of the data collection tools (study instrument)

(Reliability & Validity, 2009) defined reliability as the consistency of your measurement, or the extent to which an instrument measures the same way each time it is used under the same condition with the same subjects enrolled. They further referred to validity as the strength of conclusions, inferences and propositions. In order to increase validity during this study, the instrument was presented to the two study supervisors for prompt validation and evaluation. The data was also collected by the researcher herself. By conducting the pilot study, the researcher was also ensuring validity and reliability. The researcher has been in the study area for about a year, and thus was familiar with the study site, and which helped with ensuring reliability. The data was collected for a period of two months.

3.8 Data analysis

The data was analysed using Epi Info 7 and Excel and presented as tables, graphs and charts. Prevalence ratios were calculated. The strength of association of selected risk factors for undernutrition was determined by estimating Odds Ratios (ORs) and their 95% Confidence Intervals (CIs). Descriptive statistics was used to summarize continuous variables into mean, median and standard deviation. Bivariate analysis between independent variables and dependent variables were calculated. Statistical significance was determined at p-value less than 0.05. Significant factors from the bivariate analysis were used to determine the key predictable factors by generation Odds Ratio (OR) at 95% confidence level. This is an analysis that is used in estimating the relationships between cause and effects, which in this case estimated the relationship between Undernutrition and its risk factors.

3.9 Ethical considerations

The principle of anonymity was adhered to as the questionnaire did not ask names of cases or controls. Information on these cases was kept safe by the researcher and only relevant personnel got it. The information was kept strictly confidential and no unauthorised personnel had access to it. Informed consent was obtained from the parents/guardians of the children before conducting the study. Confidentiality was maintained by keeping the participants' information in a computer that is unlocked using a password known to the researcher.

3.9.1 Permission

The researcher was given Ethical Clearance Certificate to conduct the study by the University of Namibia Research Ethics Committee (URECU). The researcher was granted permission to conduct the study by the Ministry of Health and Social Services. The consent to conduct the study in Engela Health District was granted by the Regional Director.

3.9.2 Informed consent

The purposes of the study as well as the importance of the participants' responses were explained to all participants before the commencement of data collection. A written or oral informed consent was obtained from all participants prior to their participation in the study. The informed consent was written in Oshiwambo and the interview too was conducted in Oshiwambo, Oshikwanyama (specifically) by the researcher.

3.9.3 Right to privacy and voluntary participation

Every participant who took part in the study did so, voluntarily; it was not forced on anybody. The participants were informed of their rights in the study, which included the right to withdraw from the study at any time, the right to not provide information if they are not comfortable and the right to demand for clarification of anything concerning the study.

3.9.4 Anonymity

Anonymity is defined as “the degree to which the identity of a message source is unknown and not specified, therefore if one has less knowledge about the source it becomes harder to specify who the source is among all the respondents (Whelan & Carolina, 2007). During the study, all the participants were assured that the rule of anonymity would be respected. The participants' names were never connected to any of the information they have given, and all the participants were informed and assured of this. No names of patients were recorded during the study.

3.9.5 Confidentiality

According to Wiles, Crow, Heath, & Charles (2006), assuring someone of confidentiality means that what has been discussed will not be repeated or given to a third party without permission. Therefore the researcher ensured participants that none of the information they provided during the study would be given to another person throughout the study.

3.10 Dissemination of research findings

The study findings will be disseminated to The Ministry of Health and Social Services at National Level, The University of Namibia, Ohangwena Regional Health Directorate, and to Engela Health District respectively.

3.11 Summary

In this chapter the research methodology was discussed. The researcher employed an analytical cases control quantitative study which was used to meet the study objectives. This chapter also discussed the sample size, the sampling methods and the ethical issues. The recruitment of participants was explained, the pilot study, the validity and reliability, the anonymity and confidentiality principles. The next chapter presents and discusses the findings of the study.

CHAPTER 4: RESULT PRESENTATION AND ANALYSIS

4.1 Introduction

This chapter is going to present the findings of the study and further discuss the analysis of the data. The structured interview was conducted on all the participants. A total of 264 subjects were enrolled in the study. These consisted of the 132 cases and 132 controls whose parents and caretakers were interviewed. The cases were children with undernutrition admitted to Engela district hospital and the controls were the children in the same age group as the cases, from the same areas as the cases but had no undernutrition or history of it. The cases were from areas all over the district.

The chapter describes demographic information, medical history and the feeding practices that might be associated with undernutrition among those children. The P-values and Chi-squares and frequencies were calculated in order to determine the statistical significance and associations among variables, if any.

The structured interview questionnaire that was used consists of five sections: section A, B, C, D & E. Section A was on demographic information, section B was on the educational background and economic status of parent/guardian, section C is on the feeding history, section D is about the medical information and the last section E is on the clinical history of the child under study.

4.2 Demographic information

The demographic and geographical information that was obtained during the study are: age, parent or guardian relationship to the child, age of the mother of the child, village name, date of admission and the child's gender. All cases and controls were taken from Namibia and were all living within the borders of Engela district, none were from outside.

4.2.1 Demographic characteristics

A total of 264 children between the ages of 6 months and 5 years with their caregivers (mothers, grandmothers and aunts) were employed in this study. These were the children that were admitted to Engela district hospital with undernutrition during the period of the data collection were sampled, data on them was collected and analysed. For all these caregivers, most of them were mothers (90.5%) and the rest were aunts and grandmothers and other care takers. The average age of the mothers of cases interviewed was 25.2 years. The youngest mother was aged 16 years old and the oldest was aged 42 years old. Most of the mothers were between the ages of 21-23 years (29.5%). The majority of the mothers had attended junior high school and above as their highest level of education (53%) and least had primary or no formal education (6.1%). Most of the parents or caretakers of the cases were unemployed (65.2%). A high number of children (90.5%, cases), (94, 7% controls) were being taken care of by their biological mothers other than by other caretakers.

The demographic characteristics are presented in Table 4.1.

