

**CHILD AND MATERNAL RELATED FACTORS ASSOCIATED WITH
MALNUTRITION AMONG UNDER FIVES IN BOSASO, PUNTLAND SOMALIA**

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DECLARATION

I declare that this research thesis is my original work and has not been presented at any other university.

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RECOMMENDATION

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DEDICATION

This research thesis is dedicated to my parents, my family, and friends, as well as my bosses, Allah, bless them for their efforts.

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I thank Allah for providing me with strength and health throughout the project. I'd like to acknowledge my supervisors. **Dr. Beatrice Gisemba** and **Mrs. Nyakobo Nyaribo**, for their ongoing supervision and assistance, corrections, and invaluable contributions. I am sincerely grateful to everyone in my family who helps me financially, mentally, and academically.

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ABSTRACT

Undernourishment is one of the foremost reasons of disease and mortality among children under the age of five in Sub-Saharan Africa. Significant illnesses and deaths across the world have been associated with malnutrition, accounting for 52.5% of all deaths among young children across the world. Approximately 45% of all mortalities among young children in Somalia are due to undernutrition. In Puntland, 11% of children are wasted and in Bari, where Bosaso is located, 37% of children are underweight. This research aimed at assessing child and maternal related factors associated with malnutrition among children under five in the Bosaso region, Puntland-Somalia. A descriptive cross-sectional study design with the purposive method of non-probability sampling was deployed. The target population included children aged between six to fifty-nine months attending the maternal and child health clinic (MCH) and pediatric outpatient clinic at Bender Qassim Hospital in Puntland, Somalia. Main data was gathered using a questionnaire using drop and pick approach, while the anthropometric assessment was done using a height board and electronic weighing scales. Data was analyzed in SPSS version 25 with descriptive statistics and a chi-square test used to test associations between study variables. A total of 159 children were selected for the study. More than half (54.1%) were females. Most (54.7%) of the caregivers did not attend school. Most (72.3%) of the children reported not having diarrhea while more than half (64.8%) did not contract respiratory a fortnight before the study. More than half (51.6%) of the children of the children had a z-score of above -2SD while 30.2% and 18.2% were moderately and severely wasted respectively. Exclusive breastfeeding is connected with the nutrition status of children. There is a significant connection between nutrition status and exclusive breastfeeding, $\chi^2 (1, N=159) = 14.92, p = 0.05$. The caregiver's monthly income is associated with the nutrition status of the children. There is a significant relationship between nutrition status and monthly income, $\chi^2 (1, N=159) = 11.82, p = 0.05$. The majority (69%, $n=29$) of severely wasted children had caregivers earning less than 100 US monthly. The study concluded that the child factor associated with malnutrition is exclusive breastfeeding while the maternal aspect connected with malnutrition in children under 5s includes monthly income. Besides, the level of malnutrition is still a community well-being concern. There is a need to generate more cognizance of the importance of exclusive breastfeeding for women of reproductive age. Sustainable sources of livelihood need to be enhanced to boost the average income of a household. Also, there is a need to strengthen active case findings of children with malnutrition so that they can be admitted to nutrition programs for management.

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DEFINITION OF TERMS

Exclusive breastfeeding	Refers to the action of giving breast milk only to a baby for the 6 months of its life.
Malnutrition	State of having inadequate nutrients to meet the optimum physiological needs of the body
Moderate wasting (MAM)	Form of moderate acute malnutrition characterized by z-scores of $<-2SD$ and MUAC of 11.6 to 12.5
Nutrition status	State of determining if a child's caloric and nutrient intake is being met in the correct amounts
Nutritional assessment	Process by which the malnutrition of a child is determined by the use of anthropometric measurement data, psychosocial data, dietary history and intake data, medical history & clinical examination, and biochemical data
Severe wasting (SAM)	Form of severe acute malnutrition characterized by MUAC of 11.5, z scores of $<-3SD$
Under 5	Children from 6 months to 59 months

Wasting Indicates low weight for a child's height. Usually used to determine recent incidences of acute malnutrition

ABBREVIATIONS AND ACRONYMS

ANC	Antenatal Clinic
EBF	Exclusive Breastfeeding
FANTA	Food and Nutrition Technical Assistance
FAO	Food and Agriculture Organization
FSNAU	Food Security Nutrition Analysis Unit
GAM	Global Acute Malnutrition
IYCN	Infant and Young Child Nutrition
LMICs	Low- and Middle-Income Countries
MAM	Moderate Acute Malnutrition
MUAC	Mid-Upper Arm Circumference
NGOs	Non-Governmental Organization
ODK	Open Data Kit
PLHDS	Puntland Demographic and Health Survey
SAM	Severe Acute Malnutrition
SGDs	Sustainable Development Goals
SPSS	Statistical Package for Social Science
UNICEF	United Nations International Children's Emergency Fund
W/H	Weight for height
WHO	World Health Organization

CHAPTER ONE

INTRODUCTION

In this chapter, the main focus is on the conceptual examination of literature and stating the key problem warranting the need for the inquiry.

1.1 Background to the Study

Based on World Health Organization (WHO) malnutrition is considered one of the greatest ravaging health complications majorly resulting in a considerably high child mortality rate (World Health Organization [WHO], 2020). Malnutrition is described as the state of having excess or inadequate nutrients to support the body's optimum physiological needs nutrients (Etim et al., 2017). It is associated with adverse health effects and research indicates that it accounts for nearly one-third of infant mortalities in low-income nations annually (United Nation Children's Fund [UNICEF], & WHO, 2020). Significant illnesses and deaths across the world have been associated with malnutrition, accounting for 52.5% of all babies' mortalities across the globe (Tette et al., 2015). Reports from the World Bank, UNICEF, and WHO indicate that in the year 2013 alone, stunted children under-fives were 161 million, in which a third of the stunted children reside in Africa (Tette et al., 2015).

In Sub-Saharan Africa, malnutrition is associated with high child mortality rates compared to other parts of the world. For instance, it has the highest number of stunted children (UNICEF, 2019). Severe acute malnutrition (SAM) was estimated to be about 39.9% in Africa (Mekonen, et al., 2024). Complementary feeding practices and associated factors among mothers of children aged 6 to 23 months in Sub-saharan African countries: a multilevel analysis of the recent demographic and health survey. In Nigeria, it was found to

account for 49% of school absenteeism among school-going children (Yanusa et al., 2012). The Republic of Botswana has shown malnutrition as a persistent problem with significant differences across the various districts in the country. Regions that were most hit by high poverty rates and those characterized by poor socio-economic levels were seen to be the most ravaged by malnutrition rates. The Central Statistical Agency (CSA) and ICF (2016) study shows that around 9.7 % of the kids had wasting and 28 % were underweight (Gebremeskel et al., 2022). Based on the 2014 Kenya Demographic and Health Survey, in Kenya 26% of kids have stunting, 4% have wasting and 11% are underweight (Lima et al., 2023).

In Somalia, malnourishment is a substantial root-cause of childhood problems and the country remains among the nations with the prominent rates of child malnutrition in the world (Martin et al., 2020). Approximately 45% of all mortalities among young children in Somalia are due to undernutrition. Based on the most current Puntland demographic and health survey, 25% of children have stunting, 11% have wasting and 25% underweight. A study by (Abdiwali et al., 2022) found that the prevalence of childhood malnutrition in Somalia has been associated with a lack of nutritional knowledge, a lack of childcare facilities and the poor use of health services, and a lack of Community Health Workers (CHW) united nation children's fund (UNICEF, 2018).

Somalia is one of the African countries affected by drought. Thus, food security is a major issue in the country, with food security varying depending on the area, livelihood, season, and economic as well as political factors united nation children's fund (Wudil et al., 2022). Families are the most affected by the high prevalence of food security in Somalia.

Generally, food security at household levels is assessed by the quantities of meals taken per day. The central and southern regions are the most affected by food security issues, with more than three-quarters of families present in the regions taking only two meals a day. However, the situation is fairer in Puntland as half of the families present take 2 meals a day while the other half take three meals a day unite nation children's fund (WHO, 2016)

The seventeen Sustainable Development Goals (SDGs) are directly or indirectly trying to reduce rates of malnutrition (Giuseppe et al., 2020). In most African nations, reducing malnutrition forms a vital part of their development agenda. Constant illness and inadequate food are considered the leading causes of malnutrition in Africa. Additionally, poor feeding practices, lack of adequate food at the family level, and drought in various regions in Africa are attributed to the rising cases of malnutrition in the vast African continent.

Poor health care services, inadequate child care, insufficient food, and poor sanitation in the household environment are outlined as the three primary genesis of childhood malnutrition based to the united nation children's fund (UNICEF) theoretical outline on causes of malnutrition (Tette et al., 2015). Poverty, low income, type of dwellings, and employment and sanitation levels are all determined by political as well as socio-economic factors, directly or indirectly contributing to the worst cases of malnutrition in Africa. Other factors that are loosely linked to malnutrition include poor dietary habits, recurrent illnesses, chronic diseases, measles, birth weight, and diarrhea. At the same time, social factors have a substantial impact on the prevalence of childhood malnutrition across the world. A study carried out in Ghana shows that the prevalence of childhood malnutrition in

the 1990s was mostly associated with young mothers with a low maternal socio-economic status (Tette et al., 2015). Besides, food security, a lack of access to adequate and appropriate education about diet and nutrition, poor feeding habits, and large family sizes are also some other factors that have been linked with childhood malnutrition among children less than five years (Govender et al., 2021)

Some of the devastating ill-health effects related with malnutrition include hampered cognitive development, an increased rate, and risk of infections, poor growth and development, and death. Children characterized by malnutrition have also been observed to exhibit a reduced ability of their bodies to fight infections, making them more vulnerable. Malaria and respiratory infections are examples of common diseases (Tette et al., 2018).

1.2 Statement of the Problem

Significant illnesses and deaths across the world have been associated with malnutrition, especially among young children. According to UNICEF (2019) approximately 52.5% of all deaths among children under five years of age globally are related to malnutrition. One of the main reasons for this alarming statistic is wasting, a condition characterized by low weight for height (Govender et al., 2021). Approximately 20 million children are affected by severe wasting worldwide. United Nations Children's Fund with the children affected being 5-20 times at risk of death compared to well-nourished children (UNICEF 2019). The World Health Organization guidelines on managing malnutrition highlight the importance of proper nutrition, hygiene, and healthcare to reduce mortality and morbidity rates among children (WHO, 2020).

Under-nutrition is a pressing issue that significantly contributes child mortality rates in

Somalia. According to WHO (2021), approximately 45% of all mortalities among children under five in Somalia are attributed to malnutrition, and this problem manifests differently across various regions. In Puntland, one of regions in Somalia, 11% of children under five suffer from wasting, a condition characterized by a low weight for height and indicative of acute malnutrition. The situation is even more critical in Bari where Bossaso is located, where 37% of children under five are underweight, reflecting chronic malnutrition and long-term health concerns (WHO, 2021). These alarming statistics emphasize the urgent need for targeted interventions, nutritional support, and community-based approaches to combat malnutrition and protect the well-being of children in these areas.

For instance, malnutrition negatively affects child growth and development and reduces immunity making children more vulnerable to diseases and generally poor health status (UNICEF, 2020). Evidence from research studies shows that malnutrition is connected with poor nutritional status for kids in Africa. The nutritional status of children is important since it is regarded as a critical criterion for assessing a country's economic status. Thus, high nutritional status among children is closely associated with the economic status of a country.

Bossaso is regarded as the hub of better education in Somalia. As a result, NGOs and government agencies have launched child rescue and other nutrition intervention programs in place to help the most vulnerable children. Despite the relative peace and the health education interventions in Bossaso, malnutrition levels remain high in Bossaso experiences. However, the causes and severity of malnutrition cases differ from one area to another (UNICEF, 2019). Generally, malnutrition cases in Somalia are multifactorial

with a limited literature gap establishing this multifactorial factor that influences malnutrition among those under five

1.3 Purpose of the study

The purpose of this study was to establish the child and maternal related factors associated with malnutrition among under-fives in Bossaso Puntland Somalia.

1.4 General Objectives

The general objective of the study was to determine the child and maternal related factors associated with malnutrition among under-fives in Bossaso, Puntland, Somalia.

1.4.1 Specific Objectives

- 1) To evaluate the nutritional status among the under-fives in Bossaso in Puntland Somalia
- 2) To assess the child related factors associated with malnutrition among under-fives in Bossaso in Bossaso Puntland Somalia
- 3) To determine the maternal related factors associated with malnutrition among under-fives in Bossaso in Bossaso Puntland Somalia

1.5 Research Questions

- i. What is the nutritional status of under-fives in Bossaso?
- ii. What are the child related factors associated with malnutrition among under-fives in Bossaso?
- iii. What are the maternal related factors associated with malnutrition among under-

fives in Bossaso?

1.6 Justification of the Study

Based on World Health Organization every child has a right to good nutrition (Cathaoir, 2016) Malnutrition is a life-threatening condition that robs the quality of life among children, especially in low- and middle-income nations (Govender et al., 2021). The socioeconomic, health and developmental effects of malnutrition are long-lasting in households, communities, and nations. The WHO, (2016) target aims at reducing wasting among the under-fives to less than 5% while the Somalia government aims to reduce wasting to less than 10% at all times by 2025 (Anato, 2022). Consequently, for this to be achieved, there is a need to strengthen those efforts through continuous research which not only creates awareness but also provides a reality check of the progress achieved or areas that need to be improved. This study focused on Bossaso Puntland Somalia because despite numerous intervention programs to curb malnutrition in Bosaso, high incidences of malnutrition among children under five are still recorded.

In addition, despite various studies conducted in Bossaso, there is still limited literature on factors related to childhood malnutrition for children less than five years attending Bender Qassim Hospital. Therefore, this study sought to determine the factors associated with malnutrition among under-fives in Bossaso was conducted to add up to the recent works of literature as well as help steer the sustainable development goals two and three for the realization of better health and nutrition for the under-fives.

1.7 Significance of the study

It is anticipated that the conclusions and endorsements from this study will be useful to

residents of Bosaso in enhancing their awareness about malnutrition, its causes as well as the possible ways to eliminate it. The findings were enhancing awareness and provide up-to-date information to the community in addition to information that already exists on the malnutrition and well-being of children under five years. The findings were lead to a better understanding among mothers and primary caregivers of the need for good nutrition and proper childcare practices. The resultant effect was to substantially reduce infant mortality and morbidity by enhancing maternal and child nutrition.

The results and conclusions of this study could form the basis of new research that was closely investigate the instincts found. Besides, the finding could inform healthcare practice among the staff members (doctors, nurses, health workers, and community health volunteers) in Bander Qassim Hospital. Also, it could inform the government, policymakers, and other stakeholders of important information that could be used to make decisions.

1.8 Limitations of the Study

The researcher anticipated that the language barrier would affect the mode of data collection. To mitigate this, the questionnaire was translated into Somali for ease of understanding. Also, the use of trained research assistants was deployed. It was anticipated that some of the mothers and caregivers might be reluctant to be part of the study due to their concerns for their children's health condition which forms the reasons why they visited the hospital. However, the researcher made use of opportunities where the mothers and caregivers are free and settled, and comfortable enough to participate in the study.

1.9 Delimitations of the Study

This study was limited to determining the factors associated with malnutrition among the under-fives attending MCH and the pediatric clinic at Bander Qassim Hospital in Bossaso. Child aspects and maternal features were the independent variables while malnutrition was the dependent variable of the study. The study only targeted children 6-59 months. The location scope were Bandar Qassim Hospital in Bossaso- Puntland Somalia. The time scope was between June and August 2021.

1.10 Assumptions of the study

The study will assume that all the targeted children are under five years and are under the primary responsibility of a primary caregiver.

1.11 Operational definitions of terms

Anthropometric measure: Metrics used to indicate malnutrition in under 5s and include wasting, stunting, and underweight

Morbidity: Sickness

Exclusive breastfeeding Refers to giving breast milk only to an infant for the first 6 months of its life.

Malnutrition State of having inadequate nutrients to meet the optimum physiological needs of the body

Moderate wasting (MAM) Form of moderate acute malnutrition characterized by z-scores of $<-2SD$ and MUAC of 11.6 to 12.5

Nutrition status	State of determining if a child's caloric and nutrient intake is being met in the correct amounts
Nutritional assessment	Process by which the nutrition status of a child is determined by the use of anthropometric measurement data, psychosocial data, dietary history and intake data, medical history & clinical examination, and biochemical data
Severe wasting (SAM)	Form of severe acute malnutrition characterized by MUAC of 11.5, z scores of <-3SD
Under 5	Children from 6 months to 59 months
Wasting	Indicates low weight for a child's height. Usually used to determine recent incidences of acute malnutrition
Mortality	The number of children who die before the age of five

CHAPTER TWO

LITERATURE REVIEW

2.1 Introduction

This chapter will present a literature review, including an empirical review of other articles.

