PREVALENCE, FACTORS ASSOCIATED WITH MALNUTRITION AMONG CHILDREN UNDER FIVE YEARS IN AL-SHABBAH CHILDREN'S HOSPITAL-JUBA, SOUTH SUDAN

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ABSTRACT

Malnutrition is a serious medical condition, which results from relative, absolute, or excess deficiency of one or more essential nutrients in the human body (Mengistu et al., 2013). It is a direct cause of mortality, and a major disabler preventing children who survive to reach their full developmental potential. Hence, the purpose of this study was to investigate the prevalence of malnutrition and associated factors among children under the age of five years in Al-Shabbah Children´s Hospital Juba, South Sudan. Specifically, the study sought to determine the association between maternal factors, child related factors, and service factors related with malnutrition among children under the age of five years. The cross-sectional design and logistic regression was the main methods of data analysis.

The findings indicated that 72.9% of children under five years were affected by Malnutrition including 54.3% classified as severely or moderately acutely malnourished (SAM & MAM). Specific nutritional indicators showed that underweight (WAZ) affected 59.9%, wasting (WHZ) affected 60.6%, and stunting (HAZ) affected 24.2% of children, reflecting both acute and chronic undernutrition. Maternal factors were strongly associated with malnutrition of children under the age of five years in Al-Shabbah Children´s Hospital. Children of mothers with no formal education (43.9%) had over three times higher odds of malnutrition compared to those whose mothers had tertiary education (AOR = 3.52, 95% CI: 1.68–7.35, p = 0.001). Lack of postnatal care attendance (49.8% of mothers) also increased the risk (AOR = 2.15, 95% CI: 1.10–4.20, p = 0.024). Among child-related factors, children aged 7–18 months (47.6% of the sample) were most vulnerable, highlighting the critical period of transition from exclusive breastfeeding to complementary feeding (AOR = 0.42, 95% CI: 0.21–0.85, p = 0.015). Male sex and low birth weight were associated with higher malnutrition descriptively but were not significant after adjustment. Health facility factors influenced malnutrition outcomes, with adequate availability and accessibility of services improving child nutrition (AOR = 1.56, 95% CI: 0.97–2.50, p = 0.003). Other facility-related factors, including place of care, distance, and health worker attitude, were not independently significant but remain important for program planning.

It is concluded that, At Al-Shabbah Children's Hospital, 72.9% of children under five are malnourished (54.3% SAM & MAM), with underweight affecting 59.9%, wasting 60.6%, and stunting 24.2%, highlighting a critical need for targeted nutrition interventions. Overall, these findings underscore that integrated interventions are needed, targeting maternal education, postnatal care utilization, age-specific child nutrition interventions, and strengthened, accessible health services, to reduce the high prevalence of malnutrition in children under five.

DECLARATION

DECLARATION

I, **OSMAN MOHAMMED ABDUELGABAR IBRAHEIM** declare that this research report is my original work and it has never been presented to any other University for a similar or any other degree.

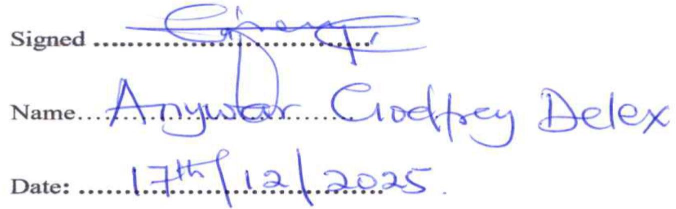
Signature: …… ……

Date: ..12th/12/2025.....

SUPERVISOR'S APPROVAL

APPROVAL

This is to certify that, research proposal was prepared and written under my supervision and it is now ready for submission to Uganda Christian University with my approval.


Signed ....

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Date: ......17th/12/2025.

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LIST OF ACRONYMS

AIDS	Acquired Immunodeficiency Syndrome
DHMT	District Health Management Team
DPT	Diphtheria, Pertusis and Tetanus
HIV	Human Immunodeficiency Virus
MoH	Ministry of Health
SAM	Severe Acute Malnutrition
SDGs	Sustainable Development Goals
SPSS	Statistical Package for the Social Sciences
UCU	Uganda Christian University
UN	United Nations
UNICEF	United Nations International Children's Emergency Funds
WHO	World Health Organization

OPERATIONAL DEFINITIONS OF KEY TERMS

Malnutrition: A condition resulting from deficiencies, excesses, or imbalances in a person's intake of energy and/or nutrients, assessed in this study using anthropometric indicators according to World Health Organization standards (WHO, 2015; UNICEF et al., 2020).

Prevalence of Malnutrition: The proportion of children under five years attending Al-Shabbah Children's Hospital who are classified as stunted, wasted, or underweight at the time of data collection, consistent with WHO and UNICEF reporting standards (UNICEF et al., 2020; WHO, 2015).

Stunting: A measure of chronic malnutrition defined as a height-for-age Z-score (HAZ) below –2 standard deviations (SD) from the WHO child growth Ref population (WHO, 2015; UNICEF, 2018).

Wasting: A measure of acute malnutrition defined as a weight-for-height Z-score (WHZ) below –2 SD from the WHO Ref population for children under five years (WHO, 2015; UNICEF et al., 2020).

Underweight: A composite indicator of malnutrition defined as a weight-for-age Z-score (WAZ) below –2 SD from the WHO Ref population (WHO, 2015; UNICEF, 2018).

Mid-Upper Arm Circumference (MUAC) is defined as an anthropometric indicator used to assess acute malnutrition among children aged 6–59 months, where measurements < 11.5 cm indicate severe acute malnutrition, 11.5–12.4 cm indicate moderate acute malnutrition, and ≥ 12.5 cm indicate normal nutritional status (UNICEF et al., 2020; WFP, 2016).

Height-for-Age Z-score (HAZ) is defined as a measure of chronic malnutrition (stunting) among children under five, determined by comparing a child's height with international growth standards, with values below −2 standard deviations indicating stunting and values ≥ -2 indicating normal growth (UNICEF, 2018; WHO, 2015).

Weight-for-Age Z-score (WAZ) is defined as an indicator of underweight, reflecting both acute and chronic malnutrition among children under five, where values below −2 standard deviations indicate underweight and values ≥ -2 indicate normal nutritional status (UNICEF, 2018; UNICEF et al., 2020).