Table 4.1: Demographic characteristics of cases and controls of undernutrition, Engela district

Variable	Frequency(%) n= 264 (132 cases, 132 controls)	
Mothers age		
Age group	Cases	Controls
16 - 22 yrs	40 (30.3)	48 (36.4)
23 - 29 yrs	67 (44.7)	54 (40.9)
30 - 36 yrs	25 (18.9)	30 (22.7)
Caregivers' level of education		
Education level	Cases	Controls
Junior high & above	101 (76.5)	110 (83.3)
No formal school - Primary	31 (23.5)	22 (16.6)
Caregivers employment status		
Employment Status	Cases	Controls
Employed	46 (34.8)	91 (68.9)
Unemployed	86 (65.2)	41 (31.1)
Relationship of caretaker to the child		
Relationship	Cases	Controls
Mother	119 (90.5)	125 (94.7)
Aunt	2 (1.5)	3 (2.3)
Grandmother	11 (8.3)	4 (3.0)

4.2.2. Gender

The study shows a high number of undernutrition cases among female children compared to males (62.9%). The same was observed in the controls (70.5%).

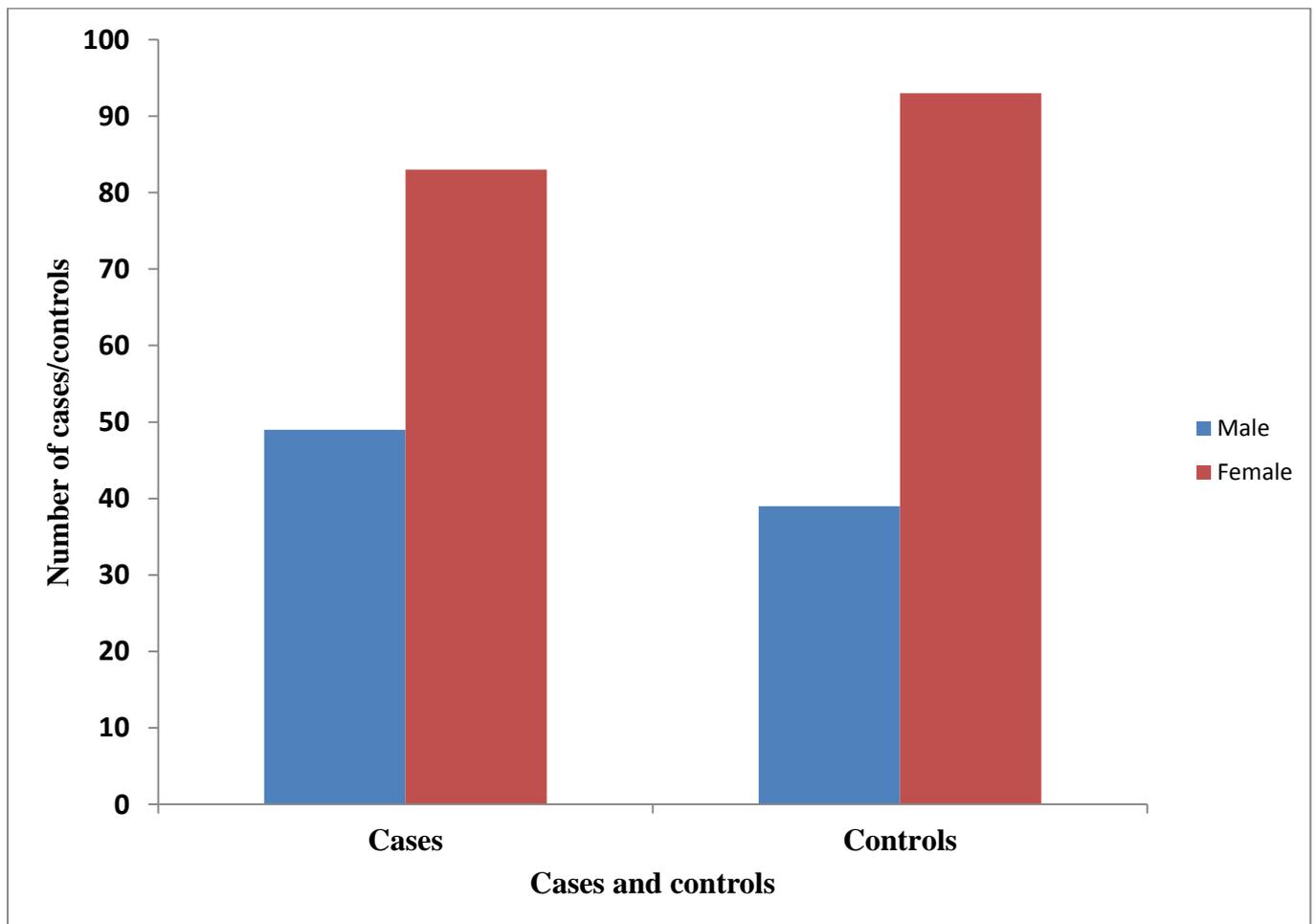


Figure 4.1: Undernutrition cases and controls by gender, Engela district, Ohangwena region, 2016

4.2.3 Age groups of children

A high number of both cases and controls were reported among the age group of 10 months - 1 year old (59.1% & 34.1%) respectively. The lowest number of both cases and controls was among the ages of 4 – 5 years (2.3% & 8.3%).