2.2 Nutritional Status of the Under Fives

Malnutrition is caused by a wide range of determinants caused by hierarchically-related factors (Gebre et al., 2019). Most of these determinants are usually related to insufficient intake of diet, diseases associated with the inadequate supply of water to various homesteads, high rates of poverty, poor maternal care, and poor sanitation around household settings (Smetana et al., 2019). The basic factors causing malnutrition include economic aspects, such as political and sociocultural conditions, environmental conditions, governance, and capacity. Malnutrition in children can also be exhibited through such instances as wasting, stunting, or cases of children having low weight for age (Lima et al., 2023; Mahgoub et al., 2006). According to WHO children whose weight-for-age index is below the international reference population standard for children between one to 59 months are considered to be underweight(Khan et al., 2019). Children whose height/length-for-age indicators are below the standard set international reference population are considered to be stunted (World Bank 2018). Children below the standard set weight-for-height indicator as stipulated by the international reference population are considered to be wasted (Ricardo et al., 2021).

The common causes of malnutrition among children are usually expressed through poor dietary intake and vulnerability to diseases. How well a household accesses these factors directly determines their nourishment. Children with poor dietary habits will be more vulnerable to disease than those who are not. According to a study carried out by Saloojee (2007) in Limpopo, South Africa, despite the emergence of HIV significantly contributing to conditions that have aggravated severe malnutrition, traditional factors such as poverty, poor access to health services, poor nutrition, and social inequity remain the highest contributors to the prevalence of malnutrition. Malnutrition is related to premature deaths, low educational achievements, economic and social incapacitation, and transcended poverty. Some of the manifestations of poor nutrition include wasting, stunted growth, and severe loss of weight. These manifestations can be explained by the body's reduced immunity, leading to edema and sudden weight loss (Saunders & Smith, 2010).

The nourishment level of children is also affected by their stay in hospitals to access medical services. A study conducted out to evaluate the level of nutrition for children admitted and discharged in Fortaleza, Asia, found that pneumonia and prolonged hospital admission were factors closely associated with malnutrition (Bélanger et al., 2019) The study results showed that children who were admitted while malnourished were discharged with no significant improvement. Another study done in Gambia to assess the magnitude of nutrition for children admitted in pediatric wards for various reasons showed that malnourished children were more susceptible to various infectious diseases prevalent in developing countries (Lang, & Mason, 2018).

Another study found that most deaths in rural Kenya were still caused by malnutrition

despite significant global efforts to fight against malnutrition. The study concluded that possible micronutrient deficiencies were closely associated with the predisposition of children to malnutrition (Smetana, et al., 2019; Sentongo. 2019). Another study carried out in the Kenyan coastal region by Wambui and Musenges (2019) shows a high malnutrition prevalence of 16% in Kilifi District Hospital.

Based on the united nation children's fund {UNICEF} theoretical framework, reasons of malnutrition can be immediate, underlying or intermediate, or root and basic(Harris & Nisbett, 2021). This shows how malnutrition is multifaceted, and how it requires multi-level, multi-sectorial, and multidisciplinary.

From the above literature, several research gaps exist across various studies. For example, a study by Gebre et al. (2019) broadly discussed the multiple determinants of malnutrition but in a different context and did not delve into specific child and maternal factors, hence contextual and conceptual gaps are presented. Additionally, the study by Saloojee (2007) emphasized the role of traditional factors like poverty and poor healthcare access in South Africa, thus both contextual gap and conceptual gaps are evident. Moreover, Studies by Krause et al (2019) looked at the nutritional statuses of hospitalized children but didn't offer a comprehensive understanding of pre-hospital conditions or post-discharge outcomes.

In addition, the study by Githanga et al. (2019) focused only on rural Kenya and micronutrient deficiencies, presenting contextual and conceptual research gaps. Furthermore, the study by Wambui and Musenge (2019) gives data on high malnutrition prevalence in Kilifi District Hospital. But since the study was conducted in Kilifi Kenya a

different context, its findings may not apply to Bossaso in Puntland Somalia. The study also presents conceptual gap because it mainly focused on high malnutrition prevalence as the only study variable. Overall, these studies leave gaps in understanding the complex interplay of child and maternal factors, the influence of geographic and cultural contexts, and the long-term outcomes for children who experience malnutrition in Bossaso in Puntland Somalia. The current study thus sought to address the identified gaps by determining the child and maternal related factors associated with malnutrition among under-fives in Bossaso, Puntland, Somalia.

This study also aimed to offer a deeper understanding of how both child and maternal factors interact to affect malnutrition in a specific geographic and cultural context, as most prior studies had either focused on one group of factors or lacked regional specificity. Contextually, it strived to shed light on malnutrition in Bosaso, Puntland, a region in Somalia that had been underrepresented in the existing literature, thereby providing data that could help in tailoring interventions to the local population. Methodologically, the study aimed to employ a multi-level, multi-sectorial, and multidisciplinary approach, acknowledging that malnutrition is influenced by a complex web of factors including economic, political, environmental, and cultural elements. By doing so, the study hoped to provide a more comprehensive and actionable set of findings that could serve as a foundation for future research and policy development in the region.

2.2.1 Causes of Malnutrition

Malnutrition is majorly caused by cultural, political, economic, and religious systems, which may include the social status of women, making them have reduced access to human

and technological resources (Harris & Nisbett, 2021). Other underlying causes of malnutrition are at the family level. Some of the family-related causes of malnutrition include poor dietary habits, inadequate knowledge of diseases and nutrition, and limited access to quantity and quality organizational and economic resources. The immediate malnourishment origins, however, are at person's levels. Inadequate food consumption and their associated diseases lead to deaths and disabilities (Govender et al., 2021).

Malnutrition is associated with economic and health consequences, with the most serious being an increased risk of death. Other consequences of malnutrition include illness risks, and low cognitive development, which resulted in reduced educational achievement. According to the results of a study carried out among Bosaso IDPs, the malnutrition prevalence as well as the associated risk factors indicated that the Bosaso exhibited a 68.8% prevalence of malnutrition. As well, it was observed that inadequate access to maternal care, lack of the required period of breastfeeding, and general ignorance of ideal lacteal feeding were some of the factors associated with malnutrition (Ahmed et al., 2022).

Through the joint efforts of the government and other partners, there has been a considerable increase in equity as far as the access and utilization of child nutrition interventions are concerned. The result of these efforts includes a reduction in severe malnutrition cases, and lowered child illness and death rates.

2.3 Child Related Factors and Malnutrition

Some child attributes such as age, sex, and disease, as well as the mother's breastfeeding position, have a significant effect on the level of nutrition for children below five years. Results from the same study showed that PEM was relatively higher in the third-year level

of life compared to the second level of life. According to Nyaruhucha et al. (2006) children aged between 24-35 months exhibited a higher of under-nutrition while children less than one year showed fewer symptoms of under-nutrition. However, it has been generally observed that stunting is closely associated with the weight and sex of children in more independent instances (Nyaruhucha et al., 2006).

The age and gender of children are also considered critical factors in influencing the status of nutrition of children. For example, the nutritional requirements of boys are different from the nutritional requirements of girls. However, studies have shown that boys are more likely to suffer from malnutrition compared to girls. While there has not been a clear evidence-based justification for this assertion, Olack et al. (2011) show that boys were more likely to be malnourished than girls because boys are more likely to be affected by environmental stress, which is a significant contributor to malnutrition. Githanga et al. (2019) also found that boys were highly subject to undernutrition. However, on the contrary, Mkhize and Sibanda, (2020) found that girls were more likely to suffer from malnutrition than boys.

In Africa, there is a tendency to give more preference to male children compared to female children. This is because of the notion that male children will propagate the family after marriage, something that puts female children at a higher nutritional risk compared to male children. According to Nyaruhucha et al. (2006), most households give food to male children first before female children. Another study by Olack et al. (2011) shows that more than half of girls (65.7%) tend to show more wasting characteristics compared to their male counterparts. Generally, wasting was more prevalent among girls than among boys (Olack

et al., 2011). Apart from gender, children aged between 13 to 24 months in India were observed to exhibit stunting characteristics (81.8%), wasting (18.2%), and being underweight (45.5%) (Kumar et al., 2006). Wasting was more prevalent among children of 37-48 months (Kumar et al., 2006). This is evidence that children aged more than one year are more likely to suffer from malnutrition compared to children below one year. Furthermore, (Olack et al., 2011) reported that children of 6-11 months exhibited moderate wasting (4.1%) while children of 48-59 months (1.1%). Another study by (Adhikari et al., 2017) established that there is a close relationship between age and underweight and stunting with the odds of wasting and underweight highest in children aged between 6 and 23 months. This trend can be attributed to children's feeding practices in the first 1000 days of their lives. Feeding children with inappropriate solid foods during their weaning period and suboptimal breastfeeding are the leading causes of poor nutrition outcomes for children. Inappropriate weaning limits children from accessing a sufficient number of foods with the required nutrients to support the normal growth of children.

Another factor that was associated with children's increased odds of being underweight includes birth order. This can be explained by the increasing number of children within one household, thus putting pressure on available resources, especially food (Adhikari et al., 2017). This impacts the children's access to the required nutritional diet that will support the children's normal growth and development. These findings emphasize the need for proper family planning practices to allow wives to control when and how they bear children.

Dietary intake is significant when it comes to children's normal growth and development,

especially in children's first 1000 days. An insufficient dietary intake is highly likely to limit a child's normal growth and development, disposing a child to various illnesses and diseases that ultimately lead to malnutrition (Wali et al., 2019). Findings from this study show that diet plays a significant role in determining the nutritional status of children. Wali and Kingsley (2022) found an association between poor dietary intake and consuming foods with an insufficiency of essential vitamins, such as zinc, iron, vital vitamins, and calcium. Taking foods lacking such nutrients leads to protein-energy malnutrition (PEM), manifested in illnesses such as marasmus, kwashiorkor, and kwashiorkor-marasmus. Poor diet intake among children causes poor cognitive development.

According to (Halli et al., 2022), low birth weight is another leading cause of stunting. At the same time, global researchers have observed that low birth weight is a great incentive towards malnutrition. For instance, a study by (Mkhize & Sibanda, 2020) indicates that low birth weight was a significant predictor for childhood morbidity, malnutrition, and mortality. Simultaneously, a study established that a low birth weight ranging from about 2500g was more likely to be considered underweight compared to a birth weight of more than 2500g (Adjei-Gyamfi et al., 2023) There is a close relationship between low birth weight and stunted growth for children below five years (Halli et al., 2022;Wali et al 2021).

According to a study carried out by Saleem et al. (2024), other health conditions, such as the prevalence of tuberculosis (TB), measles, and diarrhea aggravate malnutrition among children. At the same time, a combination of these problems leads to a weakened immune system. Furthermore, prolonged illness among children can lead to a loss of absorption,

metabolic disorder, behavioral change, and a loss of appetite, which further negatively affects children's nutritional status (Dipasquale et al., 2020). At the same time, poor nutritional levels among children tend to dispose them of illnesses that take a prolonged time to make recovery. The results of this review show that childhood infections are the leading factors influencing child dieting habits. Findings by other scholars also show that diseases such as malaria, fever, vomiting, and diarrhea have negative effects on a child's nutritional status of children below five years. Simultaneously, malnutrition leads to lowered body immunity.

Every year, 1.7 million children in the world die from preventable diseases (Shetty, 2019; Taha et al., 2023)

The unavailability of vaccines, misinformation on the benefits of immunization, and poor access to health services leave an excess of 30 million unimmunized. Therefore, diseases such as diarrhea, malaria, HIV/AIDS, pneumonia, measles, and malnutrition are the leading causes of death among children in developing countries. Poor health services, eating diets lacking sufficient supply of vitamin A and other essential micronutrients, and living in environments where pathogens thrive are some of the factors that aggravate the death of these children (Morales et al., 2023). Proper nutrition will positively impact the health of children with the consequent effect of improving their mental and physical development, protecting their health, and laying a firm foundation for their future productivity (Roberts et al., 2022). Raising healthy children requires access to appropriate knowledge, self-sacrifice, awareness, financial resources, and time.

Since these studies under this section were conducted in different contexts, using different

variables and adopting varied methodologies, conceptual, contextual and methodological gaps were identified which the current study sought to address by determining the child and maternal related factors associated with malnutrition among under-fives in Bossaso, Puntland, Somalia.

This study also aimed to offer a deeper understanding of how both child and maternal factors interact to affect malnutrition in a specific geographic and cultural context, as most prior studies had either focused on one group of factors or lacked regional specificity. Contextually, it strived to shed light on malnutrition in Bosaso, Puntland, a region in Somalia that had been underrepresented in the existing literature, thereby providing data that could help in tailoring interventions to the local population.

2.4 Maternal Related Factors and Malnutrition

Maternal literacy is a critical factor that determines the nutritional status of children less than five years show that children should receive enough primary care for the first six years from their mothers or caregivers (Sufiyan et al., 2012). However, the standard of care provided to the children largely depends on the mother/caregivers' understanding of basic healthcare practices as far as nutrition is concerned. According to Chen (1986), literate mothers and caregivers are likely to delay childbearing, leading to a low infant mortality rate. Sufiyan et al. (2012) established that illiterate mothers were at a higher risk of disposing of their children to stunt than literate mothers. Ali et al. (2005) also found out that there was a 40.8% risk of stunting and a 33.3% risk of wasting for children born to illiterate mothers compared to children born to literate mothers.

A study carried out by Cui shows that education has a direct relationship with children's

health through the propagation of health information from generation to generation (Cui et al, 2019). Proper health information is associated with the ability of the mother to detect illnesses quickly and administer treatment promptly. Educated women are more likely to administer good health practices to their children compared to uneducated mothers. At the same time, this trend is common because educated women tend to marry men with a relatively higher income compared to uneducated women (Barbara et al., 2019). Parent health education is a significant factor affecting the nutritional status of children. This implies that a high level of education and information awareness among parents is related to better child-raising practices. In another study by Barbara et al. (2019), children born to parents with a high level of income and increased knowledge of child nutrition tend to receive a nutritious diet. However, parents with increased educational attainment can also predispose children to values that may detriment their children's health.

The association between parents' educational attainment and diet habits is complicated. Greater educational attainment is associated with broad exposure to the benefits of good nutrition. Therefore, it is expected that educated and informed parents should provide their children with a nutritious diet because they can identify the nutritional value of various foods (Krause et al., 2019). Children born to educated mothers have a better chance of survival and healthy growth and development than children born to uneducated mothers. (Augustine et al, 2009). A mother's level of education and access to information determines whether the mother understands the care practices of a child. This relates to issues such as the duration of breastfeeding, when the child should be weaned, which foods to initiate for the first introduction, how foods can be best cooked for a child, and immunization (Nabeen et al., 2018).

The level of care provided to children is said to be related to maternal education. Education improves a mother's ability to earn more money as well as her understanding of the value of child care. In terms of family planning, it has been discovered that less educated women do not plan childbirths, whereas educated mothers can plan the intervals between births. (Martinez et al, 2012). Children born to mothers with nutritional education tend to be healthier compared to children born to mothers with limited education in nutrition education (Mondal & Paul, 2020).

In Kenya, the three nutritional indicators, including Height for age and Weight for Height, Weight for Age (WA, HA, WH) were observed to be inversely related to the mothers' educational levels. Children born to mothers with secondary education were observed to exhibit low underweight and stunting signs, 10.6%, and 19.3% respectively, and 34.5% and 34.2% for children born to mothers with no education at all. High levels of wasting (12.8%) were also observed among children born to mothers with primary education only (UNICEF, 2018).

Findings from a review by Mkhizhe and Sibanda (2020) show that the level of education of caregivers was a significant factor influencing the nutritional level of children. Low educational attainment among caregivers was related to poor nutritional levels among children because of the low income, which dictates the quality of food consumed in a family. This finding is also supported by Ji et al. (2017), who found that the level of education among caregivers was directly related to the children's nutritional level. The low level of educational attainment among givers makes them less likely to access well-paying jobs, which also determines the quality of food consumed in a household. Therefore,

children reared with caregivers with low educational attainment tend to exhibit more wasting and have a higher risk of being underweight. Education is associated with the awareness of knowledge on health, practices of hygiene, and income generation. Generally, caregivers with low educational attainments have an insufficient understanding of hygiene practices.

According to Mkhize and Sibanda (2020) lacking knowledge of balancing nutrients and the benefits of a balanced diet influences children's nutritional status, leading to malnutrition. These findings are also supported by (Motebejana et al., 2022) who established that the nutritional knowledge possessed by caregivers is significant in influencing a child's survival and general development. According to Chege and Kuria, (2017) lowly-educated caregivers have inferior knowledge as far as child nutrition is concerned. Lang and Mason (2018) also weighed in that caregiver that is well-informed as far as nutrition is concerned tend to take good care of their children by giving them good nutrition. Therefore, fostering education among parents and caregivers can be a critical tool for fighting against various types of malnutrition.

Poorly nourished mothers tend to give birth to children who are underweight and who have a high risk of stunted growth in the course of their childhood. Furthermore, malnourished mothers are highly likely to give birth to malnourished children. Therefore, understanding the characteristics of maternal malnutrition is a critical factor to prevent malnutrition from becoming an intergeneration problem. Factors such as the mother's consumption of food and nutrients in the course of pregnancy and lactation habits as well as socioeconomic influences all affect a mother's overall nutritional status (World Bank, 2016).