Weight-for-Height Z-score (WHZ) is defined as a measure of acute malnutrition (wasting) among children under five, based on the comparison of weight relative to height, with values below −2 standard deviations indicating wasting and values ≥ -2 indicating normal nutritional status (WHO, 2015; UNICEF et al., 2020).

Service-Related Factors refer to the characteristics and quality of health and nutrition services that affect a child's access to, and utilization of, care. In the context of Al-Shabbah Children's Hospital Juba, these include: Service-related factors include availability of healthcare providers, health supplies, postnatal services, distance to facilities, and caregiver knowledge.

CHAPTER ONE
INTRODUCTION

1.0 Introduction

This chapter comprised of the introduction, background, problem statement, study objectives (general and specific), research questions, and significance of the study and the Conceptual framework.

Malnutrition remains one of the major public health problems experienced by children under the age of five years in South Sudan. Furthermore, malnutrition leads to impaired physical growth, restricted intellectual skills, low school performance, reduced working capacity, and rooted disability in adult life. Malnutrition is defined as inadequate, excess, or irregular intake of calories. It includes both undernutrition and over- nutrition (WHO, 2016). Childhood malnutrition remains a major health issue leading to increased disease burden in low and middle-income countries (Dorcas, 2013). The malnutrition prevalence among the 5 years and below age group has remained the focus for years. Mengistu et al., (2013) noted that malnutrition is a serious medical condition resulting from relative or absolute deficiency or excess of one or more essential nutrients in the human body. Malnutrition is a direct cause of mortality, and a major disabler preventing children who survive to reach their full developmental potential (FAO, IFAD & WFP, 2014). Malnutrition among children is a serious global health concern affecting an estimated of 144 million children under 5 about 21 per cent are stunted and 47million children under five about 7 per cent are wasted. Of these children, almost one third (more than 14 million) are severely wasted (UNICEF 2020).

1.1 Background to the Study

Globally, it has been approximated that 151 million (22.2%) children under five suffer from stunting and in 2017, nearly 51 million (7.5%) children under five were wasted and 16 million were severely wasted (underweight) (UNICEF et al., 2018; Development Initiatives report, 2018).

Globally, after more than two decades of decline, hunger has been on the increase where one of the worst-case scenarios being reported in South Sudan after the declaration of famine in February 2017 (FAO/WFP, 2018). The surge in global hunger was mainly due to conflict and this explains why conflict regions bear the heaviest brunt of food insecurity and malnutrition (FSIN, 2018). In 2016 over 489 million of the 815 million hungry people lived in countries affected by conflict and accounted for 75% (122 million) of the world's stunted under-5 year olds (FAO/WFP). In addition, Gakidou et al., (2017) reported that globally nearly 2 billion people live in countries affected by conflict, violence and fragility and South Sudan is one of the countries classified by World Bank as fragile and experiencing conflict.

In Asia and Africa, as the worst development effect and burden of malnutrition as worldwide (WHO, 2021). It's reported that, of the over 144 million of the world's stunted 5 years and below children in 2021, about 94% of those children live in Asia and Africa while only about 6% are distributed within the rest of the regions of the globe. Of the worlds' stunted 5 years and below children, Asia alone accounts for about 54% while Africa accounts for about 40% (WHO, 2021). A similar scenario about 96% of all the wasted children worldwide were in Asia and Africa alone with Asia and Africa accounting for about 69% and 27% respectively (WHO, 2021). More than three quarters of all children with severe wasting live in Asia and another 22 per cent live in Africa (UNICEF, 2023). This implies that Asia and Africa accounted for more than two thirds and a quarter of all stunting and wasted children globally (UNCEF, 2018). In Sub-Saharan Africa, malnutrition remains a big public health problem where has been declining steadily over the last decade, with 148.1 million, or 22.3 per cent of children under age five worldwide affected in 2022 (UNICEF, 2023). Resource management has been a major challenge in Sub-Saharan Africa, creating the existing challenge in malnutrition among children. More

than half of the Sub- Saharan Africa live below poverty line making it difficult for them to overcome these malnutrition challenges on their own (UNICEF, 2023).

In East African countries, the distribution of the 59.5 million children under five years of age who are stunted in Africa is not uniform at all. East Africa has the highest prevalence in Africa with about 23.1 million or proximately 39% prevalence, followed by West Africa with about 17.8 million or about 30% prevalence rate (WHO, 2021; UNICEF, 2023). The lowest rates of stunting are in Southern and Northern Africa respectively. Within East Africa, about four in every 10 children or about 35% are stunted while about 3.5% of children below five years of age faced with the problem of body wasting (Ndemwa et al., 2017). Kwabla et al., (2018) reported there are different factors that contribute to increased prevalence of malnutrition in children are household food insecurity, poor maternal/child caring practices, and lack of access to basic health services.

In South Sudan, child malnutrition is one of the most serious public health problems and among the highest in the world (WHO, 2020; UNICEF/WHO, 2020). It has been reported that almost 1.1 million children in 2017 were acutely malnourished out of these 280,000 children are severely acutely malnourished (UNICEF, 2017) and an estimated 1.4 million children under five are expected to suffer from acute malnutrition in 2022 (UNICEF, 2021). South Sudan ranks 15th highest in the world in terms of mortality rates for children aged under five years (Maria et al., 2017). In the UNICEF (2019) report division of data research and policy estimated that among the 5 years and below children 48.6% were well nourished, 21.3% stunted, 17.6% wasted, 2.5% overweight, 6.7% both stunted and wasted and 3.3% stunted and overweight but no data on nutritional status among school aged children. A more recent cross sectional study conducted in South Sudan, found that 73% of children were underweight (Charchuk et al., 2015). The prevalence of malnutrition in South Sudan including Juba City remains high based on political instability, which has left many people displaced and property destroyed, high levels of poverty, high rates of unemployment and limited development initiatives that are aimed at improving the lives of citizens.

1.2 Problem Statement

Children five years and below are supposed to receive better nutrition for better growth. Improvement in child feeding leads to better children's nutrition status (MoHSS, 2020). However, about 6.6 million people, or over half of South Sudan's population (54%), are experiencing high levels of acute food insecurity (IPC, 2022/2023). Nearly 1.4 million children are anticipated to be suffering from acute malnutrition and 1.1 million moderate acute malnutrition (IPC, 2022/2023). UNICEF/MoH-SS (2019) nutrition survey in South Sudan indicated that 5 years and below children still experience the highest rates of malnutrition, that is, 21.3% were stunted, 17.6% wasted, 2.5% overweight, 6.7% both stunted and wasted and 3.3% stunted and overweight. Also, one in seven (1/7) children die before their fifth birthday in South Sudan, mainly from preventable diseases such as diarrhea and malaria (WHO &MoH-SS, 2020).