The age groups of both the cases and controls in the district were analysed and presented as follows:

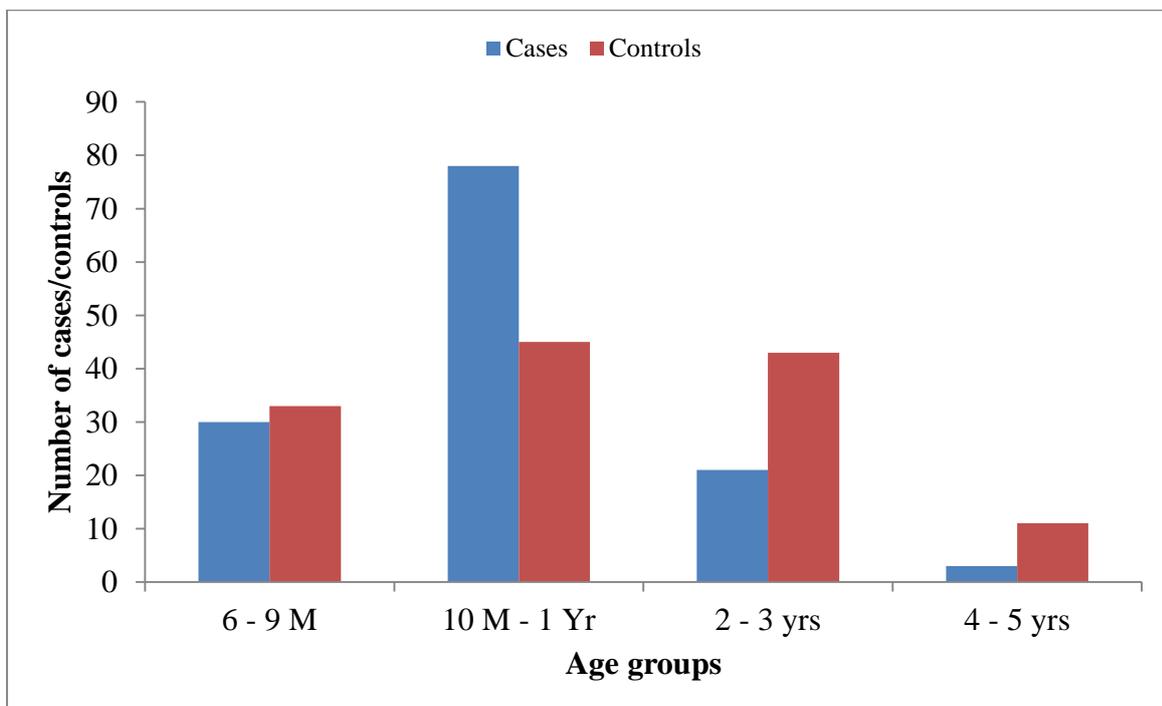


Figure 4.2 Undernutrition cases and controls by age groups, Engela district, Ohangwena region, 2016

4.3 Health practices

The table below summarises child health care practices of caregivers enrolled in the study for both cases and controls. More than half (55.3%) of the children were born in hospitals. Eighty seven out of one hundred and thirty two children (65.9%) had been appropriately vaccinated for their age; however, 45 children did not complete their vaccinations. About 41.7% of these children have been attending growth monitoring regularly, 58.3% did not attend at all or they have attended only partially and did not complete their follow-ups.

Table 4.2 undernutrition cases and controls by their health practices, Engela district hospital, Ohangwena region, 2016

Variable	Frequency (%) n= 264 (132 cases,132 controls)	
Place where the child was born		
	Cases	Controls
Home	59 (44.7)	14 (10.6)
Hospital	73 (55.3)	118 (89.4)
Immunization status		
	Cases	Controls
Complete	87 (65.9)	126 (95.5)
Incomplete	45 (34.1)	6 (4.5)

Growth monitoring attendance

	Cases	Controls
Attended	55 (41.7)	110 (83.3)
Did not attend/Partially	77 (58.3)	22 (16.7)

4.4 Feeding practices

The majority of the children (cases) began complementary feeding at the age of 4 - 5 months (64.4%), followed by 6 - 7 months (35.6%), and for the controls a high number of children started complementary feeding at 6 - 7 months and the least in 4 - 5 months old. More than half of the children (cases) are no longer breastfeeding (65.9%) and applies for the controls. Mothers are usually the caretakers and the ones that feed the children (81.1% cases) and 90.9% for the controls.

Table 4.3 Feeding practices of cases and controls of undernutrition, Engela district hospital, Ohangwena region, 2016

Variable	Frequency (%) n=264 (132 cases, 132 controls)	
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Age when complementary feeding began

Age	Cases	Controls
4 - 5 months	85 (64.4)	18 (13.6)
6 - 7 months	47 (35.6)	114 (86.4)

Is the child still breastfeeding

	Cases	Controls
Yes	45 (34.1)	32 (24.2)
No	87 (65.9)	100 (75.8)

Who usually feeds the child

	Cases	Controls
Mother	107 (81.1)	120 (90.9)
Non-mothers	25 (18.9)	22 (16.7)

4.5 Number of children under five in the house

The study results in Figure 4.4 show that most of the cases had about 3 – 4 other children staying in the same house, followed by 1- 2 children and the least had 9 children and more in the same house. The development of undernutrition can be influenced by the high number of children in the house, since it can be difficult to give sufficient and nutritious food to all the children. It is also not easy to give close attention to the child's feeding when they are a lot in the house therefore making it easy for the child to become undernourished.