Women working outside their homes have a lower likelihood of breastfeeding their children as required and are highly likely to practice early weaning (Lauer et al., 2019). In developing countries, women double up as the primary caregivers to their children and as income generators for the family. According to Hitomi et al . (2018), the more women were involved in the labor workforce, the more they are less likely to take hold of the household responsibilities, especially as the children's welfare is concerned. This aggravates the children's nutritional status. Several studies indicate that young maternal age is associated with a high prevalence of malnutrition, while children born to older mothers are less likely to exhibit characteristics of malnutrition.

This study establishes that the age of mothers is a significant factor when it comes to influencing the nutritional status of children. Older caregivers (more than 50 years) are highly likely to neglect the children's nutritional needs because of the high likelihood of increased illiteracy with advancing age. A study carried out in Tanzania revealed that children under the care of relatively older mothers were less likely to suffer from malnutrition compared to children born by younger mothers (Nyaruhucha et al, 2006). Age-related fertility rates are higher between the ages of 20-24 years in rural areas compared to c25-29 years in urban areas (Naz et al., 2023). The age at which childbearing starts has important health implications for the care practices of a child. In a study done in Mbarara slums in Uganda, children of mothers of early years had more stunting characteristics compared to children born to aged women because aged women tend to be more experienced in childcare practices than women of early years (Johnston et al., 2018; Wali & Kingsley, 2022).

The resources available for household care depend on a family's socioeconomic situation. Due to their ability to buy enough healthful foods, wealthy households are more likely to have better nutritional status. Most of the socioeconomic factors are interlinked, with one affecting the other either directly or indirectly. Since malnutrition is related to a lack of high-quality food in the right quantity, it is common knowledge to conclude that poverty is a leading factor aggravating malnutrition. At the same time, a high number of children in a family means that the food allocated to each family member is rationed, therefore affecting a child's nutritional needs. Poorer households are especially the most affected by food rationing and are also prevalent with poor quality food (French et al., 2019).

A study carried out by Ren et al. (2019) found that low-household income tends to have a significant influence on family consumption trends, further impacting the dietary habits of the members of a household, especially children. At the same time, another review showed that low-income flow was directly related to poor dieting habits in children of five years and below. A study carried out in South Africa showed that approximately 2.5 million children aged below five years were mostly found in families that were considered to be in dire poverty.

Insufficient finances make family members acquire poorly balanced foods to compensate for their inadequacy of financial resources. Thus, children's dieting habits, therefore, is affected negatively. A study carried out by Sello et al. (2023) showed that families that receive aid in terms of social grants still had children with characteristics of stunting compared to those families that fail to receive sufficient social grants to help them purchase food. Kadiyala et al. (2014) also found out that despite the aid of grants, some families still

consume food that is not rich in nutrition.

2.5 Empirical Review

The results of reviews of studies carried out by Mhizhe and Sibanda (2020) show that there are several factors associated with the dieting habits of children in South Africa. Almost half of the studies (48.4%) cited insufficient food in families as the major cause of the high rate of childhood malnutrition for children below five years. Most of the studies also indicated poor income generation as the leading factor that contributed to childhood malnutrition among children below five years. Other factors that influence childhood malnutrition that the studies found out include the level of education of caregivers (37.03% of the studies), lack of employment (29.62% of the studies), poor dieting habits, underweight and child illness (25.92% of the studies). A monotonous diet, poor sanitation and inaccessibility to water, poor weaning trends, and the age of the child as well as that of the caregiver were other risk factors that were observed from the studies (Bhowmik & Das, 2017; Hien & Hoa, 2009).

A cross-sectional descriptive survey carried out in Nghean, Vietnam by Mussida, and Patimo (2021) using questionnaires and the height and weight measurements of children aged 6 to 36 months discovered that the mother's body mass index (BMI), size of the family, occupation of the mother, the region of the child's residence (whether in the rural or urban area), ethnicity, duration of breastfeeding and the time when the supplementary diet was initiated are significantly related to child malnutrition. In a study conducted in Zimbabwe by Marume et al. (2022), education was discovered to have a significant negative effect on the duration of breastfeeding. According to the study, illiterate mothers

breastfed their children for a significantly longer period than post-primary educated mothers (Marume et al., 2022).

Turyashemererwa. et al. (2009) carried out a cross-sectional descriptive study through qualitative and quantitative methods to collect data to assess the prevalence of childhood malnutrition for children below five years in Kabarole District, Uganda. The children (aged 6-59 months) were selected randomly from selected households. The results of the study indicated that the mother/caretaker's level of education, the age of the child, the child's feeding habits, and the time when the child was introduced to a supplementary diet were correlated to stunted growth. Mahgoub et al. (2006) conducted to investigate the malnutrition status and the impact of demographic and socio-economic factors on households with children below three years. Four hundred (400) mothers of children below three years participated in the study and the results indicated the malnutrition level among male children compared to female children. The results also indicated that there was a minimal likelihood of underweight cases from parents doing informal business. Underweight children were more prevalent among single parents compared to children with both parents. The cases of underweight children were seen to decrease with an increase in family income. The more the mother's level of education, the more the decrease in the child's wasting. Additionally, the prevalence of underweight cases among children was seen to increase with parents that breastfed their children exclusively for the first six months after birth.

From the above literature, several research gaps exist across various studies. For instance, the study by Mhizhe and Sibanda (2020) focused mainly on the dieting habits of children in

South Africa and the role of family income, leaving out other maternal factors that might contribute to malnutrition. This presents both contextual and conceptual gaps when considering the situation in Bosaso, Puntland, Somalia. Hien and Hoa (2009) examined factors like the mother's BMI and the child's environment in Vietnam, but did not cover other elements like family structure or maternal education in depth, thus presenting a contextual gap.

In Zimbabwe, Marume et al. (2022), highlighted the influence of maternal education on breastfeeding but did not touch upon how this may directly correlate with malnutrition. A study in Uganda by Turyashemerwa, et al. (2009) provided data on childhood malnutrition related to maternal education and feeding habits but lacked information on other socio-economic factors, which is a conceptual gap. Mahgoub et al. (2006) did consider a wider range of socio-economic factors, but the study's focus on male children may not fully represent the complexity of malnutrition across genders, leaving a conceptual gap.

Furthermore, these studies generally lacked a multi-level, multi-sectorial, and multidisciplinary approach and most were concentrated in specific regions, leaving a geographical or contextual gap, particularly concerning Bosaso in Puntland, Somalia. This current study aimed to fill these identified gaps by examining child and maternal factors associated with malnutrition in under-fives in this specific Somali region. It sought to offer a more nuanced understanding of these relationships in a specific geographic and cultural context that has been underrepresented in the existing literature. Methodologically, the study intended to adopt a comprehensive approach to understand the multifaceted nature of

malnutrition, thereby hoping to provide actionable insights for future research and policy-making in the region.

2.6 The Conceptual Framework

Based on the United Nations Children's Fund (UNICEF) theoretical framework on the genesis of malnutrition, immediate causes are factors within an individual that can lead to malnutrition. This includes inadequate dietary intake and diseases. Individual child factors such as morbidity, and inadequate dietary intake resulting from either lack of adequate breastfeeding can result in malnutrition. Studies have also shown that other factors such as gender, age, and EBF effect are linked to malnutrition. For instance, males have higher chances of wasting as compared to females while children under the age of five are at an advanced danger of malnutrition due to their increased nutritional needs compounded with rapid growth and development.

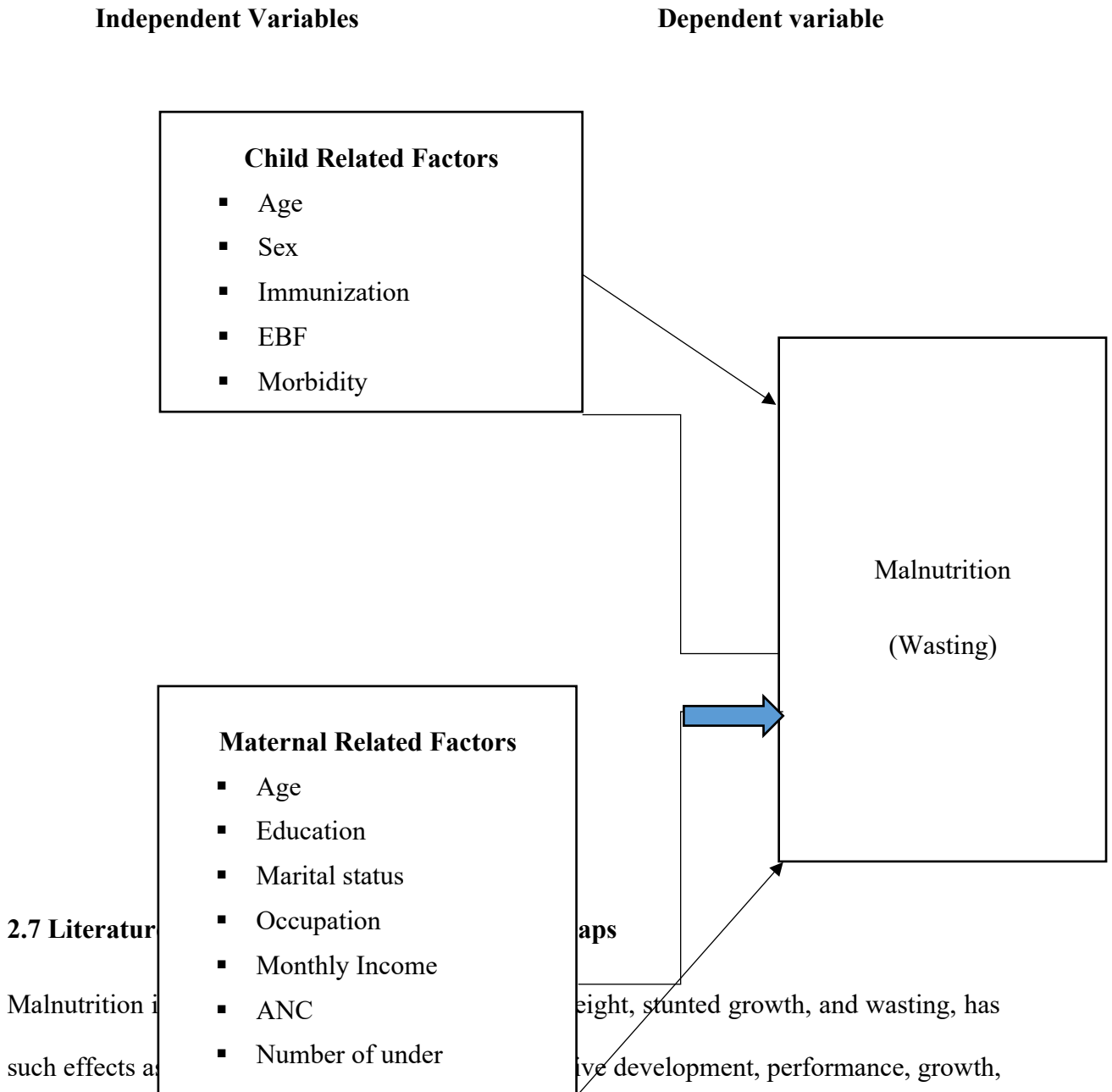
On the other hand, maternal factors include both immediate and underlying factors that can result in a child being malnourished. Maternal access to health care services such as ANC, safe delivery, right age of pregnancy can directly or indirectly lead to malnutrition. Optimum childcare practices such as EBF can also impact the nutritional position of a child. The family income and a mother's occupation greatly determine the food security of the family which is directly linked to the dietary intake of a child. More income means the increased capacity of purchasing adequate and nutritious amounts of food for the family. Maternal education greatly determines the knowledge and attitude of a mother to practicing optimum child-feeding practices.

From the framework, the independent variables include the child and maternal factors

while the dependent variable is wasting.

Figure 2.1

Conceptual Framework



2.7 Literature

Malnutrition i
such effects a

aps

eight, stunted growth, and wasting, has
ive development, performance, growth,

health, and survival. UNICEF classifies the causes of childhood malnutrition into

immediate, intermediate, and basic values, which interact differently to lead to childhood malnutrition. Several studies have been reviewed in the literature review on the risk factors of poor child nutrition habits across the world. However, the current study will be the first among many to come (Marume et al 2022; Johnston et al. 2018; Turyashemererwa et al. 2009; Hien and Hoa (2009), Wambui and , Musenge (2019) and Mahgoub et al. (2006) (Johnston et al., 2018 ; Mahgoub et al., 2006 ; Marume et al., 2022; Turyashemererwa et al., 2009 ; Hien & Hoa 2009 ; Wambui & Musenge 2019). conducted cross-sectional studies to assess the factors related to child malnutrition in various investigations. However, Saleem et al. (2024) According to their report, while cross-sectional studies are inexpensive and simple to conduct, they have some limitations. Cross-sectional studies cannot distinguish between factors that cause disease and factors that may prolong the disease's duration. To address the limitations identified, the current study combined the concept of descriptive research with a descriptive cross-sectional survey.

CHAPTER THREE

RESEARCH METHODOLOGY

3.0 Introduction

This chapter presents the methodology that was adopted by this study. The chapter discusses the research design, target population, sampling technique and sample size, instrumentation and data collection methods, validity and reliability, operationalization of variables, data analysis, and ethical considerations.

3.1 Study Design Study

A descriptive cross-sectional research design was used in this study. The method usually gathers data from the population at one point in time. The variables are not impacted by the researcher in any way. Also, the method allows the gathering of a large amount of survey data in a minimum period.

3.2 Study Location

The study was conducted in the Bosaso District of the Bari Region in Puntland Somalia. Formerly known as Bender Qassim, but now it is called Bosaso (Also Bossaso). Bosaso is located in North Eastern Somalia, towards the Gulf of Aden. The city is located on latitude $11^{\circ} 17' 0.42''$ N and longitude $49^{\circ} 10' 31.26''$ on an elevation of 12 meters above sea level. After Hargeisa and Mogadishu, the town is the third largest economic hub of Somalia besides having a large population of 74,287 inhabitants.

The main sources of income for individuals in the district include livestock rearing and selling livestock products. Livestock has proved to be a source of wealth, such as household products, including skins, milk, and meat as well as a source of wealth. All non-food products are imported, such as wheat flour, milk powder, oil, and rice in 2016, the rate of malnutrition in Bosaso was 28% (Bettencourt, et. al. 2015).

3.3 Target Population

They include groups of people with exact features that are relevant to the study. The study targeted children 6-59 months and their mothers attending the maternal and child health clinic (MCH) as well as the outpatient pediatric clinic at Bender Qassim Hospital in Bosaso Puntland Somalia.

3.4 Inclusion and Exclusion Criteria

3.4.1 Inclusion criteria

The study included children aged below 5 years (6-59 months). The study also included children who attended maternal and child health clinics and outpatient pediatric clinics at Bandar Qassim Hospital and caregivers/parents.

3.4.2 Exclusion Criteria

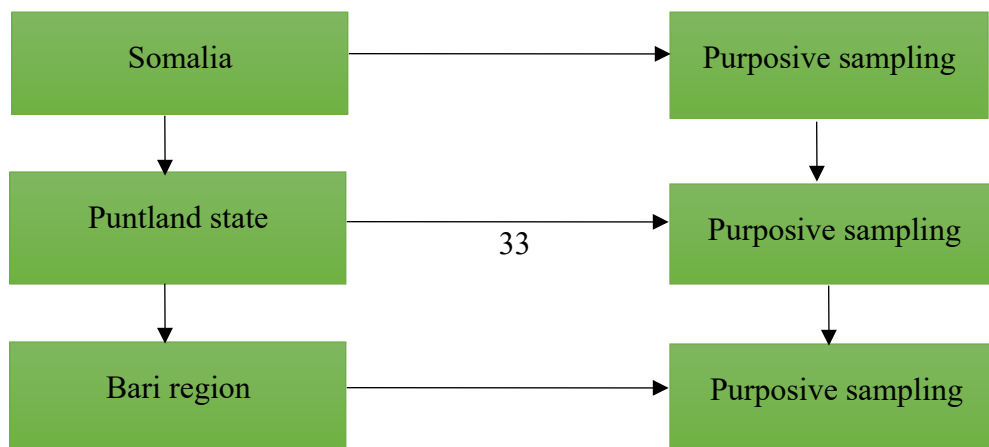
The study excluded children with chronic diseases, malignancies, or any physical or mental conditions. The study also excluded children above 5 years and below six months. The study also excluded participants that declined to participate in the study.

3.5 Sample and Sampling Techniques

Sampling entails choosing study respondents from the target population. A purposive method of non-probability sampling was used. This technique allowed the researcher to pick only cases that will help in answering the research questions. The study location was purposively selected by the researcher. The Figure 2 illustrates the sampling procedure adopted.

Figure 3:1

Sampling Procedure



3.5.1 Sample Size Determination

Sampling is the procedure of selecting the study participants from the target population to participate in the study. A purposive method of non-probability sampling will be deployed for the study. The method allows the researcher to select and include participants with information essential for the study (Yadav et al., 2019).