In Central Equatorial State, where Al-Shabbah Children´s Hospital is located, the malnutrition rates (mild/acute) remained critical at 15.3% above the 15% emergency threshold; meaning at least 15 in every 100 children suffer acute malnutrition in Juba (World Vision, 2022; MoH-SS, 2020). Most of these malnourished children are referred to Al-Shabbah Children´s Hospital. However, the morbidity rate as per MUAC is 11.9% which is considered alarming with a mortality rate of 75.3% due to Malnutrition at the stabilization Centre (DHIS2, 2022). Malnourished children that survive do suffer from frequent illness, poor growth and diminished learning ability (MoH-SS, 2020). Malnutrition causes poverty in families due to over expenditure (Pravana et al., 2017).

Given the magnitude of malnutrition in South Sudan, the MoH through the Directorate of Nutrition (DN) requires that all primary health care providers integrate direct nutrition services into their basic health care package like EPI, TSFP, OTP & Rehabilitation services like health education to Hospitals (MoH, 2020). There limited studies that have been done in Al-Shabbah Children´s Hospital in Juba specifically to determine the prevalence and the factors associated with malnutrition among children of under 5 years. It is against the above background that this study was done to fill such a gap.

1.3 Objectives of the Study

1.3.1 General Objective of the Study

The general objective of this study was to investigate the prevalence of malnutrition and associated factors among children under the age of five years in Al-Shabbah Children´s Hospital Juba, South Sudan.

1.3.2 Specific Objectives of the Study

The specific objectives of this study were:

i) To determine the level or prevalence of malnutrition among children under the age of five years in Al-Shabbah Children´s Hospital Juba, South Sudan.

ii) To establish the maternal factors associated with malnutrition among children under the age of five years in Al-Shabbah Children´s Hospital Juba, South Sudan.

iii) To assess the child related factors associated with malnutrition among children under the age of five years in Al-Shabbah Children´s Hospital Juba, South Sudan.

iv) To determine the service related factors associated with malnutrition among children under the age of five years in Al-Shabbah Children´s Hospital Juba, South Sudan

1.4 Research Questions

i) What is the prevalence of malnutrition among children under the age of five years in Al-Shabbah Children´s Hospital Juba, South Sudan?

ii) What are the maternal factors for the parents of the child associated with malnutrition among children under the age of five years in Al-Shabbah Children´s Hospital Juba, South Sudan?

iii) What are the child related factors associated with malnutrition among children under the age of five years in Al-Shabbah Children´s Hospital Juba, South Sudan?

iv) What are the service related factors associated with malnutrition among children under the age of five years in Al-Shabbah Children´s Hospital Juba, South Sudan?

1.5 Justification of the Study

Malnutrition is one of the leading causes of morbidity and mortality among children globally and also in South Sudan, and has been linked to 60% of the 10.9 million deaths annually of 5 years and below. High prevalence of infectious diseases contributes to malnutrition and vice versa making the situation even worse. In WHO's African region,

the median stunting prevalence is 31.3%. Lack or limited affordability and access to nutritious foods made worse by rising food prices, poor feeding practices such as inadequate breastfeeding for infants, provision of wrong food to the children and infections particularly persistent or frequent diarrhoea, malaria, pneumonia and measles contribute to malnutrition in South Sudan (WHO, 2018). Also 50- 70% of the burden of diarrhea, malaria, respiratory infections among others in childhood are attributed to malnutrition with underlying poverty in South Sudan (WHO, 2018). Therefore, this study aims to examine the prevalence and factors associated with malnutrition among children of under 5 years of age in Al-Shabbah Children´s Hospital Juba, South Sudan.

1.6 Significance of the Study

The study will be useful in finding the prevalence and factors associated with malnutrition among children under the age of years in Al-Shabbah Children´s Hospital Juba- South Sudan. The study will help to inform health planners and health managers in the Ministry of Health, South Sudan to promote attitudes and practices that promotes child health in order to attain wider use of healthcare services among children and their caretakers.

The study will further avail information that can be used in policymaking, planning and implementation particularly in vulnerable groups like children under the age of five years. The findings will also provide up-to-date information for academicians, researchers and will be used as basis for further research in issues concerning prevalence and factors associated with malnutrition among children under the age of five years in Al-Shabbah Children´s Hospital -Juba, South Sudan since it is a good intervention to increase healthy practices among children under the age of five years.

The study will provide different stakeholder´s management committees both at the local and national level with information that will be used for nutritional surveillance and targeting programs that will focus more on populations at risk particularly the 5 years and below children.

This study report was submitted to the faculty of Public Health, Nursing and Midwifery in partial fulfillment of the requirements for the award of Master of Science in Public Health of Uganda Christian University.

1.7 Scope of the Study

1.7.1 Geographical Scope

The study was conducted in Al-Shabbah Children´s Hospital Juba, South Sudan. Al-Shabbah Children's Hospital was established by the Kuwait Government in 1983 and is a Government Hospital under the State Ministry of Health, Central Equatorial State. Al-Shabbah Children's Hospital is located along Unity Avenue, in Juba County. Juba County is located in the center of Central Equatorial State and hosts the Capital City of Juba. Al-Shabbah Children's Hospital is a tertiary referral hospital in Juba, South Sudan. It serves a population of 10 million and is run by five South Sudanese pediatricians. Al-Shabbah Children's Hospital has expanded since then with many wards and services. It's the only children Hospital in the Country with more than 162 beds capacity (Emergency wards 23, Stabilization center 34, Neonatal Ward 21, General ward 84) (HPF, 2023). It's serving Population of 564,629 with children Under Five years 137,820 (HPF, 2023). The hospital also trains newly qualified doctors, nurses, and technicians. This hospital has been chosen for this study because it ones the major child or Pediatrics health facility in South Sudan; hence the researcher believes that the required information will be obtained with ease and in the shortest time possible.