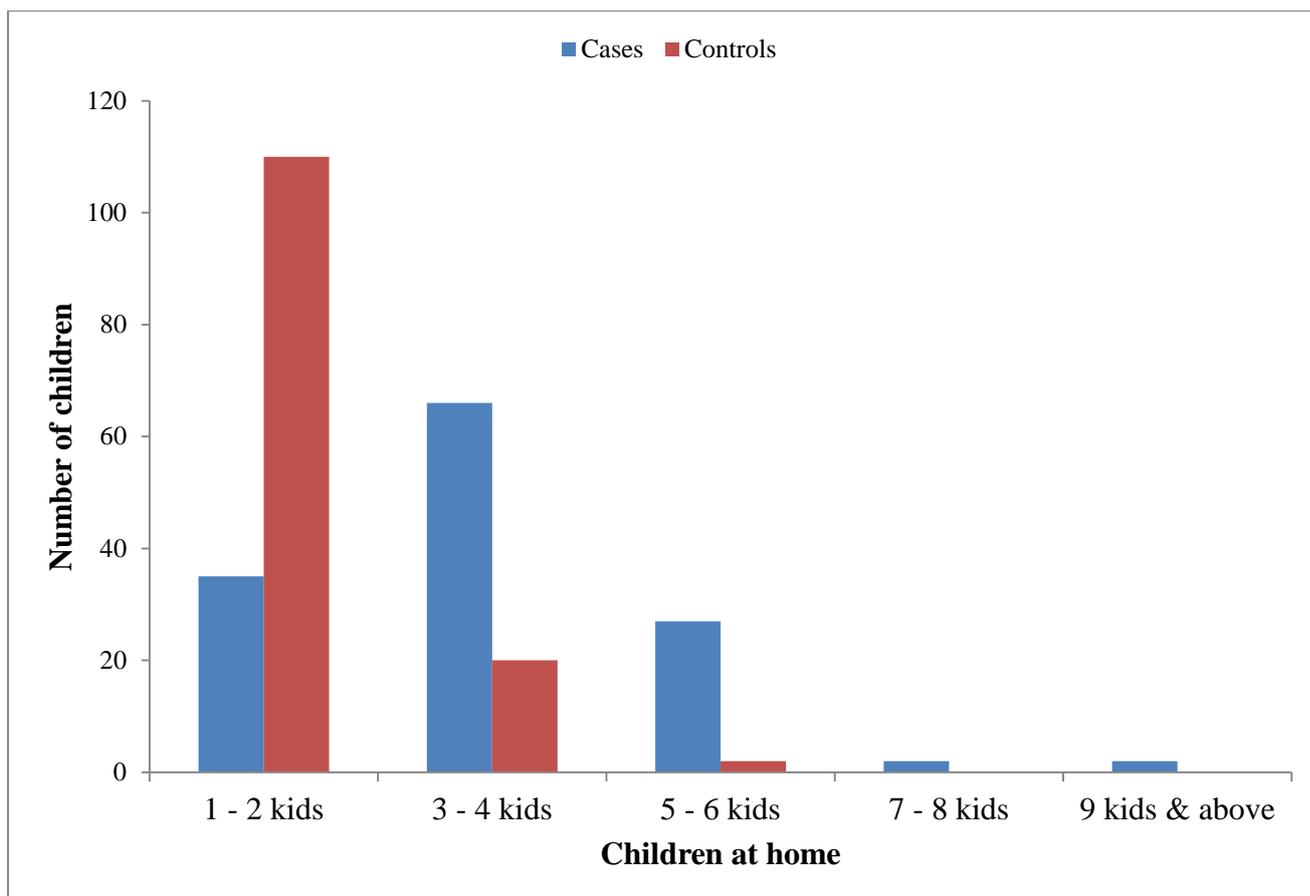


Figure 4.3 The number of children under five in the house where cases/controls reside, Engela district, Ohangwena region 2016

4.6 The type of food consumed by children

Many children according to the study consumed food rich in carbohydrates (100%), and only one child consumed food rich in fats and oil and also those made from beans, peas and nuts (0.75%). A few of the children consumed fruits or vegetables (18.2%) and also food made from cereals (10.6%). Many children, both cases and controls, were also consuming milk products in their daily meals (56.7%). The least number of cases were consuming food with fat and oil (0.75%), but none of the controls were.

The following table shows the type of food consumed by children in the study, both cases and controls

Table 4.4 Type of food consumed by children, Engela district hospital, Ohangwena region

Type of food	Cases	Controls
Foods from cereals	14 (10.6%)	6 (4.5%)
Other fruits or vegetables	24 (18.2%)	23 (17.4%)
Carbohydrate rich foods	132 (100%)	132 (100%)
Foods from beans, peas, or nuts	1 (0.75%)	4 (3.0%)
Milk products	76 (56.7%)	97 (73.5%)
Foods made with oil, fat	1 (0.75%)	0 (0.0)

4.7 Number of feeds of children per day

The following is a presentation of the cases and controls of undernutrition by the number of feeds they received per day in Engela district hospital