Fisher's formula was used to establish the sample size required for the study. The study used Fisher's formula because the exact population was not known. All that was needed was the margin of error (the range within which the true population parameter is expected to

lie) and the confidence level. The populations less than 10,000 a sample size of 10 to 30% is an acceptable number for the target population. Since the prevalence of wasting among children under 5 years in Puntland is 11%, the following calculation provided the sample size;

$$n = [z^2 * p * (1 - p) / e^2] / [1 + (z^2 * p * (1 - p) / (e^2 * N))]$$

Where: $z = 1.96$ for a confidence level (α) of 95%, $p =$ proportion (11% based on PLDHS, 2020), $N =$ population size, $e =$ margin of error.

$$z = 1.96, p = 0.11, N = 10000, e = 0.05$$

$$n = [1.962 * 0.11 * (1 - 0.11) / 0.0025] / [1 + (1.962 * 0.11 * (1 - 0.11) / (0.0025 * 10000))]$$

$$n = 150.4371 / 1.015 = 148.207$$

$$n \approx 149$$

With 10% attrition $n = 159$

3.6 Methods and Instruments of Data Collection Instruments

3.6.1 Methods of Data Collection

The use of semi-structured questionnaires was the primary method of data collection in this study. Semi-structured questionnaires is a versatile research tool, especially valuable when both standardized and personalized information is needed. They support a more in-depth exploration of the subject matter while still allowing for systematic analysis and comparison, often making it an ideal choice for a wide variety of research studies. Trained research assistants were deployed to administer the questionnaires.

Anthropometric assessments were used to determine the nutrition status of children. Wasting is an index that can be used to assess the recent development of acute malnutrition. As a result, this research used weight for height measure (wasting) to determine the nutritional status of the children. In that regard, the nutritional status among children was then classified into three distinctive classes. This includes; severe wasting characterized by weight for height z-scores of $-3SD$, moderate wasting characterized by weight for height z-scores of $-3SD$ to $<-2SD$, and well-nourished characterized by weight for height z-scores of $>2SD$. The children's height was assessed using the stadiometer (portable one) without shoes. Buttocks, shoulders, as well as heels, must touch the stand, with the head facing the Frankfurt position, estimated to the nearest 0.1 cm. However, for children aged between 6 and 23 months, their recumbent length was used. Those aged between 24 to 59 months, were required to stand to the nearest 0.1 cm.

3.6.2 Instruments of data collection

The data was gathered using a structured questionnaire which was administered with the help of two research assistants. Weight was obtained using an infant electronic scale and a salter scale for children who were not able to stand and standing weight for children able to stand on an electronic weighing scale. The weight accuracy was pegged at 0.1kg, height against length board also had an accuracy pegged at 0.1kg, length measurements as well as MUAC. The age of the children was obtained from the clinic card. For height and length, a UNICEF-recommended stadiometer was used for assessment.

3.7 Validity

During pilot test, validity test was carried out and to ensure the validity of the data

collection instruments, a draft copy of the questionnaire was made available for review to the supervisors and a panel of experts. The supervisors' and experts' views, opinions, and recommendations were incorporated into the questionnaire's refinement as needed until valid and reliable data collection instruments were constructed. Besides, the questionnaire was pre-tested using 10% (16 persons) of the population with similar features to the target population. Thereafter, modification of the tool was then done.

3.8 Reliability

A research instrument is considered reliable when it is consistent. According to the U.S Census Bureau in 2010, reliability is described as the dependability and consistency of the collected data if a similar data collection instrument would be used to collect the data repeatedly with all other conditions kept constant. Using SPSS version 25, Cronbach's alpha was used to evaluate the consistency of the questionnaire (Cronbach, 1951). A value of above 0.7 was obtained and hence the tool was reliable.

3.9 Methods of data analysis

After evaluation for correctness, completeness, and accuracy the collected data was transferred to the ODK server via an excel file, then transferred to and analyzed using the SPSS tool version 25. The collected data was further analyzed using descriptive statistics and inferential analysis which included and correlation analysis using chi-square test. The primary tools for entering and analyzing data were nutrition survey tools, including the ENA for SMART tools.

3.10 Ethical considerations

Clearance and approval to undertake the study were obtained from Kenya Methodist

University. Permission was also acquired from the Ministry of Health Office in Puntland. Permission to undertake the study was then obtained from the ethics committee of Bandar Qassim Hospital Bossaso. The study respondents were informed of the study and its aim. Through verbal consent, they voluntarily agreed to participate in the study. No reward as a financial gain was given to participants for undertaking this study. The respondents were assured that even after agreeing to participate in the study, they were free to withdraw at any stage or decide not to answer some or all questions and there would be no consequence whatsoever.

CHAPTER FOUR

RESULTS AND DISCUSSION

4.1 Introduction

This chapter presents the results and findings from the data collected by the study.

4.2 Response Rate

The study realized a 100% Response rate with all the 159 questionnaires administered having been dully filled and respond the information contained in the questionnaires was found to be valid and was used to inform the findings of this study.

4.3 Description of Research Respondents

The researcher presented detailed description of research respondents (children and mothers). This was necessary because understanding the specific characteristics, behaviors, and circumstances of both the children and their mothers provides essential context to the study. It allows for a deeper evaluation of the diverse factors that might contribute to malnutrition, including socio-economic conditions, educational levels, access to healthcare, dietary practices, cultural beliefs, and more. The rich, descriptive information about the respondents was important in creating targeted interventions, recognizing patterns, and understanding the underlying causes of malnutrition in this specific setting, thereby contributing to more effective policy and action to combat this serious health issue.

This section presents results on respondents' demographic characteristics which included child sex, child age (in months), place of delivery, immunization status, exclusive breastfeeding for up to 6 months, length of breastfeeding, recent diarrhea, recent respiratory infection, mother's age, level of education, marital status, type of residency, occupation, monthly income, number of ANC (Antenatal Care) Visits in last pregnancy, number of children under 5. Demographic characteristics on the respondents are presented in Table 1.

Table 4: 1

Characteristics of Study Respondents

Child Sex	Frequency	Percent
Male	73	45.9
Female	86	54.1
Total	159	100.0

Child age (months)		Frequency	Percent
	<12	26	16.4
	12-23	62	39.0
	24-35	52	32.7
	36-47	12	7.5
	48-59	7	4.4
	Total	159	100.0
Place of delivery		Frequency	Percent
	Hospital	121	76.1
	Home	38	23.9
	Total	159	100.0
Immunization Status		Frequency	Percent
	Fully immunized/Up to date	117	73.6
	Not fully immunized/not up to date	42	26.4
	Total	159	100.0
Exclusive breastfeeding for up to 6 months		Frequency	Percent
	Yes	73	45.9
	No	86	54.1
	Total	159	100.0
Length of Breastfeeding		Frequency	Percent
	< 1 year	85	53.5
	1 - 2 years	74	46.5
	Total	159	100.0
Recent diarrhea		Frequency	Percent
	Yes	44	27.7
	No	115	72.3
	Total	159	100.0
Recent Respiratory Infection		Frequency	Percent
	Yes	56	35.2
	No	103	64.8
	Total	159	100.0
Mother's Age		Frequency	Percent
	<20	46	28.9
	20-29	60	37.7
	30-39	39	24.5
	>39	14	8.8
	Total	159	100.0
Level of Education		Frequency	Percent

	None	87	54.7
	Primary	63	39.6
	Secondary and above	9	5.7
	Total	159	100.0
Marital status		Frequency	Percent
	Single	3	1.9
	Married	134	84.3
	Separated	16	10.1
	Widowed	6	3.8
	Total	159	100.0
Type of Residency		Frequency	Percent
	Urban	65	40.9
	Rural	75	47.2
	IDPs	19	11.9
	Total	159	100.0
Occupation		Frequency	Percent
	Daily laborer	39	24.5
	Housewife	80	50.3
	Business	35	22.0
	Employed	5	3.1
	Total	159	100.0
Monthly Income		Frequency	Percent
	<100	73	45.9
	100-150	63	39.6
	> 150	23	14.5
	Total	159	100.0
Number of ANC visits in last pregnancy		Frequency	Percent
	1 Time	71	44.7
	2-3 times	48	30.2
	> 3 times	40	25.2
	Total	159	100.0
Number of children under 5		Frequency	Percent
	1	67	42.1
	2	70	44.0
	Above 3	22	13.8
	Total	159	100.0

Based on the results in Table 1, females constituted the majority of the children, at 54.1%.

This implies that there is a need for gender-specific considerations in health interventions. In addition, most of the children were in the age bracket of 12-23 months, constituting 39.0% of the sample, implying that most of the children that were part of this study were within the age bracket sought by the researcher and that the information is likely to guide age-specific nutritional interventions. The study also found that hospital deliveries were significantly higher, at 76.1%, implying that there was progress in maternal health care, but also indicating the need to address barriers to hospital births for the remaining 23.9%. The results show that majority of children (73.6%) were fully immunized, a positive sign, yet the unimmunized 26.4% represent a critical public health concern that requires attention.

Furthermore, it is evident that more than half of the mothers (54.1%), did not practice exclusive breastfeeding for up to 6 months. This trend may be connected to malnutrition issues and calls for increased breastfeeding education and support. The majority of children were breastfed for less than 1 year (53.5%), a statistic that may have implications for dietary diversity and nutritional status. Most children did not suffer from recent diarrhea (72.3%) or respiratory infections (64.8%), indicating positive trends in child health, though vigilance is needed to maintain these rates. In the age category, majority of the mothers were aged between 20-29 years (37.7%), reflecting cultural or economic factors influencing family planning.

The study however found that most (54.7%) of the mothers had no education, potentially affecting health literacy and child care practices and most of them were married (84.3%), with implications for social support and possibly health outcomes. Regarding residence,

urban residency was at 40.9%, with rural at 47.2%, indicating the need to tailor interventions to different living conditions. Most mothers were housewives (50.3%), likely influencing income levels and access to resources. Concerning income, most of the mothers were earning less than \$100 in monthly income (45.9%) reflects significant economic constraints that must be considered in health interventions. In terms of antenatal care visits, most mothers only had 1 time (44.7%), showing gaps in maternal health services. Finally, the results in Table 1 show that most families had either 1 or 2 children under 5, making up 42.1% and 44.0% respectively. This implies that the targeted families were practicing family planning and child welfare strategies.

4.4 Nutrition Status of the Children

Weight for height z-scores was calculated to determine the nutrition status of the children and the results were as shown in Table 2.

Table 4.2:

Nutrition Status

Nutrition Status	Frequency	Percentage
Severe wasting	29	18.2
Moderate wasting	48	30.2
Nourished	82	51.6
Total	159	100

Slightly more than half of the children (51.6%) were nourished, a figure overshadowed by the 30.2% who were moderately wasted and the 18.2% who were severely wasted. These

findings have serious implications, emphasizing the urgency of targeted interventions. The higher wasting percentages signal a need for immediate healthcare measures, including early detection, treatment, and gender-responsive nutritional guidance. The results imply that there is an urgent need for immediate and targeted healthcare measures that must include early detection and treatment of malnutrition, as well as gender-specific strategies that recognize and address the unique needs and risks faced by boys and girls in this age group. Table 3 presents nutrition status based on gender, and age.

Table 4.3

Sex, Age, and Nutrition Status

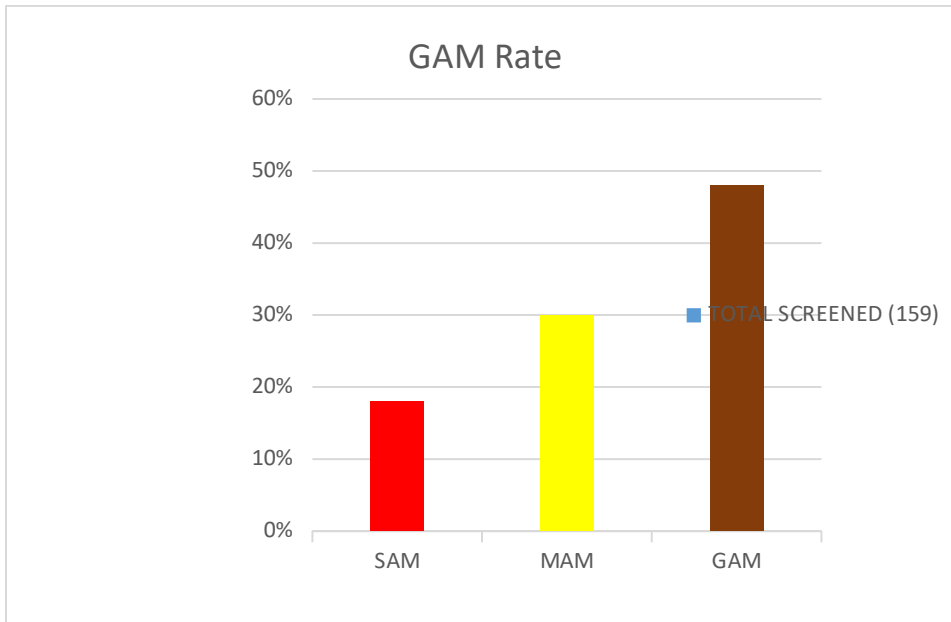
Child Sex	Severe wasting	Moderate wasting	Nourished	Total	<i>P-Value</i> <i>CI-95%</i>
Male	16 (21.90%)	17(23.30%)	40(54.80%)	73(100%)	0.182
Female	13(15.10%)	31(36.00%)	42(48.80%)	86(100%)	
Child age (months)	Severe wasting	Moderate wasting	Nourished		
<12	5(19.2%)	7(26.9%)	14(53.8%)	26(100%)	0.818
13-23	11(17.7%)	21(33.9%)	30(48.4%)	62(100%)	
24-35	9(17.3%)	17(32.7%)	26(50%)	52(100%)	
36-47	2(16.7%)	1(8.3%)	9(75%)	12(100%)	

48-59	2(28.6%)	2(28.6%)	3(42.9%)	7(100%)
Total	29(18.2%)	48(30.2%)	82(51.6%)	159(100%)

The results in Table 3 show that gender differences were apparent, with 21.9% of boys being severely wasted compared to 15.1% of girls. The age category of 13-23 months was the most affected, where the majority (17.7%) and 33.9% had severe and moderate wasting, respectively. The vulnerability of the 13-23 months age group also calls for a particular focus on complementary feeding practices. Together, these statistics spotlight critical areas for healthcare professionals, policymakers, and community leaders to address in order to combat malnutrition effectively in this region. Figure 3 shows GAM ratings.

Figure 4.1:

GAM Rates



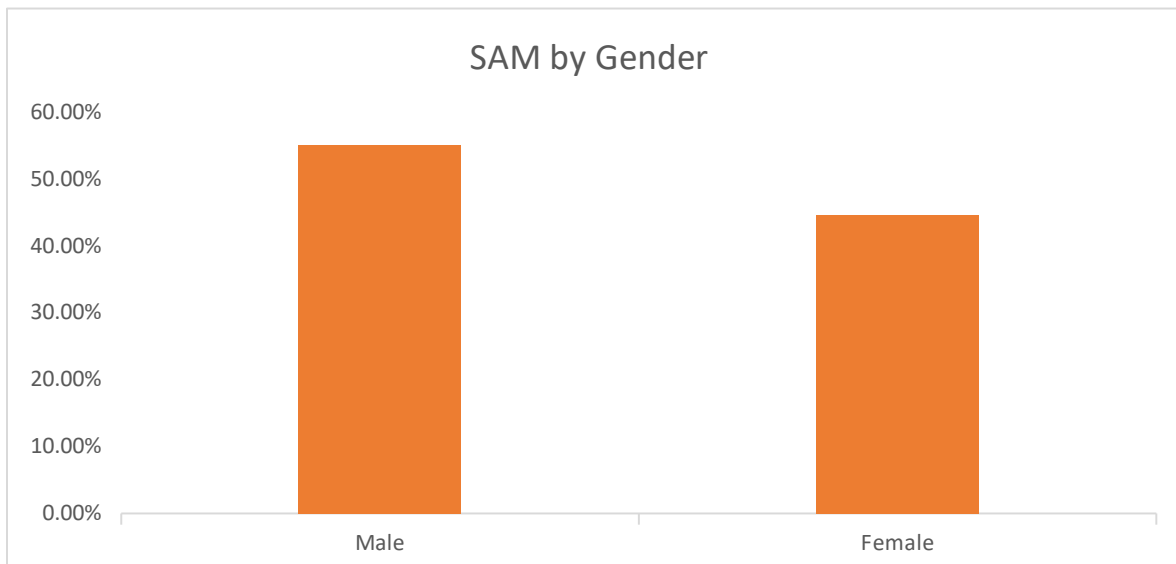
The results in Figure 3 shows that 48% of the children were found to be wasted, with 18% suffering from severe acute malnutrition (SAM) and 30% suffering from moderate acute malnutrition (MAM) after adding the number of wasted children (severe and moderate) against the total number of children screened. The presence of such high rates of malnutrition implies that there is a severe concern which is likely associated with a lack of proper nutrition, healthcare, and education among mothers. This also points to that fact that many children might have been born with low birth weight due to maternal malnutrition, leading to a higher likelihood of them developing acute malnutrition. Infants may also lack proper breastfeeding, which is essential for their growth. Moreover, diseases like diarrhea, often caused by poor sanitation, can lead to malnutrition. Ensuring proper maternal care, better sanitation, and educating mothers about proper child feeding can help tackle these problems.