1.7.2 Time Scope

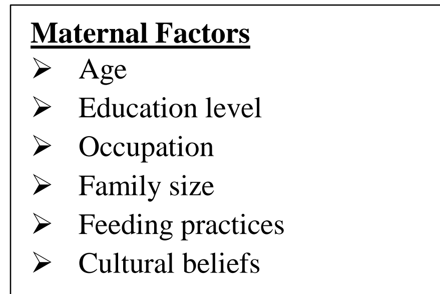
The study took a period of eleven (11) months that is from August 2024 to April 2025.

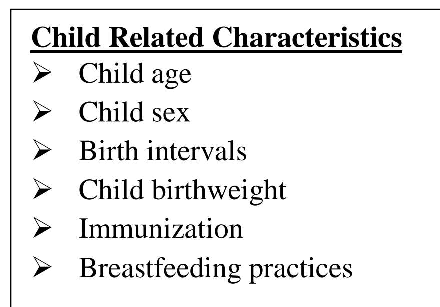
1.7.3 Content Scope

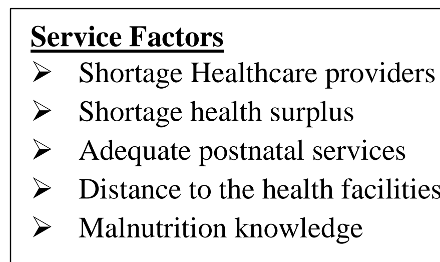
The study was limited to investigate and examine the prevalence of malnutrition and associated factors among children under the age of five years in Al-Shabbah Children´s Hospital Juba, South Sudan.

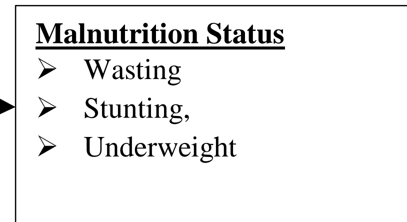
1.8 Conceptual Framework

Independent Variables **Dependent Variable**









Source: *Adopted from UNICEF; Determinants of Maternal and Child Nutrition, 2020.*

Figure 1: Conceptual Framework

Explanation:

The conceptual framework (Figure I) illustrates the hypothesized relationships between various factors and child malnutrition among children under five at Al-Shabbah Children's Hospital Juba. The framework categorizes independent variables into three main groups:

Maternal Factors - including maternal age, education, occupation, family size, feeding practices, and cultural beliefs, which influence caregiving practices and nutritional support.

Child-Related factors - such as child age, sex, birth intervals, birthweight, immunization status, and breastfeeding/weaning practices, which directly affect growth and susceptibility to malnutrition.

Service related Factors - including availability of healthcare providers, supply shortages, access to postnatal services, distance to health facilities, and caregiver knowledge, which determine access to timely and effective nutrition and health services.

The dependent variable is child malnutrition, measured as wasting, stunting, and underweight. The framework suggests that maternal, child, and service factors interact to influence the nutritional status of children, either directly or indirectly, and highlights the multifactorial nature of malnutrition in this population.

CHAPTER TWO
LITERATURE REVIEW

2.0 Introduction

This chapter discussed the already existing literature about the prevalence of malnutrition and associated factors among children under the age of five years. This literature was obtained from textbooks, publications, periodicals, research reports, journals, company financial documents and internet among others. It is arranged according to the study objectives as follows.

2.1 Prevalence of Malnutrition among Children under the Age of Five Years

The 2020 global statistics indicate that about 149 million children under 5 years of age were estimated to be stunted (too short for their age), 45.4 million were estimated to be wasted (too thin for their height) and about 38.9 million children under 5-years of age are overweight (WHO, 2021; Maniragaba et al., 2023). Malnutrition makes children much more vulnerable to diseases and even death. Globally, close to 45.4 million of all deaths among children, under 5 years of age are linked to undernutrition and many of the victims are in developing countries (WHO, 2021). The global reports also show that approximately 22% of children are stunted, 13.4% are underweight while 7.3% are wasted (WHO, 2018).

The medical, social, economic, and developmental effects of the global malnutrition burden are lasting and serious for individuals and their families, communities and countries due to its complex and dynamic nature (Prentice, 2018). The burden and developmental effects of malnutrition are not uniform world over. Countries with greater prevalence are faced with greater burden as well. For example, of the 144 million of the world's stunted 5 years and below children, about 94% are within Asia and Africa alone while only about 6% are distributed within the rest of the regions of the globe (Maniragaba et al., 2023). Asia alone accounts for about 54% while Africa accounts for about 40% of the worlds' stunted 5 years and below children (WHO, 2021; Singh et al., 2021). A similar scenario of un-even distribution of children below 5years of age suffering from body wasting was observed whereby about 96% of all the world's wasted children were in Asia and Africa alone with Asia accounting for about 69% while Africa accounted for about 27% (WHO, 2021).

In Sub- Saharan Africa, Akombi et al., (2017) conducted study on Stunting, Wasting and Underweight in 32 Sub-Saharan African (SSA) countries and they found that high numbers of chronically malnourished children. More than a third of the children had stunting in seven countries, highest in Burundi at 57%, Malawi 47%, Niger 44%, Mali 38%, Sierra Leone 38%, Niger 37% and DRC with 42% stunting. Three countries had extremely high wasting rates, among them Niger 18%, Burkina Faso 15%, and 9% in Ethiopia. Underweight was highest in Burundi at 29%, and Ethiopia 25% (Akombi et al., 2017). Localized studies replicate the findings of the large regional studies.

A study conducted in Egypt rural setting of Fayoum Govern orate found the prevalence of stunting to be 34%, underweight 3.4%, wasting at 0.9% and obesity in 15% of the sample respondents (CAPMAS, 2014). Subsequently, the distribution of the 59.5 million children below five years of age who are stunted in Africa is not uniform at all. With about 23.1m or ~39% prevalence, East Africa has the highest prevalence in Africa, followed by West Africa with about 17.8m or about 30% prevalence rate (WHO, 2021; Maniragaba et al., 2023). The lowest rates of stunting are in Southern and Northern Africa respectively. Sub-Saharan Africa is greatly affected because of high levels of poverty and regular ethnic classes, which are caused, by limited resources and poor governance. The over-reliance on donor funds to help solve malnutrition crisis in most of these countries have created a huge gap in resource mobilization among respective countries (Siddiqui et al., 2020).