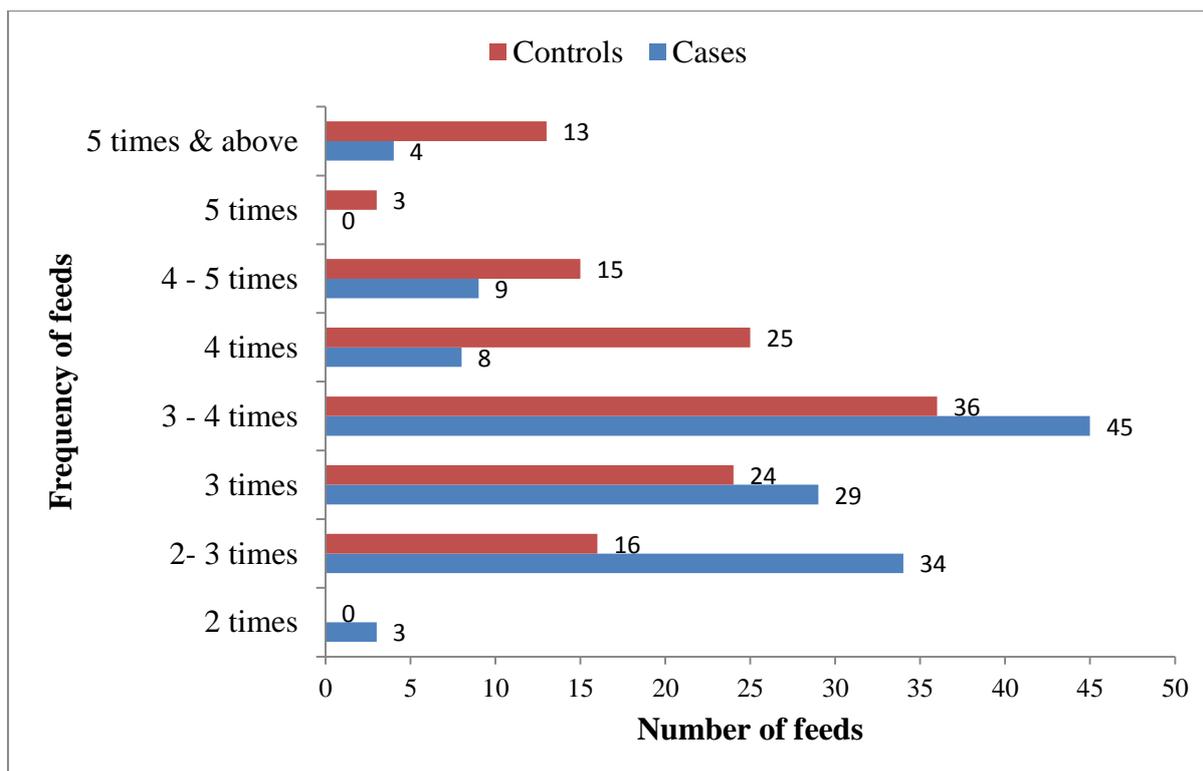


Figure 4.4: The frequency of feeds, the children were fed for undernutrition cases and controls, Engela district, 2016

Most of the children are fed between 3 – 4 times daily (45 cases; 36 controls) followed by 2 – 3 times daily (34 cases; 16 controls) and a few are fed 5 times and above, 2 times, 3 and 4 times and also 4 – 5 times.

4.8 Severity of undernutrition

Results in Table 4.6 indicate that a high number of children (59.8%) had fallen under the acute undernutrition phase, 31.1% were moderately undernourished and 9.1% were severely undernourished.

Table 4.5: Cases of undernutrition by their degree of severity, Engela district hospital, Ohangwena region, 2016

Degree of undernutrition	Cases
Moderate acute undernutrition (MUAC \geq 11.5 cm & $<$ 12.5 cm)	41
Severe acute undernutrition, (MUAC $<$ 11.5 cm)	12
Acute undernutrition (MUAC $<$ 12.5)	79

4.9 Bivariate analysis

According to the analysis in Table 4.7, the children that started complementary feeding at the age of 4 – 5 months were 11.5 times more likely to develop undernutrition compared to the children that started complementary feeding at 6 – 7 months. This was found to be statistically significant since the p-value is less than 0.05 and also because 1 does not fall within the Confidence Interval. Therefore, there is an association between starting complementary feeding at the age of 4 – 5 months and developing undernutrition in children under five years in Engela district hospital. The odds of developing undernutrition are 1.6 times more in children that are currently breastfeeding than in those that are not breastfeeding. This was found not to be statistically significant since 1 is part of the confidence interval therefore there is no association between breastfeeding and developing undernutrition.

The odds of developing undernutrition in children who are taken care of and fed by mothers are 2.3 times than the odds of children who are taken care of and fed by non-mothers. This was found to be statistically significant at the p-value of $<$ 0.01. There is therefore an association between the two.

Table 4.6 Bivariate Analysis of Undernutrition Exposure Variables of Children under- five in Engela district Hospital: feeding practices.

Variable	Frequency (%) n=264 (132 cases, 132 controls)		OR	95% CI	p-Value
Age when complementary feeding began					
Age	Cases	Controls			
4 - 5months	85(64.4)	18 (13.6)			
6 - 7 months	47(35.6)	114(86.4)	11.5	6.2 - 21.1	<0.00
Is the child still breastfeeding					
	Cases	Controls			
Yes	45(34.1)	32(24.2)			
No	87(65.9)	100(75.8)			
Who usually feeds the child					
	Cases	Controls	1.6	0.9 - 2.8	<0.01
Mothers	107(81.1)	120(90.9)			
Non-mothers	25(18.9)	22(16.7)	2.3	1.1 - 4.9	<0.01

The analysis below shows that the odds of developing undernutrition is 6.8 times more in children that were born at home than in those that were born in hospital. This was found to be statistically significant at the p-value of less than 0.05 and 1 was also not part of the CI. The findings therefore show an association between being born at home and developing undernutrition. However, the study showed statistical significance and therefore, there is an association between the immunization status and development of undernutrition.

The study has also shown that the odds of developing undernutrition among children under-five was 7 times more in children that do not attend growth monitoring than in those that do attend. This was found to be statistically significant and have indeed proven an association between attending growth monitoring and developing undernutrition.

Table 4.7 Bivariate Analysis of undernutrition Exposure Variables of Children under-five in Engela district hospital 2016: Health Practices

Variable	Frequency (%) n= 264 (132 cases, 132 controls)				
Place where the child was born					
	Cases	Controls	OR	95% CI	P-value
Home	59 (44.7)	14 (10.6)			
Hospital	73 (55.3)	118 (89.4)			
			6.8	3.6 - 13.1	<0.00
Immunization status					
	Cases	Controls			
Complete	87 (65.9)	126 (95.5)			
Incomplete	45 (34.1)	6 (4.5)			
			10.9	0.04- 0.2	<0.00
Growth monitoring attendance					
	Cases	Controls			
Attended	55 (41.7)	110 (83.3)			
Did not attend/Partially	77 (58.3)	22 (16.7)			
			7.0	3.9 - 12.4	<0.00

The mother's age was not statistically significant with the development of undernutrition among children under five in Engela district hospital, therefore there was no association found between the two.

The study also has not found any association between the caregivers' educational levels and development of undernutrition among the children. However, the study found a significant association between the caregiver's employment status and children being undernourished in Engela district hospital.

It was found in the same study that the odds of getting undernourished is 2 times more in children who did not live with their mothers than in the children who lived with their mothers. Contrarily this study did not find statistical significance at the p-value of > 0.05 , and also since 1 was not part of the confidence interval. There was therefore no association between living with the mother or not living with the mother and being undernourished.