4.5 Child Related Factors and Malnutrition

Table 4 portrays the results got from the bivariate analysis to determine the association between child factors and malnutrition. From the results, it is clear that EBF is associated with the nutrition status of children. There is a significant relationship between nutrition status and exclusive breastfeeding, $\chi^2(1, N=159) = 14.92, p = 0.05$. Boys (55.2%, n=29) are severely wasted as compared to girls (44.8%, n=29) while more girls (64.6%, n=48) are moderately compared to boys (35.4%, n=48). Children between the age of 13-23 months have both high levels of severe (37.9%, n=29) and moderate wasting (43.8%, n=48) compared to the rest of the age groups.

Figure 4:2

Wasting by Gender



The majority (82.8%, n=29) of the severely wasted children were not exclusively breastfed

for up to six months of their life. This was associated with wasting (p, 0.001).

Figure 4:3

EBF Rate in Severely Wasted Children

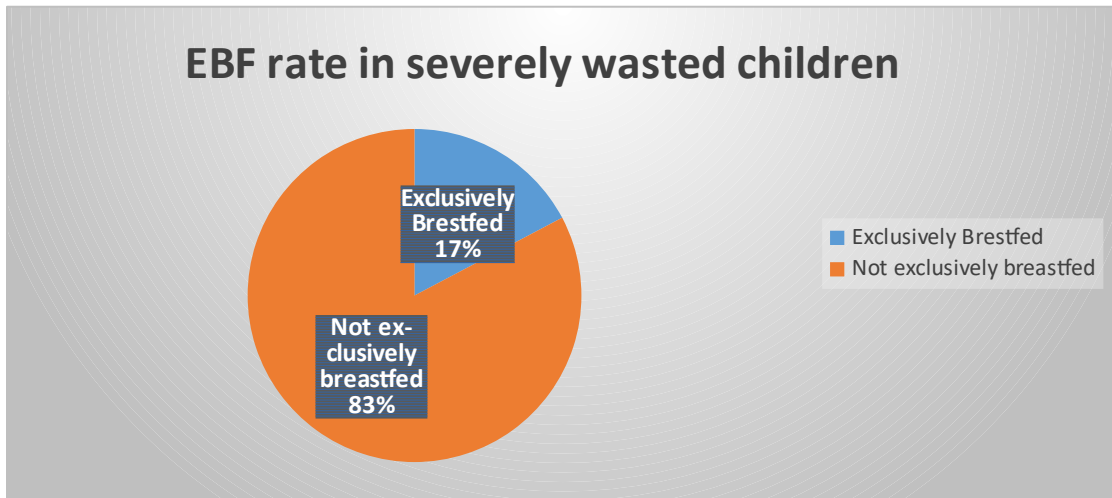


Table 4:4

Association between Child Factors and Nutrition Status

Child Sex	Severe wasting	Moderate wasting	Nourished	Total	P-Value
Male	16 (21.90%)	17(23.30%)	40(54.80%)	73(100%)	0.182
Female	13(15.10%)	31(36.00%)	42(48.80%)	86(100%)	
Child age (months)	Severe wasting	Moderate wasting	Nourished	Total	P-Value
<12	5(19.2%)	7(26.9%)	14(53.8%)	26(100%)	0.818
13-23	11(17.7%)	21(33.9%)	30(48.4%)	62(100%)	
24-35	9(17.3%)	17(32.7%)	26(50%)	52(100%)	
36-47	2(16.7%)	1(8.3%)	9(75%)	12(100%)	
48-59	2(28.6%)	2(28.6%)	3(42.9%)	7(100%)	
Total	29(18.2%)	48(30.2%)	82(51.6%)	159(100%)	
Place of delivery					

	Severe wasting	Moderate wasting	Nourished		
Hospital	22(18.2%)	36(29.8%)	63(52.1%)	121(100%)	0.972
Home	7(18.4%)	12(31.6%)	19(50%)	38(100%)	
Total	29(18.2%)	48(30.2%)	82(51.6%)	159(100%)	

Immunization Status

	Severe wasting	Moderate wasting	Nourished		
Fully immunized/Up to date	18(15.4%)	39(33.3%)	60(51.3%)	117(100%)	0.179
Not fully immunized/not up to date	11(26.2%)	9(21.4%)	22(52.4%)	42(100%)	
Total	29(18.2%)	48(30.2%)	82(51.6%)	159(100%)	

Exclusive breastfeeding for up to 6 months

	Severe wasting	Moderate wasting	Nourished		
Yes	5(6.8%)	30(41.1%)	38(52.1%)	73(100%)	0.001
No	24(27.9%)	18(20.9%)	44(51.2%)	86(100%)	
Total	29(18.2%)	48(30.2%)	82(51.6%)	159(100%)	

Length of Breastfeeding

	Severe wasting	Moderate wasting	Nourished		
< 1 year	14(16.5%)	28(32.9%)	43(50.6%)	85(100%)	0.668
1 - 2 years	15(20.3%)	20(27%)	39(52.7%)	74(100%)	
Total	29(18.2%)	48(30.2%)	82(51.6%)	159(100%)	

Recent diarrhea

	Severe wasting	Moderate wasting	Nourished		
Yes	9(20.5%)	13(29.5%)	22(50%)	44(100%)	0.904
No	20(17.4%)	35(30.4%)	60(52.2%)	115(100%)	
Total	29(18.2%)	48(30.2%)	82(51.6%)	159(100%)	

Recent Respiratory Infection

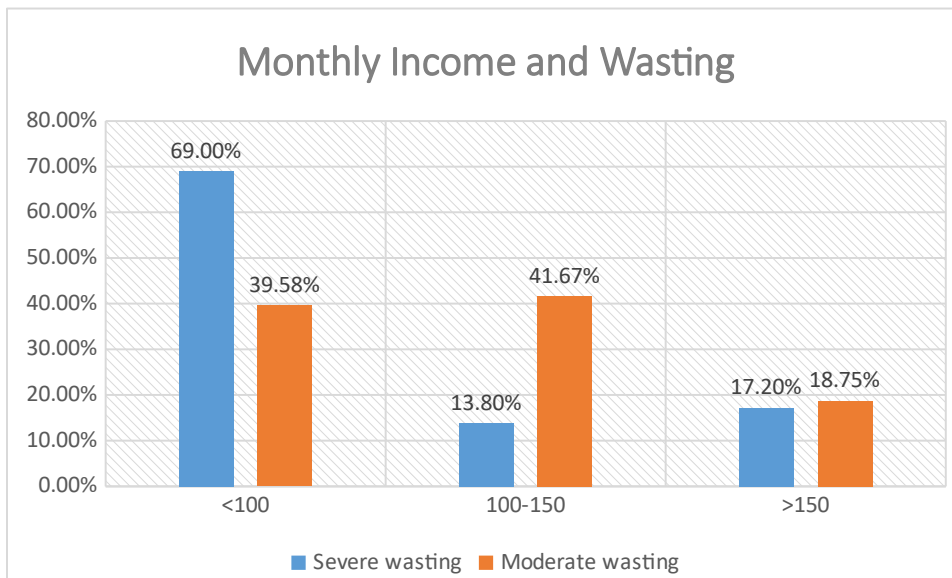
	Severe wasting	Moderate wasting	Nourished		
Yes	10(17.9%)	17(30.4%)	29(51.8%)	56(100%)	0.996
No	19(18.4%)	31(30.1%)	53(51.5%)	103(100%)	
Total	29(18.2%)	48(30.2%)	82(51.6%)	159(100%)	

4.6 Maternal Related Factors and Malnutrition

Table 5 portrays the results got from the bivariate analysis to determine the association between maternal factors and malnutrition. From the results, it is clear caregiver's monthly income is associated with the nutrition status of children. There is a significant relationship between nutrition status and monthly income, $\chi^2(1, N=159) = 11.82, p = 0.05$. Besides, the majority (69%, n=29) of severely wasted children had caregivers earning less than 100 US monthly. For the majority (41.7%, n=48) of moderately wasted children, their caregivers had a monthly income of 100-150 US dollars.

Figure 4:4

Monthly Income and Wasting Levels

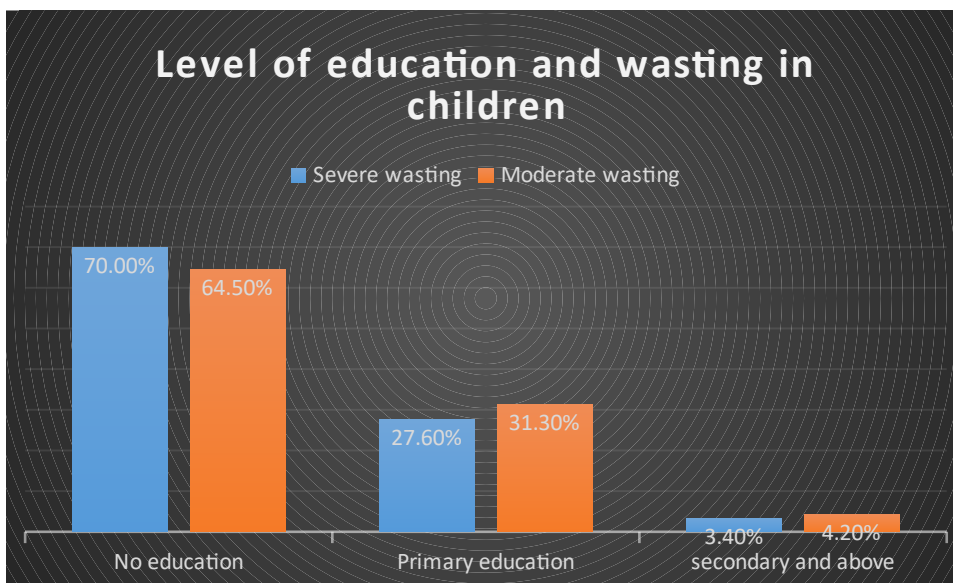


Despite insignificant associations, results reveal that mothers aged 20-29 and <20 had the highest number of wasted children (37.9% and 34.5% respectively, n=29). Mothers aged

<20 had the majority (37.5%, n=48) of children with moderate wasting. Mothers with no education had the majority of their children moderately and severely wasted (64.6%, n=48 and 70%, n=29 respectively).

Figure 4:5

Severe and moderate wasting levels with caregiver's level of education



As noted from the table, there were no other significant relationships observed between malnutrition and maternal factors.

Table 4:5

Association between Nutrition Status and Maternal Related Factors

Mother's Age		Severe wasting	Moderate wasting	Nourished	Total	P-value
<20	10 (21.7%)	18 (39.1%)	18 (39.1%)	46 (100%)	0.327	
20-29	11 (18.3%)	14 (23.3%)	35 (58.3%)	60 (100%)		

30-39	7 (17.9%)	13 (33.3%)	19 (48.7%)	39 (100%)	
>39	1 (7.1%)	3 (21.4%)	10 (71.4%)	14 (100)	
Total	29 (18.2%)	48 (30.2%)	82 (51.6%)	159(100%))

Level of Education

	Severe wasting	Moderate wasting	Nourished		
None	20(23%)	31(35.6%)	36(41.4%)	87(100%)	0.086
Primary	8(12.7%)	15(23.8%)	40(63.5%)	63(100%)	
Secondary and above	1(11.1%)	2(22.2%)	6(66.7%)	9(100%)	
Total	29(18.2%)	48(30.2%)	82(51.6%)	159(100%))

Marital status

	Severe wasting	Moderate wasting	Nourished		
Single			3(100%)	3(100%)	
Married	26(19.4%)	44(32.8%)	64(47.8%)	134(100%)	0.150
Separated	3(18.8%)	4(25%)	9(56.3%)	16(100%)	
Widowed			6(100)	6 (100%)	
Total	29(18.2%)	48(30.2%)	82(51.6%)	159(100%))

Type of Residency

	Severe wasting	Moderate wasting	Nourished		
Urban	11(16.9%)	23(35.4%)	31(47.7%)	65(100%)	0.681
Rural	13(17.3%)	20(26.7%)	42(56%)	75(100%)	
IDPs	5(26.3%)	5(26.3%)	9(47.4%)	19(100%)	
Total	29(18.2%)	48(30.2%)	82(51.6%)	159(100%))

Occupation

	Severe wasting	Moderate wasting	Nourished	Total	
Daily laborer	6(15.4%)	12(30.8%)	21(53.8%)	39(100%)	0.234
Housewife	18(22.5%)	19(23.8%)	43(53.8%)	80(100%)	
Business	5(14.3%)	16(45.7%)	14(40%)	35(100%)	
Employed		1(20%)	4(80%)	5(100%)	
Total	29(18.2%)	48(30.2%)	82(51.6%)	159(100%))

Monthly Income

	Severe wasting	Moderate wasting	Nourished		
<100	20(27.4%)	19(26%)	34(46.6%)	73(100%)	0.019
100-150	4(6.3%)	20(31.7%)jh	39(61.9%)	63(100%)	

> 150	5(21.7%)	9(39.1%)	9(39.1%)	23(100%)	
Total	29(18.2%)	48(30.2%)	82(51.6%)	159(100%))
Number of ANC visits in last pregnancy					
	Severe wasting	Moderate wasting	Nourished		
1 Time	11(15.5%)	25(35.2%)	35(49.3%)	71(100%)	0.541
2-3 times	8(16.7%)	12(25%)	28(58.3%)	48(100%)	
> 3 times	10(25%)	11(27.5%)	19(47.5%)	40(100%)	
Total	29(18.2%)	48(30.2%)	82(51.6%)	159(100%))
Number of children under 5					
	Severe wasting	Moderate wasting	Nourished		
1	15(22.4%)	18(26.9%)	34(50.7%)	67(100%)	0.176
2	9(12.9%)	20(28.6%)	41(58.6%)	70(100%)	
Above 3	5(22.7%)	10(45.5%)	7(31.8%)	22(100%)	
Total	29(18.2%)	48(30.2%)	82(51.6%)	159(100%))

The findings in Table 5 indicate that the youngest mothers (under 20) and those in the 20-29 age group had higher rates of children with severe and moderate wasting. As age increases, the percentage of well-nourished children also seems to increase. This suggests that younger mothers need more support and education in child nutrition. In addition, the children of mothers with no education are more prone to severe and moderate wasting than those with higher educational levels. This emphasizes the importance of maternal education in child nutrition. Children of single, separated, or widowed mothers appear to have different nourishment statuses. It may imply that family support structures play a role in children's nutritional health.

The rates of wasting do not significantly differ between urban, rural, or internally displaced persons (IDPs), suggesting that the nutritional challenges are widespread and not confined

to a specific area. The occupation of the mother does not seem to have a strongly consistent pattern with malnutrition, though there might be some underlying factors that require further exploration. A lower income is associated with higher rates of severe wasting, emphasizing the role of economic factors in child nutrition. More visits might not necessarily correlate with better nutrition, which could indicate that the quality of care or education during these visits might need improvement.

It was established that families with more young children finds it more challenging to provide optimal nutrition, though the pattern is not strongly consistent. These results highlight the complex interplay between various maternal and socio-economic factors in determining the nutritional status of children under five in Bosaso. The presence of malnutrition across different demographics emphasizes the need for multifaceted, tailored interventions. Strategies focusing on maternal education, support for younger mothers, economic empowerment, and improved quality of healthcare visits could be key in addressing the prevalent malnutrition in this region. The study found that significant association between malnutrition and the caregiver's level of education ($p=0.021$, OR at 95% CI 0.039-0.465).

4.7 Discussion

This section will provide an in-depth evaluation of the study findings and compare them with findings of similar studies conducted elsewhere.

4.7.1 Nutrition Status of the Children

The study was conducted to determine the child and maternal related factors associated with malnutrition among the under in Bossaso. From the data analysis, the prevalence of

malnutrition was noted. The study found that, majority (51.6%) of the children were well-nourished based on weight for height z-scores. However, 18.2% and 30.2% of the children have severe and moderate wasting respectively. Wasting usually is an outcome of acute malnutrition thus it depicts the most recent nutritional status of a child. Wasting levels are higher than the 11% recorded in the demographic and health survey conducted in Puntland (PLDHS, 2020). Somalia is one of the nations with higher numbers of malnutrition in Africa. Persistent droughts, political instability, and lack of adequate health services have increased the risk of children under-fives to malnutrition.

In the wasting category, more children exhibit a moderate form of wasting compared with severe wasting. These results are parallel or slightly higher compared to other studies conducted. An unmatched case-control study conducted in western Kenya revealed more children (20%, n=79) were moderately wasted as compared to severe wasting (9%, n=79) among children with under nutrition (Gudu et al., 2020). Another study conducted in Ethiopia had a prevalence of malnutrition at 15.8% (n=422) and well-nourished at 84.2% (n=422). On forms of malnutrition, the study revealed that 33% were severely wasted (Menalu et al., 2021). This is higher than the severe wasting recorded in this study. Another evidence review conducted in Burkina Faso had wasting levels among the under-fives at 15.7% (Poda et al., 2017). The statistical difference identified in this and other studies may be linked to dissimilarities in access to health and nutrition services in study locations and different characteristics of study participants and sample size used.