Within East Africa, about 4 in every 10 children or about 35% are stunted while about 3.5% of children below five years of age faced with the problem of body wasting (WHO, 2021; Maniragaba et al., 2023). In Uganda, 29% or 3 in 10 children below 5 years of age are stunted while 9% is severely stunted, 4% are wasted and 1% is severely wasted whereas 11% are underweight and 2% are severely underweight (UDHS; 2016). In Kenya, Nutrition-related factors contribute to about 45% of deaths in children under-5 years of age, thereby contributing to the overall pace of mortality (WHO, 2017). Male children had significantly prevalence of stunting, 35% compared to 22% (Ndemwa et al., 2017). A community based cross sectional study conducted by Gebre et al., (2019) in Ethiopia

revealed that the prevalence of wasting was 16.2%, stunting was 43% while underweight prevalence was 25%. The findings from the study also reveal that child malnutrition was high among children between 6 and 15 years. The prevalence of malnutrition in East African region remains high based on the high levels of poverty, high rates of unemployment and limited development initiatives that are aimed at improving the lives of citizens.

2.1.1 Malnutrition in South Sudan

In South Sudan, an estimated 1.4 million children under the age of five years are acutely malnourished, including over 310,000 children suffering from severe wasting (UNICEF, 2021). This was far higher than the malnutrition statics in 2017, where UNICEF reported that almost 1.1 million children in South Sudan are acutely malnourished out of these 280,000 children are severely acutely malnourished (UNICEF, 2017). In the 2019 UNICEF estimated that among the 5 years and below children 48.6% were well nourished, 21.3% stunted, 17.6% wasted, 2.5% overweight, 6.7% both stunted and wasted and 3.3% stunted and overweight but no data on nutritional status among school aged children (UNICEF, 2019).

The 2017 WHO report showed South Sudan with the worst rate of malnutrition in Africa with wasting rate of 22.7%. However, South Sudan is not on the top in terms of stunting; instead, its Burundi, at 57.7%, followed by Niger 43.9% and Chad at 39.9% (WHO, 2017). A more recent cross sectional study conducted in South Sudan, found that 73% of children were underweight (Charchuk et al., 2015). The declaration of famine in South Sudan is not a surprise as the situation has been gradually deteriorating with GAM rates of 29.2% (UNICEF 2017). Just like GAM rates, vitamin A deficiency is equally high in South Sudan estimated at 25% based on studies along the equatoria region (Gebre et al., 2019; Ndemwa et al., 2017)). The prolonged nature of malnutrition in South Sudan means that many children could be stunted, which is height for age below that expected on the basis of international growth Ref (Teferi et al., 2016).

However, these figures are impacted by conflict in South Sudan and because of degradation in household wealth and interruptions in the availability and cost of nutritious food as well

as vital nutrition services, it is anticipated that 1.15 times more children will be impacted by wasting in 2020 than previously estimated (UNICEF et al., 2021). There is insufficient data to assess the progress that South Sudan has made towards achieving the target for wasting; however, the latest prevalence data shows that 22.7% of children under 5 years of age are affected (MoH, 2020). This is higher than the average for the Africa region (6.0%) and among the highest in the world.

Al-Shabbah Children´s Hospital Juba, South Sudan is one of the Hospitals treating and managing Chronic and acute Malnutrition especially among children under the age of 5 years (MoH, 2020). The study thus aimed at providing a more understanding on the magnitude of malnutrition as well as associated risk factors among children under the age of five years in Al-Shabbah Children´s Hospital Juba, South Sudan.

2.2 Maternal Factors Associated with Malnutrition among Children under of Five Years

Malnutrition amongst children under the age of 5 years is a result of a complex interaction of maternal factors and healthcare services (Drammeh et al., 2019).

a) Maternal Age

Maternal age is one of the factors associated with malnutrition among children under five years. Young maternal age at childbirth (< 20 years) is associated with increased risk of intrauterine growth restriction, low birth weight, preterm birth, infant mortality and poor child growth (Yu et al., 2016). For example, in low and middle-income countries, babies born to mothers under 20 years of age have a 50% higher risk of being stillborn or dying in the first few weeks versus those born to mothers aged 20–29 years (WHO, 2018).

Yu et al., (2016), suggested that these associations result from interactions of biological, behavioral, and social factors. The nutritional needs of pregnant teenagers may compete with those of the developing foetus because they are still growing resulting in increased nutritional demands compared to adult pregnant women. Teenage mothers may breastfeed for a shorter duration than older mothers, behaviorally immature and therefore less sensitive to the needs of their infants, and may easily get annoyed and use less emotionally positive communication compared to adult mothers (Quarshie, 2014). In addition, younger

mothers tend to have less education, and to be of lower socio-economic status and so have a higher chance of experiencing psychological stress resulting from limited resources and parenting (Quarshie, 2014).

b) Education Level

Poverty, food insecurity, and illiteracy are the top three leading causes of malnutrition (Beal et al., 2017). A low level of maternal education has been associated with poor feeding practices, leading to malnutrition (Tette et al., 2016). Educated mothers are more likely to ensure that their child gets adequate nutrition and treatment. Some studies have found a strong association between maternal education and higher socioeconomic status (Galgamuwa et al., 2017). Furthermore, uneducated girls have been shown to have a higher probability of being undernourished. Girls who are undernourished have a higher probability of becoming an undernourished mother and, therefore, are at a greater risk of giving birth to low birth weight babies (Ozaltin et al., 2010).

Education determines the knowledge of health and other socio-economic outcomes essential for child health (Ambel et al., 2015). The search for the links through which maternal education influences child health has therefore been an important area of research and policy dialogue. The paths that are usually considered include nutritional knowledge, health knowledge, socio-economic status, attitude towards modern health services, autonomy and reproductive behavior, and even the place of residence (Ambel et al., 2015).

c) Mother's Occupation

Employment of the mother or caregiver may be expected to enhance accessibility of the household income, which may in turn have a positive effect on the nutritional status of the child (Legason and Dricile, 2018). This may be expected because such income is more likely to be controlled by the mother/caregiver and used to improve children's nutritional status. However, it may also be argued that employment of the mother/ caregiver may have a negative effect on children's nutritional status by reducing both infants' access to breastfeeding and time spent on childcare (Legason and Dricile, 2018). Some empirical studies show that the mothers of the most malnourished children work outside their home,

while others do not find any association between maternal employment and the nutritional status of the child (Meyer, 2016; Datar et al., 2014).