Table 4.8 Bivariate Analysis of undernutrition Exposure Variables of Children under five in Engela district hospital 2016: Demographic Characteristics

Variable	Frequency (%) n= 264 (132 cases, 132 controls)				
Mother's age					
Age group	Cases	Controls	OR	95% CI	P-value
16 - 22 yrs	40 (30.3)	48 (36.4)	0.8	0.5 - 1.3	0.4
23 - 29 yrs	67 (44.7)	54 (40.9)	1.5	0.9 - 2.4	0.14
30 - 36 yrs	25 (18.9)	30 (22.7)	0.8	0.4 - 1.4	0.54
Care giver's level of education					
Education level	Cases	Controls			
Junior high & above	101(76.5)	110 (83.3)	0.7	0.4 - 1.2	0.22
No formal school-Primary school	31(23.5)	22 (16.6)	1.5	0.8 - 2.8	0.22
Caregivers employment status					
Employment Status	Cases	Controls			
Employed	46 (34.8)	91 (68.9)			
Unemployed	86 (65.2)	41 (31.1)			
			4.1	2.8 - 6.9	< 0.00
Relationship of caretaker to the child					
Relationship	Cases	Controls			
Mother	119 (90.5)	125 (94.7)			
Aunt	2 (1.5)	3 (2.3)			
Grandmother	11 (8.3)	4 (3.0)	2.0	0.8 - 5.0	<0.24

4.10 Summary

This chapter presented data in the form of pie charts, bar graphs and tables. The figures in the graphs, charts and tables were interpreted and discussed in further detail. The next chapter is going to discuss study conclusions, which were drawn from the study findings. In addition, the chapter will also look at any challenges or limitations experienced during the study and make recommendations based on study findings.

CHAPTER FIVE: DISCUSSIONS, CONCLUSIONS, LIMITATIONS AND RECOMMENDATIONS

5.1 Introduction

In this chapter the researcher will present a detailed discussion of the findings of the study followed by the conclusions of the study based on study findings. Any limitations that were experienced during the study will be presented, as well the recommendations. This study had general and specific objectives. The study's general objective was to determine factors associated with undernutrition among children under the age of 5 admitted in Engela Hospital, 2016. The following were the specific objectives:

- To determine socio-economic related risk factors
- To determine nutritional risk factors
- To determine medical related risk factors

5.2 Discussion and Conclusions

The study findings are discussed based on the study objectives, as follow:

5.2.1 To determine socio-economic related factors associated with undernutrition

The first objective was to determine the socio-economic risk factors. The mother's age, level of education and employment status were some of the socio-economic factors that were investigated in this study. The majority of the mothers had junior high school and above as their highest level of education (53%) and 6.1% had primary or no formal education. Most of the cases' caretakers were unemployed (65.2%). Conversely, a high number of the controls' mothers/caretakers were employed compared to the cases (68.9%). For cases and controls, a high number of children (90.5%, cases), (94, 7% controls) were being taken care of by their biological mothers rather than by other caretakers such as grandmothers and aunts. The findings indicate that the mother's age was not statistically significant with the development

of undernutrition ($P > 0.05$) among children under five in Engela district hospital. Therefore mother's age was not associated with undernutrition in children aged under five years. These findings correlate to those of a study conducted in Uganda that found no significant relationship between the mother's age at birth and undernutrition (Habasaa, 2014).

Furthermore, the study did not find any association between the caregivers' educational level and development on undernutrition among the children under study ($P = 0.22$). According to (Kadima, 2012), in a study conducted in South Africa, a parent's education level was not a significant predictor of underweight ($P > 0.05$). These were also similar to findings by (Habasaa, 2014) who found no significant relationship between a mother's education level and undernutrition.

However, this study found a significant association between the caregiver's employment status and children being undernourished in Engela district hospital ($P < 0.05$). These findings were similar to those of (Asfaw, Dube, Taha & Wondaferash, 2015), that stated that fathers' educational status were significantly associated with undernutrition. Another study also showed a statistically significant association between parents' employment status and being childhood undernourishment among children under five in Engela district hospital (Faridan, Kamran & Sharghi, 2011). This finding may imply that parents who have an income are able to buy nutritional food for their children unlike those who are unemployed.

In addition, this study found no association between children not living with their mothers and being undernourished ($P = 0.24$). These findings correlate with the findings of another study conducted in Iran (Sharghi, Et al, 2011).

5.2.2 To determine nutritional risk factors associated with undernutrition

The second objective was to determine nutritional risk factors and the findings are detailed below.

The children who had started complementary feeding at the age of 4 – 5 months were 11.5 times more likely to develop undernutrition compared to the children who had started complementary feeding at 6 – 7 months ($P < 0.05$). This finding indicates the need to educate mothers and caregivers that children should only start with complementary feeding at the age of 6 months as per MOHSS guidelines, and not earlier (REPUBLIC OF NAMIBIA, Ministry of Health and Social Services, Primary Health Care Directorate National Guidelines on Infant and Young Child Feeding May, 2011). There was no association found between breastfeeding and developing under nutrition among children in the study.

Furthermore, children who were fed and cared for by their own mothers were less likely to suffer from undernutrition compared to those that are fed by other caretakers ($P < 0.01$).

The majority of children were fed between 3 – 4 times daily (45 cases; 36 controls) with less children being fed 5 times and more, and 4 – 5 times. Some literature (Egata, Berhane, & Worku, 2014) and (Degarege, Degarege, & Animut, 2015) state that children who eat only less than or equal to three times a day had a greater likelihood to develop undernutrition compared to those who eat more than three times a day.

5.2.3 To determine medical related factors associated with undernutrition

The third objective was to determine the medical related factors of undernutrition in children at Engela District Hospital.

According to the analysis, there was a statistically significant association between being born at home and developing undernutrition ($P < 0.05$). This finding was correlated with the findings

in a study conducted in the Democratic Republic of Congo which revealed that there was a higher number of undernutrition cases among children born outside the hospital compared with their counterparts born in hospitals (Kandala, Madungu, Emina, Nzita, & Cappuccio, 2011). It is therefore essential to educate pregnant women to attend antenatal care and go to health facilities when they are due to give birth to prevent medical conditions that can lead to undernutrition.