4.7.2 Child Related Factors and Malnutrition

In this study, correlation using the chi-square test was used to determine the relationship

between the dependent and the independent variables of the study. Analysis was then conducted to reveal the degree to which maternal and child related factors impact the nutrition status of the children. From the study results, exclusive breastfeeding was associated with the nutrition status of children ($p=0.001$). This finding might same or different from studies conducted elsewhere. A study conducted in the same region, Garowe Puntland found the same results. In the study, the lack of EBF by introducing mixed feeding in the first six months of a child's life was significantly linked with child wasting (AOR=8, 95% CI: (4.5, 14)) (Abdiwali et al., 2022). However, the study by Menalu et al. (2021) in Ethiopia found that EBF was significantly associated with stunting and other forms of undernutrition. In their study, children who were not exclusively breastfed were two times more likely to be wasted as compared to well-nourished children (Menalu et al., 2021).

Ahmed et al in their study conducted in Bangladeshi found that EBF was significantly linked to stunting ($p=0.033$) and underweight while no significant link was found between wasting and EBF (Ahmed et al 2017). Similarly, an analysis of secondary data in the same country (Bangladesh) revealed no significant relationship between wasting and EBF ($p=0.241$) (Aktar, 2021). A study by Ayuningrum et al. (2018) in their Indonesia study, found an insignificant relationship between EBF and wasting ($p=0.521$). However, they found an indirect significant relationship between EBF and wasting through complementary feeding. The difference in study results may be associated with variations in study populations as well as the difference in regional context for accessing healthcare services (Ayuningrum et al., 2018). Exclusive breastfeeding is a critical practice that enhances a child's nutritional status for the first six months of life. Based on WHO, EBF is

among the key high-impact nutrition interventions to end malnutrition, especially among those under the age of 5 years. Consequently, children who are exclusively breastfed up to six months of age have reduced chances of malnutrition.

This study found that other factors such as child sex, age, and place of delivery, immunization status, and length of breastfeeding, recent diarrhea & respiratory infections did not have a significant association with nutrition status. However, from univariate analysis, more male are severely wasted as compared to female. This is consistent with another study conducted in Burkina Faso that found males with higher chances of wasting as compared to girls (OR = 1.25, 95% CI:1.09–1.45, $P < 0.05$) (Poda et al., 2017). Another study by Kassandra et al. (2018), in South Asia, found that a baby's age and sex (except in Maldives and Nepal) were significantly associated with wasting among the under-fives. However, higher chances of wasting were reported categorically among those under six months a case not investigated in this study (Kassandra et al., 2018). The same was reported in northern Ghana where wasting was significantly associated with boys. More boys were found to have higher wasting as compared to females, 24 times higher [AOR = 2.40; 95% CI (1.189–4.844); $p = 0.015$] (Ali et al., 2017). Children especially from birth to two years (1000 days) are at higher risk of malnutrition. At this stage, they experience significant growth and development that requires increased nutritional needs. If these needs are inadequately met, the children are at risk of poor dietary intake a risk factor for malnutrition.

Studies conducted have revealed significant links to morbidity such as diarrhea and wasting (Poda et al., 2017; Yeshivas et al., 2020). A community-based case-control study

conducted in North-East Ethiopia reported that wasting was more than two times more in children who had acute respiratory diseases a fortnight before the study . In North Eastern Ethiopia, wasting was more than two times higher in children with recent experience of diarrhea (AOR = 2.06; CI: 1.29, 3.30). In the same study, children who had no disease incidences before the study were not likely to be wasted (Derso, et al., 2017). The immediate causes of malnutrition, especially wasting are inadequate dietary intake and diseases. Disease and malnutrition create a vicious in which they exacerbate one another. For example, diarrhea leads to loss of important nutrients as well as malabsorption of food taken.

A recent study conducted in Garowe, Puntland reported that lack of immunization was significantly associated with wasting (AOR=2.9, 95% CI:(1.7, 5.2) (Abdiwali et al., 2022) while another study in Western Kenya reported that children who are not vaccinated as endorsed in health guidelines at risk of undernutrition (OR = 1.6; 95% CI: 0.9–2.7) (Gudu et al., 2020). Immunization helps to strengthen a child's immunity thus reducing the risks of childhood morbidity and mortality.

4.7.3 Maternal Related Factors and Malnutrition

Using univariate and bivariate analysis the associations between maternal characteristics and child malnutrition were investigated. A significant relationship between nutrition status and monthly income, $\chi^2 (1, N=159) = 11.82, p = 0.019$. Also, the majority (69%, n=29) of severely wasted children had caregivers earning less than 100 US monthly. For the majority (41.7%, n=48) of moderately wasted children, their caregivers had a monthly income of 100-150 US dollars. Low income is an indicator of poverty which directly or

indirectly contributes to malnutrition.

The results are similar to the findings of studies conducted elsewhere. A study conducted in South Asian countries by Kassandra et al. (2018), reported a high occurrence of wasting in children coming from poor families. For instance, in India, unwealthy families had higher chances of child wasting (Sarkar. 2016). Another study to investigate factors related to wasting in 35 LMICs reported that wasting was greatly associated with the level of poverty in the study population. Lowest households had higher chances of having wasted children (OR, 3.4 95% CI, 3.2-3.5; $P < .001$) (Bhowmik & Das, 2017). Another study showed a significant relationship between household wealth and wasting where children from high-income or wealthy families were not likely to have wasted children (Nabeen et al., 2018). A Bangladeshi study reported that the chances of recovering from malnutrition were 24% and 43% among poor households compared to rich households respectively (Ashis, 2017).

Other maternal factors investigated in this study but did not reveal significant associations with malnutrition include maternal age, level of education, residency, marital status, number of children under 5, and number of ANC visits in the last pregnancy. The results are concurrent with the findings of Ali et al., who reported an insignificant relationship between malnutrition such as education status and visits to ANC clinics (Ali et al., 2017). From the descriptive statistics, severely wasted children had 70% of their mothers with no education moderately wasted children had the majority (64.5%) of mothers with no education. Those findings are similar or different from studies conducted elsewhere. Smetana et al. (2019) in their LMICs study, found that illiteracy was associated with wasting among children (OR, 3.5; 95% CI, 3.3-3.7; $P < .001$)

Besides, other studies have also reported a significant association between illiteracy and wasting among children under five years (Ali et al., 2017). Another study in Bangladesh found significant emergency states of both SAM and MAM among children whose mothers and fathers were illiterate or educated up to the primary level (Ashis, 2017). Poda et al. (2017), in Burkina Faso found significantly lower wasting levels in children who had literate mothers (secondary and above OR = 0.64, 95% CI:0.40–0.98, P < 0.05). In this study, high wasting levels were observed in children from rural areas. The study by Bhowmik and Das, (2017) found reported the same in their study. Other reports have shown a significant association between wasting and mothers' attendance at ANC visits in their last pregnancy (Abdiwali et al., 2022; Ashis, 2017; Gudu et al., 2020).

4.8 Summary

The chapter presented findings on the factors associated with malnutrition among children under five in Bender Qassim Hospital Bosaso Puntland Somalia. Exclusive breastfeeding and monthly income have been associated with malnutrition. The findings are both similar and dissimilar from findings revealed in different studies. This can be attributed to variations among the study populations, study location, and access to health and nutrition services.

CHAPTER FIVE

CONCLUSIONS AND RECOMMENDATIONS

5.1 Introduction

This chapter presents a summary of the study and the concluding remarks. It also entails recommendations on the research findings and recommendations for further research.

5.2 Summary of the study

The purpose of this study was to establish the factors associated with malnutrition among children under five in Bender Qassim Hospital Bosaso Puntland Somalia. A descriptive cross-sectional survey design with a purposive method of non-probability sampling was deployed.

5.3 Conclusions

The prevalence of malnutrition is still high in the Bossaso region. The levels of wasting found in this study remain a public health concern and intervention. Exclusive breastfeeding was the child factor found to be associated with malnutrition among the under-fives. On the other hand, monthly household income was also found to be associated with malnutrition.

5.4 Recommendations

The study recommended that mothers should be educated more on infant and child feeding habits particularly exclusive breastfeeding and breastfeeding on demand to ensure children get maximum nutrients from breast milk. This can be done through community-wide awareness raising, pre-natal and post-natal clinic visits, and community health workers.

The study further recommends that first-time mothers and young mothers should be accorded a friendly support system to guide, mentor, advice, and support them in seeking adequate information on good nutritional feeding habits as well as comfort them when they feel overwhelmed for instance with exclusive breastfeeding.

The study recommended that medical institutions such as hospitals and clinics should provide constant follow-up on child immunizations through the use of community health workers and volunteers. This will ensure all children are fully immunized as a means of improving their nutritional status and overall health.

5.4.2 Recommendations for Further Research

This study recommends further research to focus on the influence of household support systems and the number of household members on the nutritional status of children less than five years. In particular, the study should interrogate the influence of the father and other siblings on the nutritional status of children.

Also, future researchers should explore the effectiveness of different intervention programs that aim to improve the nutritional status of under-fives, which should range from community education efforts to targeted food aid programs. By assessing the success rates of these initiatives, future researchers will be able to provide recommendations for scalable solutions to combat malnutrition in Bosaso or similar contexts. Another avenue for research is to investigate the role of local healthcare systems and how they can be optimized to address malnutrition. This should include looking into the availability and effectiveness of prenatal and postnatal care for mothers, as well as regular check-ups for children where nutrition is discussed and assessed. Understanding the gaps in healthcare

could offer a holistic picture of why malnutrition is a persistent issue and how it can be systematically addressed.

REFERENCES

- Abdiwali, A., Gebremichael, B., Gebretsadik, S., & Roba, K. T. (2022). *Prevalence of Wasting and Associated Factors Among Children Aged 6-23 Months in Garowe, Puntland, Somalia*. <https://doi.org/10.21203/rs.3.rs-1300355/v1>
- Adhikari, D., Khatri, R. B., Paudel, Y. R., & Poudyal, A. K. (2017). Factors Associated with Underweight among Under-Five Children in Eastern Nepal: Community-Based Cross-sectional Study. *Frontiers in Public Health*, 5, 350. <https://doi.org/10.3389/fpubh.2017.00350>
- Adjei-Gyamfi, S., Musah, B., Asirifi, A., Hammond, J., Aryee, P. A., Miho, S., & Aiga, H. (2023). Maternal risk factors for low birthweight and macrosomia: A cross-sectional study in Northern Region, Ghana. *Journal of Health, Population, and Nutrition*, 42(1), 87-96. <https://doi.org/10.1186/s41043-023-00431-0>
- Ahmed, F., Malik, N. I., Shahzad, M., Ahmad, M., Shahid, M., Feng, X. L., & Guo, J. (2022). Determinants of Infant Young Child Feeding Among Mothers of Malnourished Children in South Punjab, Pakistan: A Qualitative Study. *Frontiers in Public Health*, 10, 834089. <https://doi.org/10.3389/fpubh.2022.834089>
- Ahmed, R., Sultana, P., Al-Fuad, S. & Islam, A. (2017). Association between breastfeeding practices and nutritional status of children aged 6-24 months in Jessore, Bangladesh. *International Journal Health Science Research* 7(1), 247-251. <https://www.researchgate.net/publication/327847974>
- Aktar, K. (2021). *The association between exclusive breastfeeding and nutritional status among infants under six months of age in Bangladesh: A secondary analysis of Bangladesh Demographic and Health Survey*. <https://www.diva-portal.org/smash/get/diva2:1569670/FULLTEXT01.pdf>
- Ali, Z., Saaka, M., Adams, A. G., Kamwininaang, S. K. & Abizari, A. R. (2017). The

- effect of maternal and child factors on stunting, wasting and underweight among preschool children in Northern Ghana. *BMC nutrition*, 3(1), 1-13. <https://doi.org/10.1186/s40795-017-0154-2>.
- Alshammari, S. Z., AlFayyad, I., Altannir, Y., & Al-Tannir, M. (2021). Parental Awareness and Attitude about Childhood Immunization in Riyadh, Saudi Arabia: A Cross-Sectional Study. *International Journal of Environmental Research and Public Health*, 18(16), 8455. <https://doi.org/10.3390/ijerph18168455>
- Anato, A. (2022). Predictors of wasting among children under-five years in largely food insecure area of north Wollo, Ethiopia: A cross-sectional study. *Journal of Nutritional Science*, 11, e8. <https://doi.org/10.1017/jns.2022.8>
- Ayuningrum, I. Y., Murti, B., Salimo, H., & Dewi, Y. L. R. (2018). Exclusive breastfeeding, complementary feeding, low birthweight, and wasting in children under-five: path analysis evidence from Indonesia. *Asian Journal of Pharmaceutical and Clinical Research* 11 (12), 174-178. <https://journals.innovareacademics.in/index.php/ajpcr/article/view/28068>
- Barbara, S. M., Erica, K. C., Andrea, J. M & Stephanie, R. P. (2019) Evidence for causal links between education and maternal and child health: systematic review. *Tropical Medicine and International Health*. 24(5), 504–522. doi:10.1111/tmi.13218.
- Bejon, P., Mohammed, S., Mwangi, I., Atkinson, S. H., Osier, F., Peshu, N., ... & Berkley, J. A. (2008). Fraction of all hospital admissions and deaths attributable to malnutrition among children in rural Kenya. *The American journal of clinical nutrition*, 88(6), 1626-1631. <https://pubmed.ncbi.nlm.nih.gov/19064524/>
- Bélangier, V., McCarthy, A., Marcil, V., Marchand, V., Boctor, D. L., Rashid, M., Noble, A., Avinashi, V., Davidson, B., Groleau, V., Spahis, S., & Levy, E. (2019). Assessment of Malnutrition Risk in Canadian Pediatric Hospitals: A Multicenter Prospective Cohort Study. *The Journal of Pediatrics*, 205, 160-167.e6. <https://doi.org/10.1016/j.jpeds.2018.09.045>
- Berkley, J., Mwangi, I., Griffiths, K., Ahmed, I., Mithwani, S., English, M., ... & Maitland,

- K. (2005). Assessment of severe malnutrition among hospitalized children in rural Kenya: comparison of weight for height and mid upper arm circumference. *Jama*, 294(5), 591-597. <https://doi.org/10.1001/jama.294.5.591>
- Berry, S. D., Davis, S. R., Beattie, E. M., Thomas, N. L., Burrett, A. K., Ward, H. E., ... & Snell, R. G. (2009). Mutation in bovine β -carotene oxygenase 2 affects milk color. *Genetics*, 182(3), 923-926 <https://doi.org/10.3168/jds.2016-11683>.
- Bettencour.t, E. M. V., Tilman, M., Narciso, V., Carvalho, M., Leonor S & Henriques, P. D.. (2015). "The Livestock Roles in the Wellbeing of Rural Communities of Timor-Leste," *Brazilian Journal of Rural Economy and Sociology* 53(Supplemen), 1-18, DOI: 10.22004/ag.econ.212441
- Bhowmik, K. R & Das, S. (2017). On exploring and ranking risk factors of child malnutrition in Bangladesh using multiple classification analysis. *BMC Nutrition*.3 (2) 1–10. <https://doi.org/10.1186/s40795-017-0194-7>.
- Burns, M. A., Johnson, B. N., Brahmasandra, S. N., Handique, K., Webster, J. R., Krishnan, M., Sammarco, T. S., Man, P. M., Jones, D., Heldsinger, D., Mastrangelo, C. H., & Burke, D. T. (1998). An integrated nanoliter DNA analysis device. *Science* 282(5388), 484–487. <https://doi.org/10.1126/science.282.5388.4>.
- Cao, J., Peng, L., Li, R., Chen, Y., Li, X., Mo, B., & Li, X. (2014). Nutritional risk screening and its clinical significance in hospitalized children. *Clinical nutrition*, 33(3), 432-436. <https://pubmed.ncbi.nlm.nih.gov/23871191/>
- Cathaoir, K. Ó. (2016). Childhood Obesity and the Right to Health. *Health and Human Rights*, 18(1), 249–262. <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5070695/>
- Central Statistical Agency (CSA) [Ethiopia] and ICF (2016). *Ethiopia Demographic and Health Survey 2016*. CSA and ICF.
- Chaudhary, P., & Agrawal, M. (2018). Malnutrition and associated factors among children below five years of age residing in slum area of Jaipur City, Rajasthan. India Asian. *Journal of Clinical Nutrition* 11(1), 1-8. <https://scialert.net/abstract/?doi=ajcn.2019.1.8>