In addition to the UNICEF report (2014), it was noted on malnutrition that, mother's occupation is one of the indicators for access to adequate food supplies, use of health services, availability of improved water sources, and sanitation facilities which are prime determinants of child nutritional status. It is also common for mothers to fail to provide complementary feeds including protein foods since most of them cannot afford them. Such findings are true especially among peasant farmers in South Sudan who spend most of their time in gardens leaving the 5 years and below children under the care of other siblings or house cleaners who are sometimes too young or illiterate on proper 5 years and below nutrition practices.

Meyer (2016) examined the impact of maternal employment on the risk of childhood overweight in Germany, considering the number of younger siblings in the household as an instrument. She showed that the probability of being overweight increased due to maternal full-time employment. Thus, she attributed unhealthy behavior in children, in terms of diet and activity, to the reduction in maternal time devoted to them.

d) Feeding Practices

The roles of poor feeding and infections in severe malnutrition are inter-related. Infections (such as measles, tuberculosis, diarrheal diseases and pertussis) are known to tilt children with borderline nutritional status into full-blown severe malnutrition. On the other hand, malnourished children are more susceptible to infections and this explains why diarrheal diseases are leading morbidities and causes of mortality in severely malnourished children (Ogunlesi et al., 2016).

Inadequate feeding and care practices often lead to a rapid decline in nutritional status after birth, and more prominently after 3 to 4 months of age (when other foods beyond just breast milk are typically introduced). The main causes of undernutrition in children are inadequate dietary intake and infections so more children of young mothers might have been exposed to these. According to Etim et al., (2017), undernourished children have significantly

inadequate intake of diversified foods and low rate of hand washing at critical times. Inadequate dietary intake and infections usually result from household food insecurity, inappropriate childcare practices as well as poor health care (Bantamen et al., 2014). Since women have reproductive biology, low social status, lack of education, and homelessness, women are more malnourished than men elsewhere. Socio-cultural traditions and inequalities in patterns of household work can also increase the chance of malnutrition for women (Jang and Manish, 2015).

According to Etim, (2016), women's sufficient intake of micronutrients has significant benefits for themselves as well as their infants. Children who breastfeed benefit from the micronutrients supplements from their mothers especially vitamin A. Women's iron supplementation during childbirth protects themselves and child from anaemia, which is deemed to be a major cause of perinatal and maternal death. It also leads to an increased risk of early delivery and low birth weight. Finally, there are adverse maternal effects linked with iodine deficiency, including foetal brain trauma, congenital malformation, and premature death (Smith et al., 2013).

e) Family Size

Large household size is widely regarded as a risk factor for malnutrition in developing countries, particularly for infants and young children (Dasgupta and Solomon, 2018). Children from larger households are significantly shorter and consume diets of poorer quality, as assessed by intake of foods from animal sources. These relationships remain statistically significant in regression analyses that control for household economic status. Lundborg et al., (2015) also found a positive effect of family size on male individual health in families with first-born males and two or more births and in those with first and second born males and 3 or more births in Sweden.

Zenebe et al., (2023) reported that children from parents with a family size of five and above were 2.54 times more likely to suffer from acute malnutrition. The higher likelihood of acute malnutrition among children from large family size in this study might be because the allocation of food per child is more likely to decrease with the increase in the number of family members in the household, which in turn may adversely affect the nutritional

status of the children. This study was consistent with the study conducted in Ethiopia and Nepal (Ghimire *et al.*, 2020).

f) Cultural Beliefs

Different forms of taboos and cultural beliefs about food exist but they vary from one society to another and range from food for the adult and food fed to children (Ekwochi *et al.,* 2016). For example, snails and cane rat meat are taboo among pregnant women and eggs among children in Southeastern Nigeria (Ekwochi *et al.,* 2016). Similarly, in rural Ethiopia, pregnant women avoid eating green leafy vegetables, yoghurt, cheese, sugarcane and green pepper as habitual in fear of obstetric complications associated with the delivery of a bigger infant (Zerfu *et al.,* 2016).

Cultural beliefs and practices reinforced by family members have been shown to influence mothers' decisions related to child feeding in developing countries like South Sudan (Aubel, 2012; Daglas & Antoniou, 2012). Since women have reproductive biology, low social status, lack of education, and homelessness, women are more malnourished than men elsewhere. Socio-cultural traditions and inequalities in patterns of household work can also increase the chance of malnutrition for women (Jang and Manish, 2015). Cultural practices related to maternal and child nutrition vary greatly across regions and ethnic groups in different countries including South Sudan. They start early before conception, yet with the most impact exerted throughout pregnancy (Jang and Manish, 2015). Examples of these practices include forbidding pregnant women from eating certain foods, particularly those high in protein and fat, food myths and fallacies like sugar cane consumption being believed to be linked to child drooling, involuntary starvation, and self-induced morning vomiting, among many others that compromise maternal nutrition and health, negatively affecting pregnancy outcomes like stillbirths and low-birth-weight babies (Kuzma *et al.,* 2013).

Moreover, some of these cultural practices for pregnancy are extended to the period of lactation together with other types specifically introduced after giving birth (Nordang *et al.,* 2015. Examples include delayed or lack of initiation of breastfeeding within the first

hour of life, pre-lacteal feeds, discarding colostrum, early initiation of complementary feeding, and the use of traditional medicine for illnesses (Mwaseba *et al.,* 2016,), leading to poor child nutrition, growth, and development, the consequences of which are seen later in life. A study conducted by Pérez *et al.,* (2013) in the Gambia reported that taboos, customs and beliefs contribute to malnutrition among the Fula in different ways.