This study also showed that the odds of developing undernutrition in children who were not vaccinated were 10.9 times more than in the children who were vaccinated. Therefore, being vaccinated was significantly associated decreased odds of undernutrition in children in Engela Health District ($P < 0.05$). These findings were similar to those of a study conducted in Tanzania that showed an association between immunization status and undernutrition (Ahmed, et al., 2015).

This study also found that the odds of developing undernutrition among children under-five was 7 times more in children who did not attend growth monitoring than in those who did attend. The growth monitoring is important as it is a good method of tracking anthropometric status of the children and allows monitoring of their growth velocity (Griffiths & Rosso, 2008). However, the researcher did not find any literature on the association between growth monitoring attendance and developing undernutrition.

5.3 Recommendations

5.3.1 Recommendations to the mothers

5.3.1.1 Mothers to create employment opportunities for themselves

This can be done by either taking part in income-generating activities, such as creating gardens at home to produce food items to sell, and also consume at home. This will also enable mothers to provide nutritious meals for their children. Other income-generating

activities could be making baskets, selling 'kapana', doing domestic work, plaiting hair etc. Even if the Ministry of Health through the assistance of its partners introduce the NACS programme to assist undernourished children through providing food, the problem will persist or relapse if children are discharged to homes where there is insufficient food. Therefore it is advisable for mothers to seek employment opportunities to be able to provide adequate and nutritious food for their children.

5.3.1.2 To delay complementary feeding to after 6 months

It's advisable for mothers to delay the complementary feeding stage to at least 6 months. This is because before 6 months, the child is too young to be able to feed on other food items and these food items might not consist of all the necessary nutrients needed by the child for growth, tissue repair and proper body functions. The mother's milk consists of all the nutrients that the child's body needs so it is best for the child to be breastfed until at the minimum age of 6 months. Furthermore, breast milk is free and is readily available as no cooking preparations are needed for the baby to have it. Other food items might not be prepared well to be able to be consumed by a younger child, or the methods of preparations may not be hygienic enough leading into the child developing diarrhoea.

5.3.1.3 Mothers to care for their children until they are above 5 years, wherever possible

The study has revealed an association between being undernourished among children who were cared for by caretakers rather than by their biological mothers. It is therefore advisable for mothers to take care of their children until the age of 5. This would help to improve the nutritional status of the children since their parents know their nutritional needs better than any other person. Most children cared by caretakers do not have sufficient food items due to mistreatment or improper feeding methods used by caretakers, resulting in the child becoming malnourished. Most parents monitor their children more closely compared to the

other caretakers thus enabling mothers to detect any illness or unusual behaviour in the child like reduced appetite more promptly.

5.3.2 Recommendations for the Ministry of Health and Social Services

5.3.2.1 Strengthening the importance of hospital deliveries

Since the study found an association between home deliveries and being undernourished, it is therefore advisable for the Ministry of Health and Social Services, Primary Health Care (PHC) division in Engela district to strengthen health education with emphasis on the importance of mothers delivering in health care facilities. This will not only help to minimise birth complications but will enable new-borns to get all the necessary services to help minimise future health problems. Some of the services include determining immediate birth weight, immunisation services and screening as well as treatment of any problems that may be present at birth.

5.3.2.2 Strengthen the importance of growth monitoring attendance at health facilities

This study has shown that some mothers do not take their children for growth monitoring and some do but discontinue after starting. This habit may be harmful to the child's health since growth monitoring is the first entry point towards detecting problems with a child's weight. It is therefore the responsibility of PHC services in Engela district to strengthen health education for both ante and post-natal services. It is also advisable for nurses at all health facilities to always screen children's health passports to determine whether their vaccinations are up to date and whether they are attending growth monitoring services. Nurses are required to always weigh and record the child's weight in the passport before vaccinating them. Although this is the right procedure, not all health workers follow it thus resulting in children who are vaccinated but have growth monitoring chart that were not recorded.

5.3.2.3 Strengthening immunizations for children

As the study has shown, there is a statistically significant association between not getting vaccinated and developing undernutrition. The onus is therefore on PHC services in the district to strengthen both the immunization services and the health education provided to the community on the importance of child vaccination. Furthermore, outreach services need to be strengthened since it may be the only way for the majority of children in remote areas to get vaccinated.

The study recommends that further research be conducted after five years to investigate the factors associated with undernutrition within the neighbouring Eenhana and Okongo districts. It would be interesting to look at this since the districts are now well covered with health extension workers that give health education in the communities on various topics of which nutrition is also included. Apart from the health education they are also doing the nutritional assessment among children under five.

5.4 Limitations

Even though the study was successfully carried out, there were various limitations to this study. These included:

The process of obtaining ethical clearance from University of Namibia Research Ethic Committee (URECU) took about two months.

Permission to conduct the study from the Ministry of Health took about three months to be granted as it was issued late. This caused almost a delay in the data collection process.

Some patients that were sampled earlier were later disqualified since they were not found at their houses/villages, and new patients had to be sampled again.

Many of the cases were from Angola, and even though they were treated within the hospital, they could not be followed up since they were from another country.

5.5 Summary

This chapter covered the findings' discussion according to the study objectives. Conclusions were made as well as recommendations to mothers and caregivers, health care providers; the Ministry of Health and particularly the Ohangwena regional directorate as well as the general public. The researcher also identified future studies based on this study. The study limitations were also discussed.

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Annexure A. Research tool

Part A

Consent form and research questionnaire.

Informed Consent

Dear Participant

I am Ertha Ngondjodi Haludilu, an employee of the Ministry of Health and Social Services and I am currently studying towards a Master of Science in Applied Field Epidemiology and Laboratory Management at the University of Namibia (UNAM). I am authorised by UNAM and the Ministry of Health and Social Services to conduct a study on the factors associated with undernutrition among children who are under five years, admitted at Engela hospital. I would therefore, like to ask you some questions for my research which is partly a fulfilment of my degree.