- Chege, P. M. & Kuria, E. N. (2017). Relationship Between Nutrition Knowledge of Caregivers and Dietary Practices of Children Under Five in Kajiado County, Kenya. *Women's Health Bulletin*, 4(3), 1-12. <https://doi.org/10.5812/whb.43820>
- Chekol, Y. T., Arefaynie, M., Kassa, A. A., Alene, T. D., & Ngusie, H. S. (2022). Determinants of wasting among children aged 6–59 months in North-East Ethiopia: a community-based case-control study. *BMJ open*, 12(8), e057887. <https://bmjopen.bmj.com/content/12/8/e057887>
- Cronbach, L.J. (1951) Coefficient alpha and the internal structure of tests. *Psychometrika* 16(4), 297–334. <https://doi.org/10.1007/BF0231055>
- Cui, Y., Liu, H., & Zhao, L. (2019). Mother's education and child development: Evidence from the compulsory school reform in China. *Journal of Comparative Economics*, 47(3), 669-692. DOI: 10.1016/j.jce.2019.04.001
- Derso, T., Tariku, A., Biks, G. A., & Wassie, M. M. (2017). Stunting, wasting and associated factors among children aged 6–24 months in Dabat health and demographic surveillance system site: A community based cross-sectional study in Ethiopia. *BMC pediatrics*, 17(1), 1-9. <https://pubmed.ncbi.nlm.nih.gov/28376746/>
- Dipasquale, V., Cucinotta, U., & Romano, C. (2020). Acute Malnutrition in Children: Pathophysiology, Clinical Effects and Treatment. *Nutrients*, 12(8), 1-18. <https://doi.org/10.3390/nu12082413>.
- El-Saed, A. (2018) "Quantifying the Hawthorne effect using overt and covert observation of hand hygiene at a tertiary care hospital in Saudi Arabia." *American journal of infection control* 46(8) 930-935. <https://pubmed.ncbi.nlm.nih.gov/30072161>
- English, M., Ahmed, M., Ngando, C., Berkley, J., & Ross, A. (2002). Blood transfusion for severe anaemia in children in a Kenyan hospital. *Lancet* 359(9305), 494–495. [https://doi.org/10.1016/S0140-6736\(02\)07666-3](https://doi.org/10.1016/S0140-6736(02)07666-3)
- Etim, R. K., Eberemu, A.O., & Osinubi.K..J. (2017) "Stabilization of black cotton soil with lime and iron ore tailings admixture." *Transportation Geotechnics* 10 (2017), 85-95.<https://doi.org/10.1016/j.trgeo.2017.01.002>

- French, S. A., Tangney, C. C., Crane, M. M., Wang, Y., & Appelhans, B. M. (2019). Nutrition quality of food purchases varies by household income: The SHoPPER study. *BMC Public Health*, *19*(1), 231-240. <https://doi.org/10.1186/s12889-019-6546-2>
- Gebremeskel, M., Tirore, L., & Derilo, H. (2022). Determinants of wasting among under-five children in Ethiopia: Multilevel ordinal logistic regression analysis of EDHS 2016. *Journal of Family Medicine and Primary Care*, *11*(7), 3777-1401. https://doi.org/10.4103/jfmpe.jfmpe_1993_21
- Githanga, D., Awiti, A., Were, F., Ngwiri, T., Nyarko, M. Y. & Shellack, N. (2019). A consensus on malnutrition in Africa: A report from the micronutrient deficiency awareness forum. *African Journal of Food, Agriculture, Nutrition and Development*, *19*(2), 14277-14290. https://ecommons.aku.edu/eastafrica_eai/26
- Giuseppe, G., Alberto, M, Natalie, R., Tatjan,a B.& Christopher., B.(2020) Nutrition in the context of the Sustainable Development Goals, *European Journal of Public Health*, *30*(Supplement_1), i19–i23, <https://doi.org/10.1093/eurpub/ckaa034>
- Glick, P. (2003). Women’s Employment and its Relation to Children’s Health and Schooling in Developing Countries: Conceptual Links, Empirical Evidence, and Policies. *SSRN Electronic Journal*. <https://doi.org/10.2139/ssrn.424101>
- Govender, I., Rangiah, S., Kaswa, R., & Nzaumvila, D. (2021). Malnutrition in children under the age of 5 years in a primary health care setting. *South African Family Practice*, *63*(1). <https://doi.org/10.4102/safp.v63i1.5337>
- Gudu, E., Obonyo, M., Omballa, V., Oyugi, E., Kiilu, C., Githuku, J., ... & Ransom, J. (2020). Factors associated with malnutrition in children < 5 years in western Kenya: a hospital-based unmatched case control study. *BMC nutrition*, *6*(1), 1-7. <https://doi.org/10.1186/s40795-020-00357-4>
- Halli, S. S., Biradar, R. A., & Prasad, J. B. (2022). Low Birth Weight, the Differentiating Risk Factor for Stunting among Preschool Children in India. *International Journal of Environmental Research and Public Health*, *19*(7), 3751.

<https://doi.org/10.3390/ijerph19073751>

- Harris, J., & Nisbett, N. (2021). The Basic Determinants of Malnutrition: Resources, Structures, Ideas and Power. *International Journal of Health Policy and Management*, 10(12), 817–827. <https://doi.org/10.34172/ijhpm.2020.259>
- Hien, N.N. & Hoa, N.N. (2009) Nutritional Status and Determinants of Malnutrition in Children under Three Years of Age in Nghean, Vietnam. Asian Network for Scientific Information. *Pakistan Journal of Nutrition* 8(2) 958-964. <http://dx.doi.org/10.3923/pjn.2009.958.964>.
- Hitomi, K., Hazel, J. L, Malapit, H. & Sophie, T, (2018), Does women's time in domestic work and agriculture affect women's and children's dietary diversity? Evidence from Bangladesh, Nepal, Cambodia, Ghana, and Mozambique, *Food Policy*, 79 (C), 256-270, <https://doi.org/10.1016/j.foodpol.2018.07.002>.
- Johnson, C. O., Nguyen, M., Roth, G. A., Nichols, E., Alam, T., Abate, D., ... & Miller, T. R. (2019). Global, regional, and national burden of stroke, 1990–2016: a systematic analysis for the Global Burden of Disease Study 2016. *The Lancet Neurology*, 18(5), 439-458. <https://pubmed.ncbi.nlm.nih.gov/30879893>
- Johnston, D., Stevano, S., Malapit, H., Hull, E., & Kadiyala, S. (2018). Review: time use as an explanation for the agrinutrition disconnect? Evidence from rural areas in low and middle-income countries. *Food Policy* 76, 8-18. <https://doi.org/10.1016/j.foodpol.2017.12.011>.
- Kalu, R. E., & Etim. K.D. (2018) "Factors associated with malnutrition among underfive children in developing countries: a review." *Global Journal of Pure and Applied Sciences* 24. (1) 69-74. <http://dhsprogram.com/data/available-datasets.cfm>
- Khan, S., Zaheer, S., & Safdar, N. F. (2019). Determinants of stunting, underweight and wasting among children < 5 years of age: Evidence from 2012-2013 Pakistan demographic and health survey. *BMC Public Health*, 19(1), 358. <https://doi.org/10.1186/s12889-019-6688-2>
- Kim, R., Vollmer, S., & Subramanian, S. V. (2020). Factors associated with child stunting,

- wasting, and underweight in 35 low-and middle-income countries. *JAMA network open*, 3(4), e203386. <https://jamanetwork.com/journals/jamanetworkopen>
- Koyel, B., Priyabrata, D., Rittwika, B., Swati, D., Soma, M., Jayasri, B., & Ashis, M. (2017). Deterministic role of CEA and MSI status in predicting outcome of CRC patients: a perspective study amongst hospital attending Eastern Indian populations. *Indian journal of surgical oncology*, 8, 462-468. <https://pubmed.ncbi.nlm.nih.gov/29203974/>
- Krause, H, Fabe, A. & Grote, U. (2019) Nutrient-Dense Crops for Rural and Peri-Urban Smallholders in Kenya—a Regional Social Accounting Approach. *Sustainability*. 11(11), 3017-22 . <https://doi.org/10.3390/su11113017>
- Lang, T & Mason, P (2018). Sustainable diet policy development: implications of multi-criteria and other approaches, 2008-2017. *Nutrition Society*. 77(3) 331346. doi: 10.1017/S0029665117004074.
- Lauer, E., Armenti, K., Henning, M., & Sirois, L. (2019). Identifying Barriers and Supports to Breastfeeding in the Workplace Experienced by Mothers in the New Hampshire Special Supplemental Nutrition Program for Women, Infants, and Children Utilizing the Total Worker Health Framework. *International Journal of Environmental Research and Public Health*, 16(4), 529. <https://doi.org/10.3390/ijerph16040529>
- Lima, J. P, Mirza, R. D. & Guyatt, G. H. (2023). How to recognize a trustworthy clinical practice guideline. *Journal of Anesthesia, Analgesia and Critical Care* 3(1)9. doi: 10.1186/s44158-023-00094-7.
- Mahgoub, S., Maria N, & Theodore B. (2005) "Factors affecting prevalence of malnutrition among children under three years of age in Botswana." *African Journal of Food, Agriculture, Nutrition and Development* 6(1) 1-15 <https://www.ajfand.net/Volume6/No1/Mahgoub1420.pdf>
- Mariam, B. I. (2020). *Maternal Nutrition Knowledge, Infant Feeding Practices and Young Child Nutrition: a Case of Bosaso District, Somalia* [Doctoral dissertation,

University of Nairobi]. <http://erepository.uonbi.ac.ke/handle/11295/154243>

- Martin-Canavate, R., Custodio, E., Yusuf, A., Molla, D., Fasbender, D., & Kayitakire, F. (2020). Malnutrition and morbidity trends in Somalia between 2007 and 2016: results from 291 cross-sectional surveys. *BMJ open*, 10(2), e033148. <https://doi.org/10.1136/bmjopen-2019-033148>
- Marume, A, Mahomed, S., Archary, M. (2022) Challenges experienced by community health workers and their motivation to attend a self-management programme. *African Journal of Primary Health Care & Family Medicine*. 14(1), 3373. <https://doi.org/10.4102/phcfm.v14i1.3373>
- Mbugua, S., Musikoyo, E., Ndungi, F., Sang, R., Kamau-Mbuthia, E. & Douglas Ngotho, D. (2014) "Determinants of diarrhea among young children under the age of five in Kenya, evidence from KDHS 2008-09." *African Population Studies* 28 1046-1056. <https://doi.org/10.11564/28-0-556>
- Mekonen, E.G., Zegeye, A.F. & Workneh, B.S. (2024) Complementary feeding practices and associated factors among mothers of children aged 6 to 23 months in Sub-Saharan African countries: a multilevel analysis of the recent demographic and health survey. *BMC Public Health* 24, 115-120. <https://doi.org/10.1186/s12889-023-17629-w>
- Menalu, M. M., Bayleyegn, A. D., Tizazu, M. A., & Amare, N. S. (2021). Assessment of prevalence and factors associated with malnutrition among under-five children in Debre Berhan town, Ethiopia. *International Journal of General Medicine*, 14, (1)1683. <https://doi.org/10.4314/thrb.v23i4.8>.
- Ministry of Health & Human Service Federal Republic of Somalia (2020) *SOMALIA NUTRITION STRATEGY 2020 -2025*. <https://www.unicef.org/somalia/media/1756/file/Somalia-nutrition-strategy-2020-2025.pdf>
- Mkhize M, & Sibanda M. (2020). A Review of Selected Studies on the Factors Associated with the Nutrition Status of Children Under the Age of Five Years in South Africa. *International Journal Environment Research Public Health*. 17(21), 7973-76. doi: 10.3390/ijerph17217973.

- Mkhize, M., & Sibanda, M. (2020). A Review of Selected Studies on the Factors Associated with the Nutrition Status of Children Under the Age of Five Years in South Africa. *International Journal of Environmental Research and Public Health*, 17(21), 7973. <https://doi.org/10.3390/ijerph17217973>
- Mondal, D & Paul, P. (2020) Association between intimate partner violence and child nutrition in India: Findings from recent National Family Health Survey. *Children and Youth Services Review*. 119(C), 105493. doi: 10.1016/j.chilyouth.2020.105493.
- Morales, F., Montserrat-de la Paz, S., Leon, M. J., & Rivero-Pino, F. (2023). Effects of Malnutrition on the Immune System and Infection and the Role of Nutritional Strategies Regarding Improvements in Children's Health Status: A Literature Review. *Nutrients*, 16(1), 1. <https://doi.org/10.3390/nu16010001>
- Motebejana, T. T., Nesamvuni, C. N., & Mbhenyane, X. (2022). Nutrition Knowledge of Caregivers Influences Feeding Practices and Nutritional Status of Children 2 to 5 Years Old in Sekhukhune District, South Africa. *Ethiopian Journal of Health Sciences*, 32(1), 103–116. <https://doi.org/10.4314/ejhs.v32i1.12>
- Mussida, C. & Patimo, R. (2021) Women's Family Care Responsibilities, Employment and Health: A Tale of Two Countries. *Journal of Family and Economic Issues* 42(2), 489–507. <https://doi.org/10.1007/s10834-020-09742-4>
- Mustikasari, D., Aldrin, A., & Nuriyah, L. (2012). Stories of Wayang Di Batas Angin by Yanusa Nugroho: Indonesia Wayang in Modern Literature. *International Proceedings of Economics Development & Research*, 51, 1-17. <http://www.ipedr.com>
- Nabeen, A.H.M, Akanda, M, & Salam A. (2018) Association between Economic Inequality and Under-Five Child Malnutrition: Evidence from Bangladesh Demographic and Health Survey. *Dhaka University journal of Science*. 66(1) 73–78. https://papers.ssrn.com/sol3/papers.cfm?abstract_id=3149525.
- National Population Commission. (2014). *Nigeria demographic and health survey 2013*. National Population Commission, ICF International. <https://dhsprogram.com/pubs/pdf/FR293/FR293.pdf>
- Naz, L., Kamal, A., Kamran, A., & Trueha, K. (2023). Pattern and trends of the total and

- age-specific fertility rates during 1990–2018 in Pakistan. *BMC Women's Health*, 23(1), 300. <https://doi.org/10.1186/s12905-023-02435-8>
- Nicholl, P., 2019. "For Every Child, the Right to a Childhood" UNICEF (2019). <https://doi.org/10.1080/13575279.2019.1642633>
- Nyaruhucha, C. N (2006) "Nutritional status and feeding practices of under-five children in Simanjiro District, Tanzania." *Tanzania Journal of Health Research* 8(3) 1-10 <https://www.ajol.info/index.php/thrb/article/view/45114>
- Olack, B., Burke, H., Cosmas, L., Bamrah, S., Dooling, K., Feikin, D. R., Talley, L. E., & Breiman, R. F. (2011). Nutritional status of under-five children living in an informal urban settlement in Nairobi, Kenya. *Journal of Health, Population, and Nutrition*, 29(4), 357–363. <https://doi.org/10.3329/jhpn.v29i4.8451>
- Oluchina, Sherry. (2017): "Medical Factors Influencing Protein Energy Malnutrition in Children Under Five Years Old at Kenyatta National Hospital, Kenya." *International Journal of Clinical and Developmental Anatomy* 3(1),1-10. (<http://creativecommons.org/licenses/by/4.0/>)
- Owen, D. E., Sulaiman, I. F., Baldia, S., & Mintz, S. P., (2001). *Indonesia—Information and Communications Technologies (ICT) Assessment. Assessment.* <http://www.mcconnellinternational.com>
- Peng, Y. J., Yuan, G., Ramakrishna, D., Sharma, S. D., Bosch-Marce, M., Kumar, G. K., ... & Prabhakar, N. R. (2006). Heterozygous HIF-1 α deficiency impairs carotid body-mediated systemic responses and reactive oxygen species generation in mice exposed to intermittent hypoxia. *The Journal of physiology*, 577(2), 705-716. <https://doi.org/10.1113/jphysiol.2006.114033>
- Poda, G. G., Hsu, C. Y., & Chao, J. C. J. (2017). Factors associated with malnutrition among children < 5 years old in Burkina Faso: evidence from the Demographic and Health Surveys IV 2010. *International Journal for Quality in Health Care*, 29(7), 901-908 <http://data.unicef.org/nutrition/malnutrition.html>.
- Puntland State of Somalia & United Nations Population Fund Somalia (2020) *The 2020 Puntland Health and Demographic Survey (PLHDS)* https://somalia.unfpa.org/sites/default/files/pubpdf/puntland_shds_report_2020_v15_final.pdf
- Ren, Y., Li, H., & Wang, X. (2019). Family income and nutrition-related health: Evidence

- from food consumption in China. *Social Science & Medicine*, 232, 58–76. <https://doi.org/10.1016/j.socscimed.2019.04.016>
- Ricardo, L. I. C., Gatica-Domínguez, G., Crochemore-Silva, I., Neves, P. A. R., Dos Santos Vaz, J., Barros, A. J. D., & Victora, C. G. (2021). Age patterns in overweight and wasting prevalence of under 5-year-old children from low- and middle-income countries. *International Journal of Obesity (2005)*, 45(11), 2419–2424. <https://doi.org/10.1038/s41366-021-00911-5>
- Roberts, M., Tolar-Peterson, T., Reynolds, A., Wall, C., Reeder, N., & Rico Mendez, G. (2022). The Effects of Nutritional Interventions on the Cognitive Development of Preschool-Age Children: A Systematic Review. *Nutrients*, 14(3), 532. <https://doi.org/10.3390/nu14030532>
- Saleem, J., Zakar, R., & Butt, M.S. (2024) Application of the Boruta algorithm to assess the multidimensional determinants of malnutrition among children under five years living in southern Punjab, Pakistan. *BMC Public Health* 24(167) 1-15. <https://doi.org/10.1186/s12889-024-17701-z>
- Saloojee, G. (2007). "Unmet health, welfare and educational needs of disabled children in an impoverished South African peri-urban township." *Child: care, health and development* 33.3 (2007) 230-235. doi:10.1177/1010539515592461
- Sarkar, S. (2016) Cross-sectional study of child malnutrition and associated risk factors among children aged under five in West Bengal, India. *International Journal of Population Studies*. 2(1) 89–102. <http://dx.doi.org/10.18063/IJPS.2016.01.003>.
- Saunders, J., & Smith, T. (2010). Malnutrition: Causes and consequences. *Clinical Medicine (London, England)*, 10(6), 624–627. <https://doi.org/10.7861/clinmedicine.10-6-624>
- Sello, M., Adedini, S. A., Odimegwu, C., Petlele, R., & Tapera, T. (2023). The Relationship between Childcare-Giving Arrangements and Children's Malnutrition Status in South Africa. *International Journal of Environmental Research and Public Health*, 20(3), 2572. <https://doi.org/10.3390/ijerph20032572>.