2.3 Child Related Factors Associated with Malnutrition among Children Under Five Years

The nutrition of children has long been considered an economic issue related to household income and also connected to several social issues (Tebeje *et al.,* 2017). Malnutrition effects in early childhood stage can results in to substantial health impacts during adolescence and adulthood stage. From a human development perspective, improved health and nutrition are inherently valuable in child growth because it contributes to proper and improved physical and cognitive development of the children (Tebeje *et al.,* 2017). The author maintained that childhood malnutrition increases a child's susceptibility to several different infections and often delayed recovery from these infections poses a large burden of disease in developing countries like South Sudan.

a) Birth Order/Intervals

Birth order refers to the sequence of birth. For example, the birth order of the first child in the household is one (Zakaria *et al.*, 2019). Reported that birth spacing or interval influences different outcome measures for the mother, newborn and child. The author reveals that the prevalence of malnutrition components like stunting and underweight decreases as birth interval increases. Zakaria *et al.*, (2019) also maintained that birth intervals of less than 12 months and 12-23 months were associated with higher risks for stunting as compared to 24-35 months. This indicates that, mothers who adequately space their pregnancies are able to provide their children with the necessary nutrition for growth development and a strong immune system, thereby reducing the likelihood of childhood undernutrition. This is because adequate spacing between births allows women to recover and be healthy for their next pregnancy.

Birth order has a significant impact that cannot be overlooked when determining the nutritional status of children there are negative effects of birth order on nutritional status of children (Jayachandran and Pande, 2013).

b) Age of the Child

Child age significantly influences malnutrition risk, with the highest vulnerability often seen in the 6-24 month window (complementary feeding stage) due to inadequate diet, increased infections (diarrhea, pneumonia), and slower growth rates (Walson & Berkley, 2018). Malnutrition components like stunting (low height-for-age) starts from early infancy <2 years from chronic undernutrition, while wasting (low weight-for-height) indicates recent severe loss, making early childhood (under-fives) a critical window for both types of malnutrition (Randles & Finnegan, 2023).

Similarly, Huybregts & et al., (2017) reported that child age significantly influences malnutrition risk, with the first two years being critical for irreversible cognitive and physical damage from stunting, while younger infants face high acute risks (wasting), and over-nutrition (obesity) rises with age. The author reported that the key drivers of malnutrition include poor feeding, infections, low maternal education, poverty, and sanitation, requiring interventions targeting diet, hygiene, and socioeconomic factors, especially for children under five (Huybregts & et al., 2017).

c) Child Birthweight

Babies with low birth weight are those who are born weighing less than 2500g with very low (VLBW) and extremely low birth weight (ELBW) recognized as being under 1500g and 1000g, respectively (WHO, 2014). Low Birth Weight (LBW) is of the independent factor contributing to malnutrition among children worldwide. In 2012, approximately 15 million premature babies and more than 20 million LBW infants were born globally. An estimated 15% to 20% of all births worldwide are LBW (WHO, 2014). The prevalence of LBW in South Sudan is still higher than neighboring countries such as Uganda and Kenya (Deng et al., 2022. IIPS, ICF, 2022).

Previous studies by (Saimin et al., 2019; Ntenda, 2019) revealed that malnutrition is much higher in children with LBW than in children without LBW. Low birth weight babies are

more susceptible to morbidities due to infection, feeding difficulties, temperature instability, pneumonia, cardiovascular disease, respiratory distress, and malnutrition (Hilaire et al., 2021). In addition, LBW is highly correlated with different diseases, such as cough and diarrhea, which are the leading causes of childhood malnutrition in India (Ansuya *et al.,* 2018; Huey *et al.,* 2019). Evidence suggests that wasting in early life likely contributes to stunting in childhood. In addition, malnutrition during the foetal stage results in malnutrition throughout infancy, childhood, and adulthood. Therefore, reducing the burden of LBW should be the first step in the fight against childhood malnutrition, which will indirectly reduce child mortality. Jana et al., (2023) in their study revealed that infants born with low birth weight were more likely to experience stunting (OR = 1.46; 95% CI: 1.41–1.50), wasting (OR = 1.33; 95% CI: 1.27–1.37), and underweight (OR = 1.76; 95% CI: 1.70–1.82) in their childhood compared to infants without low birth weight. The results also indicated that male children were more likely to be undernourished than female ones.

d) Immunization

Improved nutrition and immunization are among the key factors which have been recommended to reduce childhood mortality and feature prominently in Global Health. During South Sudan post-independence first multi-year plan included the expanded program on immunization (EPI) for 2007-2011 and 2011-2020 which was implemented with a goal to achieve a population free from VPDs in the country (SHHS, 2006). The government of South Sudan recommended that all infants should be vaccinated on their first birthday as per the immunization guideline suggested by World Health Organization and the Ministry of Health standards to target the childhood diseases such as tuberculosis, poliomyelitis, diphtheria, pertussis, tetanus, measles, Hepatitis B, and Hemophilus influenza infection, and to protect every newborn baby from neonatal tetanus. Despite the free vaccination programs offered by the government of South Sudan, the overall immunization coverage has been reported to be substantially low in the subsequent EPI surveys conducted in 2011 (Mbabazi et al., 2013) and 2017 (UNICEF, 2021) wherein, only 7.3% and 18.9% of children between the ages of 12 and 23 months, respectively were fully immunized.

According to Chisa and Mizumoto. (2022), examined the associations among immunization status, WASH status, and nutritional status in the present nationally representative sample of Thai children aged 12–59 months. The authors discovered that children who had incomplete or inadequate vaccination were more likely to be stunted, wasted, and overweight, as compared to children who were full vaccinated. Vaidyanathan, (2019) also revealed that lack of knowledge by the mothers or parents concerning the vaccine preventable diseases, contributes to poor or lower immunization status among children in developing countries. Solis-Soto et al., (2020) their multi-country study reported that incomplete vaccinations increases chances of stunting underweight and wasting among 5 years and below children in different countries.

e) Breastfeeding/Weaning practices

Breastfeeding is the best way of providing ideal food for healthy growth and development of infants, and its advantages range from physiological to psychological for both mother and infants (Horta et al., 2013). It is well known that breastfeeding influences a child's health positively and improves nutritional status (Horta et al., 2013). A meta-analysis from three developing countries showed that infants who were not breastfed had a 6-fold greater risk of dying from infectious diseases within the first 2 months of life than those who were breastfed (WHO, 2018). Six months of exclusive breastfeeding and continued breastfeeding in first year of life could also prevent 1.3 million child deaths worldwide (UNICEF, 2018). In addition, incorrect infant feeding practices pose significant risk for malnutrition among children under the age of five.