The purpose of this study will be to determine the factors associated with undernutrition in children under 5 years admitted to Engela district hospital. The results from this study will generate information that might help to prevent and address future occurrences of undernutrition and possibly contribute to future control measures of the problem.

The interview will take more or less 15 to 20 minutes to complete. All the information you will provide will be kept strictly confidential and a high degree of anonymity will be maintained. This means that your names will not be recorded on the questionnaire or in any report related to this study. You are therefore humbly invited to answer all questions as honest as possible.

Please understand that your participation in this study is voluntary and you are not being forced to take part in this study. The choice to participate is yours alone. You have the right to stop the interview at any time if you choose not to proceed and you will not be affected in

any way whatsoever. However I would really appreciate it if you share your views with me because your views are extremely important in this study. Your participation in the study will be highly appreciated.

You may ask any question concerning the study, at this time, if any.

Signature of the interviewer:

Part B

Research questionnaire

Section A: Demographic & Geographical Information

- a. Registration number of the child

- b. Age

- c. Parent or guardian relationship to the child

- d. Age of the mother of the child

- e. Village Name

- f. Date of admission

- g. Gender

- h. Nationality

- i. How many children under 5 are in the house?

Section B: Education and Economic Status of Parent/Guardian

- a. What is the highest grade you have passed?

- b. Are you currently employed?

If not, what is your source of income?

Section C: Feeding history

- a. Is the child still breastfed?

If not when did he/she stop?

- b. How long was the child exclusively breastfed?

- c. What types of food was the child fed?

- d. How many times per day do you feed the child?

- e. Who takes care and feed the child?

Section D: Medical information

- a. Where was the child born?

Please tick

Hospital	
Home	
Unknown	

- b. Was the baby born prematurely or at term?

If prematurely, what was the gestational age?

- c. Did the child complete all the vaccinations?
- d. Has the child been attending growth monitoring at health facilities?
- e. Was the child treated with nutritional related problems before?
- f. Did the child suffer from any other condition (or is currently suffering)?
If yes, what was/is that?

Section E: clinical information

- a. Weight
- b. Height
- c. MUAC
- d. BMI

Annexure B: ethical clearance letter

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RESEARCH PERMISSION LETTER

Date: 20/06/2016

TO WHOM IT MAY CONCERN

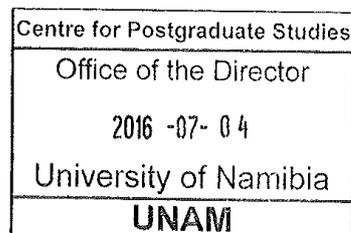
RE: RESEARCH PERMISSION LETTER

1. This letter serves to inform you that student: **ERTHA HALUDILU** (Student number: **200719726**) is a registered student in the SCHOOL of PUBLIC HEALTH for the **MASTER IN FIELD EPIDEMIOLOGY** degree at the University of Namibia. His/her research proposal was reviewed and successfully met the University of Namibia requirements.
2. The purpose of this letter is to kindly notify you that the student has been granted permission to carry out postgraduate studies research. The School of Postgraduate Studies has approved the research to be carried out by the student for purposes of fulfilling the requirements of the degree being pursued.
3. The proposal adheres to ethical principles.

Kind regards

Signed: Dr. P. Angula *Dr. P. Angula* HOS, PGS, fac. of Health Scs.
Name of Main Supervisor: Dr. P. Angula *Dr. P. Angula*

Signed: Dr. M. Hedimbi *Dr. M. Hedimbi*
Dr. M. Hedimbi
Director: School of Postgraduate Studies
Tel: 2063523
E-mail: mhedimbi@unam.na



Annexure C: Permission to conduct the study from the Ministry of Health and Social Services



REPUBLIC OF NAMIBIA

Ministry of Health and Social Services

Private Bag 13198
Windhoek
Namibia

Ministerial Building
Harvey Street
Windhoek

Tel: 061 - 203 2562
Fax: 061 - 222558
E-mail: hnangombe@mbss.gov.na

OFFICE OF THE PERMANENT SECRETARY

Ref: 17/3/3
Enquiries: Ms. H. Nangombe

Date: 08 September 2016

Ms Ertha Haludilu
School of Public Health
Oshakati Campus
University of Namibia
P.O. Box 11803
Oshakati
Namibia

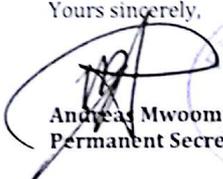
Dear Ms Haludilu

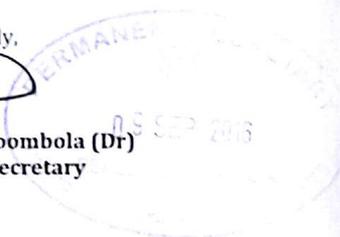
Re: Investigation on the factors associated with under nutrition among children under 5 years in Engela District Hospital, Ohangwena Region, Namibia

1. Reference is made to your application to conduct the above-mentioned study.
2. The proposal has been evaluated and found to have merit.
3. **Kindly be informed that permission to conduct the study has been granted under the following conditions:**
 - 3.1 The data to be collected must only be used for academic purpose;
 - 3.2 No other data should be collected other than the data stated in the proposal;
 - 3.3 Stipulated ethical considerations in the protocol related to the protection of Human Subjects should be observed and adhered to, any violation thereof will lead to termination of the study at any stage;

- 3.4 A quarterly report to be submitted to the Ministry's Research Unit;
- 3.5 Preliminary findings to be submitted upon completion of the study;
- 3.6 Final report to be submitted upon completion of the study;
- 3.7 Separate permission should be sought from the Ministry for the publication of the findings.

Yours sincerely,


Andreas Mwoombola (Dr)
Permanent Secretary



"Health for All"