- Sentongo, T (2019). A new approach to comprehensive growth and nutrition assessment in children. *Pediatrician Annals*; 48, e425–e433
<https://journals.healio.com/doi/abs/10.3928/19382359-20191017-01>
- Shetty, A. K. (2019). Infectious Diseases among Refugee Children. *Children (Basel, Switzerland)*, 6(12), 129. <https://doi.org/10.3390/children6120129>
- Smetana, S. M., Bornkessel, S., & Heinz, V. (2019). A path from sustainable nutrition to nutritional sustainability of complex food systems. *Frontiers in nutrition*, 6, 39-44. doi: 10.3389/fnut.2019.00039.
- Sturchio, J. L. (2008). Business engagement in public programs: the pharmaceutical industry's contribution to public health and the millennium development goals. *Corporate Governance: The international journal of business in society*, 8(4), 482-489.: <https://www.researchgate.net/publication/228340450>
- Sufiyan, M., Umar, A., & Bashir, S. (2012). Effect of maternal literacy on nutritional status of children under 5 years of age in the Babban-Dodo community Zaria city, Northwest Nigeria. *Annals of Nigerian Medicine*, 6(2), 61-70
<https://doi.org/10.4103/0331-3131.108110>
- Suneetha, K., J. Harris, D. Headey, Yosef, S. & Gillespie, S. (2014) Agriculture and nutrition in India: mapping evidence to pathways *Annual New York Academic science*. 6(1), 1331- 43, [10.1111/nyas.12477](https://doi.org/10.1111/nyas.12477).
- Taha, H., Durham, J., & Reid, S. (2023). Communicable Diseases Prevalence among Refugees and Asylum Seekers: Systematic Review and Meta-Analysis. *Infectious Disease Reports*, 15(2), 188–203. <https://doi.org/10.3390/idr15020020>
- Talukder, A. (2017). *Factors associated with malnutrition among under-five children: illustration using Bangladesh demographic and health survey, 2014 data*. *Children*, <https://doi.org/10.3390/children4100088>
- Tette, E. M., Sifah, E. K., & Nartey, E. T. (2015). Factors affecting malnutrition in children and the uptake of interventions to prevent the condition. *BMC pediatrics*, 15(1), 1-11. <https://www.infona.pl/resource/bwmeta1.element.springer-doi->

10_1186-S12887-015-0496-3

- Turyashemererwa, F.M., Kikafunda, J. & Agaba, E. (2009) Prevalence of early childhood malnutrition and influencing factors in peri urban areas of Kabarole district, Western Uganda. *African Journal of food agriculture nutrition and development* 9(4) <https://tspace.library.utoronto.ca/bitstream/1807/55488/1/nd09040.pdf>.
- United Nation Children's Fund (2018). *Combating malnutrition: Time to act*. World Bank Publications. <http://documents.worldbank.org/curated>
- United Nations Children's Fund (2019) *Poor diets damaging children's health, warns UNICEF* <https://www.unicef.org.uk/press-releases/poor-diets-damaging-childrens-health-warns-unicef/>
- United Nations Children's Fund (2020). *Levels and trends in child malnutrition: Key Findings of the 2020 Edition of the Joint Child Malnutrition Estimates*. World Health Organization; https://www.renc.es/imagenes/auxiliar/files/RENC_2020_2_00._Libros.pdf
- Vonk-Klaassen, S. M., de Vocht, H. M., den Ouden, M. E., Eddes, E. H., & Schuurmans, M. J. (2016). Ostomy-related problems and their impact on quality of life of colorectal cancer ostomates: a systematic review. *Quality of life research: an international journal of quality of life aspects of treatment, care and rehabilitation*, 25(1), 125–133. <https://doi.org/10.1007/s11136-015-1050-3>
- Wali, N, & Kingsley, A. (2022) Hidden hunger and child undernutrition in South Asia: A meta-ethnographic systematic review. *Asia Pacific Journal Clinical Nutrition* 31(4), 713-739. <https://apjcn.nhri.org.tw/server/APJCN/31/4/713.pdf>
- Wali, N, Agho, K, & Renzaho, A.M.N (2019). Past drivers of and priorities for child undernutrition in South Asia: a mixed methods systematic review protocol. *System Review*. 8(3) 189-198 .doi: 10.1186/s13643-019-1112-7.
- Wali, N., Agho, K. E., & Renzaho, A. M. (2021). Wasting and associated factors among children under 5 years in five South Asian countries (2014–2018): *analysis of demographic health surveys*. *International Journal of Environmental Research and*

Public Health, 18(9), 4578. <https://doi.org/10.3390/ijerph20186800>
(registering DOI)

Wambui, K. M, & Musenge, E. (2019) A space-time analysis of recurrent malnutrition-related hospitalisations in Kilifi, Kenya for children under-5 years. *BMC Nutrition*. 4(5) 32(5). doi: 10.1186/s40795-019-0296-5.

World Bank (2018) *Atlas of Sustainable Development Goals 2018: From World Development Indicators*.
<https://openknowledge.worldbank.org/handle/10986/29788>

World Health Organization (2016) *Standards for improving quality of maternal and newborn care in health facilities*. World Health Organization.
www.who.int/reproductivehealth/publications/maternal_perinatal_health/improving-Mnh-health-facilities/,

World Health Organization (2020). *The World Bank Group Joint Child Malnutrition Estimates: levels and trends in child malnutrition*. WHO
<https://www.who.int/publications/i/item/9789240003576>

World Health Organization. (2021). *Levels and trends in child malnutrition: UNICEF*.
<https://www.who.int/publications/i/item/9789240073791>

Wudil, A. H., Usman, M., Rosak-Szyrocka, J., Pilař, L., & Boye, M. (2022). Reversing Years for Global Food Security: A Review of the Food Security Situation in Sub-Saharan Africa (SSA). *International Journal of Environmental Research and Public Health*, 19(22), 14836. <https://doi.org/10.3390/ijerph192214836>

Yadav, P. Kumar, M, Sarita, S, Aadil, F, Aneesh, S, M.S & Ansari, M.S. (2019) Technique, complications, and outcomes of pediatric urolithiasis management at a tertiary care hospital: evolving paradigms over the last 15 years. *Journal Pediatric Urology*. 16 (6)665.e1-665.e7. doi:10.1016/j.jpuro.2019.09.011.

APPENDICES

Appendix I: Consent Form for Respondent

You are kindly requested to participate in a study titled: ***Child and Maternal Related Factors Associated with Malnutrition among under Fives in Bosaso, Puntland Somalia***. You have been selected as respondent and your consent to this is key to the success of this study. Please read the statements below, if you agree, acknowledge and willing to participate, please sign at the end of the form.

1. Participation to this study is on voluntary basis; you have the right to participate or decline.
2. Even after you agree to participate, you can withdraw at any stage or decide not to answer some or all questions and there will be no consequence whatsoever.
3. Any use of the collected data for other purpose other than the one stated, a consent has to be sorted from you and you have the right to grant or reject.
4. There are no benefits pledged or attached to this data collection that influenced your acceptance to participate in this study.
5. The collected data will be treated with utmost confidentiality, data protection and protect your rights as participant.
6. Personal details and identity will be anonymously used in the research report by applying codes that will not reveal any personal details or opinions that can personally identify you.
7. The opinions and answers to you provide the question without concealing your identity will be cited in various platforms such as conferences, journal publication, thesis reports in soft and hardcopies.
8. Any potential risks affecting you or any other respondent shared with the researcher can be reported to the relevant authorities. This consent form when it is duly filled and signed will be sole property of Kenya Methodist University and you have the right to access by request to the Directorate of Graduate studies.
9. Once the findings are published, you have the right to access like any other persons as part of knowledge dissemination through the right to

information. You are provided with contact details of the researcher to seek any further clarifications needed: **Yasir Dahir Ali; Email: ayasir0202@gmail.com**

I, _____, declare to have read the points above, understood, and accept to voluntarily without any persuasion participate to provide answers to the questionnaire for this study and hereby grant an informed consent.

Signature (participant): _____ Date: _____

Acknowledged/witnessed the informed consent by the researcher:

Signature: _____

Appendix II: Questionnaire

I am Yasir Dahir Ali, a student at Kenya Methodist University in Kenya studying for a Master's degree in Human Nutrition and Dietetics. I am researching factors associated with malnutrition among under-fives at Bander Qassim Hospital, Bosaso.

I am kindly seeking your consent to take part in this study. Your participation may provide insightful information critical to reducing malnutrition in children under five.

INSTRUCTIONS: Please fill in the following questions by ticking in the box or filling in the blank spaces where applicable.

SECTION A: Child related factors

1. Sex

- Male []
- Female []

2. Age In Months

- <12 []
- 12 – 23 []

- 24 - 35 []
- 36 - 47 []
- 48 – 59 []

3. Place Of Delivery

- Hospital/health facility []
- Home []

4. Immunization Status

- Fully immunized/up to date []
- Not fully immunized/not up to date []

5. Was the child exclusively breastfed for the first six months?

- Yes []
- No []

6. How long was the child breastfed?

- Less than 1 year []
- 1 up to 2 years []

7. In the last 2 weeks, did the child experience recent history of diarrhea?

- Yes []
- No []

8. In the last 2 weeks, did the child experience recent history of respiratory?

- Yes []
- No []

SECTION B: Maternal factors

a) Age

- <20 []
- 20 - 29 []
- 30 - 39 []
- >39 []

b) Level Of Education

- None []
- Primary []
- Secondary and above []

c) Marital status

- Single []
- Married []
- Separated []
- Widowed []

d) Type of residency

- Urban []
- Rural []
- IDPs []

e) **Occupation**

- Daily laborer []
- Housewife []
- Business []
- Employed []

f) **Monthly income (USD)**

- <100 []
- 100 – 150 []
- above 150 []

g) **Number of ANC visits during pregnancy**

- One Time []
- 2 – 3 times []
- More than 3 times []

h) **Number of children Under 5**

- 1 (One) [] 2 (Two) [] 3 (Three) and above []

END

THANK YOU FOR YOUR PARTICIPATION

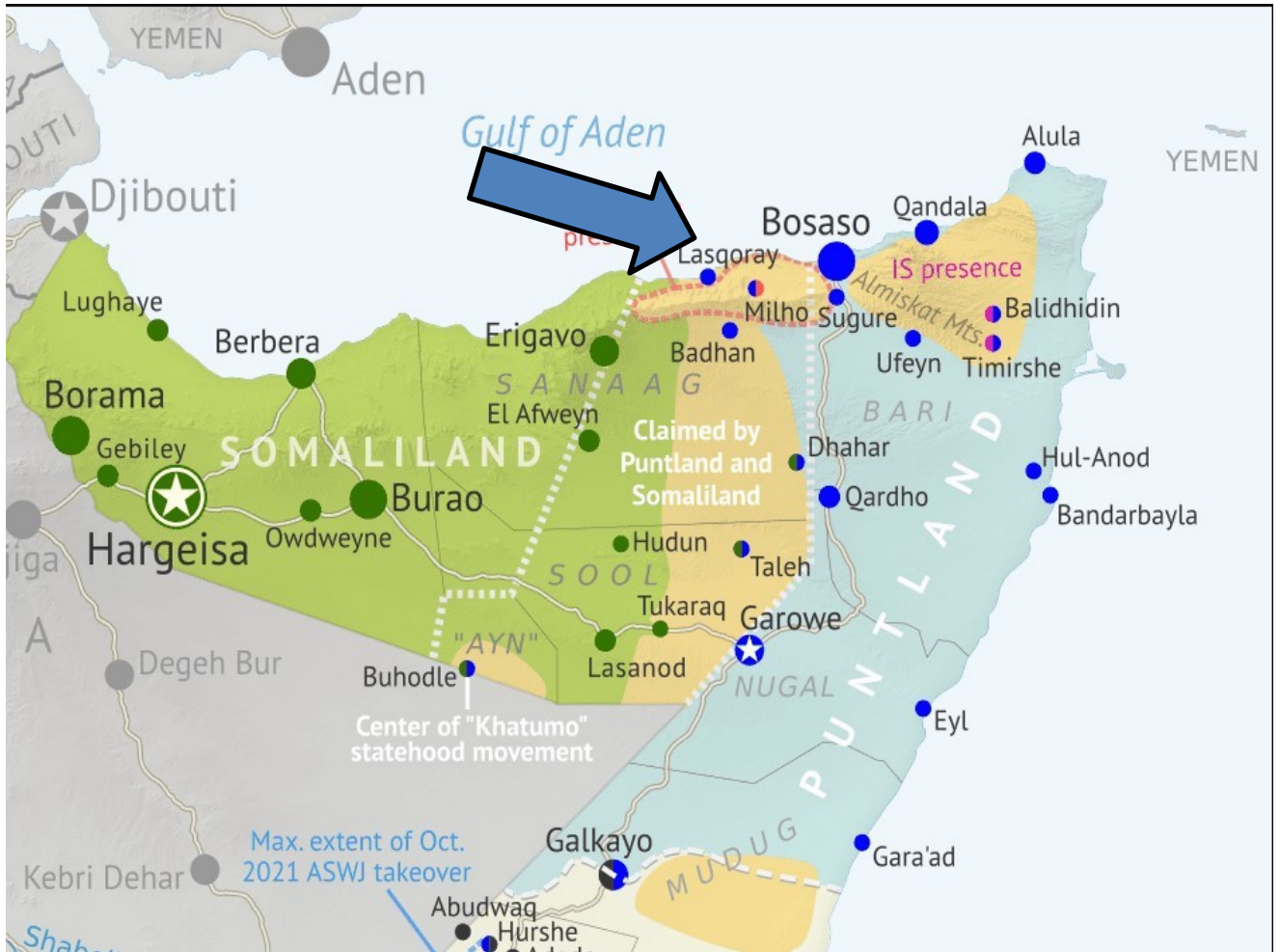
Appendix III: Nutrition Assessment

Anthrometric measurements	Age (month)	
	Weight (kg)	
	Height (cm)	
	Z scores	

Z scores Interpretation based on WHO reference charts

WEIGHT/HEIGHT Z-SCORES	
Wt/Ht z scores <-3SD	Severe Wasting
Wt/Ht z scores -3SD to -2SD	Moderately Wasted
Wt/Ht z scores -1SD and above	Normal

Appendix IV: Bosaso Map



Appendix V: Bosaso Map

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KENYA METHODIST UNIVERSITY

Tel: 254-064-30301/31229/30367/31171

Email: info@kemu.ac.ke

Our ref: NAC/ MBA/1/2022/06

MAY 16th 2022

Commission Secretary,
National Commission for Science, Technology and Innovations,
P.O. Box 30623-00100,
NAIROBI.

Dear Sir/ Madam,
YASIR DAHIR ALI HND-3 0198-1/2022

This is to confirm that the above named is a bona fide student of Kenya Methodist University, undertaking masters in HUMAN NUTRITION AND DIETETICS. He is conducting a research titled FACTORS ASSOCIATED WITH MALNUTRITION IN CHILDREN LESS THAN FIVE YEARS IN BOSASO PUTLAND SOMALIA .

In this regard, we are requesting your office to issue a permit to enable him collect data for his masters dissertation.

Any assistance accorded to him will be appreciated.

Yours faithfully,

PROF. Evangeline Gichunge, PhD.
ASS DIRECTOR POSTGRADUATE STUDIES



Encl.



Somali Federal Republic
Ministry of Health & Human Services

ETHICAL APPROVAL

This is to certify that the proposal submitted by:
Principal Investigator

Name of Researcher responsible for project: YASIR DAHIR ALI

Reference No:
MOH&HS/DGO/1526/May/2022

Full project Title:

Factors associated with malnutrition in children less the five years in bosaso putland somalia

Starting: Date 20/05/2022

Finishing Date: 25/08/2022

For the proposed period of research

Has been approved by the Research & ethics committee at the Ministry of Health
On the 22/May/2022

Director of Policy & Planning

Secretary

Chairman



Ministry of health, Somalia Email: dg@moh.gov.so/P.O BOX 22