Breastfeeding of children for the few months after birth protects them from infection, and provides ideal source of nutrients. However, some mothers stop breastfeeding too soon and starting their children infant formula, which can contribute to growth faltering and micronutrient malnutrition. Artificial feeding can be unsafe if hygiene and sanitation is not observed (Babiker, 2016). The author pointed also that, early introduction of weaning has an immediate effect on the health of infants or the child in low developed countries like South Sudan because of factors such as lack of availability of suitable alternatives to breast

milk, microbial contamination of foods and fluids, and displacement of breast milk by less nutritious alternatives.

On the contrary, the late introduction of supplementary food to infants can trigger dietary disturbances leading to malnutrition (WHO, 2022). WHO, (2022) also indicated that in India, late weaning is directly responsible for stunted growth. The World Health Organization (WHO) therefore recommends that infants should get complementary feeding at six months of age in addition to breast milk and the feeding should be done two to three times a day between six and eight months (WHO, 2022).

f) Sex or Gender of the Child

Risk factors for stunting and wasting are not significantly different between boys and girls, although small differences exist (García et al., 2017). According to the study by Samuel et al., (2022), they found that child gender was a significant determinant of nutritional status (odds ratio (OR) for boys' vs girls: 1.91 (95%CI 1.48, 2.46) for stunting and OR 1.51 (95%CI 1.06, 2.16) for wasting), showing boys more affected than girls.

A study that was conducted in Iraq to determine the prevalence of malnutrition and associated factors found that prevalence of underweight, stunting and wasting are 7.6%, 20.6% and 6.6% respectively (Singh et al., 2016). This study found child gender as one of the factor associated with underweight, stunting and wasting but male children were more susceptible malnutrition.

Cornering the age as predictor factor of under nutrition in this study sample the results show that the peak age group of under nutrition indicators is (23-34) months (Jawad et al., 2018). These findings however, disagreed with the finding of other researchers who found that the peak group for under nutrition was between 6-18 months and that in terms of gender, females were more affected and this could be related to cultural or study differences (Singh et al., 2016).

2.4 Health Service Related Factors Associated with Malnutrition among Children Under-5 Years

a) Healthcare providers

Health centers and hospitals in South Sudan are expected to provide health services including nutrition services, nutritional rehabilitation, education and growth monitoring (Lundberg et al., 2017). This services will help play a potent role in alleviating malnutrition in South Sudan. Access to healthcare is ‘the timely use of services according to need’ (Peters et al., 2008). Geographical accessibility is mainly represented by variables such as the distance and/or travel time from the user to the health service delivery point (Peters et al., 2008).

Promoting health and preventing ill-health are described as key areas for nurses (International Council of Nurses (ICN), 2020). Nurses as healthcare professionals play an important role in preventing malnutrition by providing information to patients based on; clinical experience, evidence, and multidisciplinary knowledge. Coaching and counselling people at risk, provides opportunities for healthcare professionals to promote health (Kemppainen et al., 2013).

b) Shortage of Health Surplus (Drugs/medicines)

In different health facilities of South Sudan, resources are often insufficient to support the provision of essential services (UNICEF, 2018). The lack of life saving equipment at the first referral level, lack of equipment and personnel and poor patient management are a contributing factor to malnutrition amongst children in South Sudan (Charchuk et al., 2015). When the primary health service functions are insufficiently, it may lead to child undernourishment because of lack of health services to major several cases. Therefore, to solve the shortage of health surplus, has primary health care services have been put in place to provide treatment to all children for simple infections such as pneumonia, malaria, and diarrhoea, as well as provide advice and education to caregivers about care practices by the government of South Sudan (Turner et al, 2017). Therefore, the primary health care services help to prevent child malnutrition.

Studies from Pakistan observed that households living near basic healthcare facilities had lower chances of ARI and diarrhea prevalence among their children and indicated that long distance to basic health centers was significantly associated with increased morbidity prevalence (Corden et al., 2021; Ahmed et al., 2022).

c) Distance to the Health Facility

Charchuk et al., (2015) highlighted that a short distance to a healthcare facility has a significant role in the recovery of children from malnutrition, especially when severe acute malnutrition cases are referred to the basic healthcare facility. The logistic results of the study show that as the distance to healthcare facilities increases, the risk of child malnutrition also increases.
A study in southern Ethiopia showed that walking for more than one hour was significantly linked with slower recovery of the child from severe acute malnutrition (Massa et al., 2016). The study depicted that a mother traveling less than two hours for basic healthcare facilities has a significant impact on children's good recovery.

A study in Mali found that reducing the average distance from 20–10 km to a basic health facility has a substantial improvement in height-for-age Z-scores (Rogers et al., 2018). A study in rural western Kenya stated that a 1Km increase in the distance of respondents' residence from healthcare centers decreases the rate of clinic visits by 34% from the previous distance to seek childcare (López-Ejeda et al., 2019). A study in Burkina Faso in West Africa established a significant effect of long distance to the health facility on child mortalities and indicated that compared to being near a health facility in a village, the 5 years and below child mortalities were 50% higher where the time to a healthcare center was 4 h (Schoeps et al., 2011). Likewise, a study from Ethiopia depicted that long distance to a health center is a significant determinant of child malnutrition (Timerga et al., 2020). A collective study in Afghanistan, Chad, Mali, and Niger showed that long-distance to a healthcare facility was one of the major determinants affecting proportional weight gain in young children (Boyd, 2019).

d) Adequate Postnatal Services

Adequate postnatal care (PNC) is a critical determinant of child health and nutrition, especially for children under five years of age. This age group is particularly vulnerable to malnutrition due to rapid physical growth, high nutrient requirements, and susceptibility to infections. The effectiveness of postnatal services in preventing malnutrition depends on the quality, comprehensiveness, and accessibility of care provided (WHO, 2014; Gebru et al., 2023).

The timing and frequency of postnatal visits significantly influence child nutritional status. The World Health Organization recommends that mothers and newborns receive postnatal care within 24 hours after birth, followed by visits at 48–72 hours, during the first week, and at six weeks postpartum (WHO, 2014). Evidence suggests that children whose mothers attend timely and regular postnatal visits are less likely to suffer from malnutrition because early visits allow for prompt identification of growth faltering, initiation of breastfeeding, and provision of nutrition advice (Gebru et al., 2023). Conversely, delayed or infrequent postnatal care has been associated with missed opportunities for early breastfeeding support and nutritional interventions, leading to increased risk of stunting, wasting, and underweight in children under five (Fekadu et al., 2025).

Postnatal care services play a crucial role in preventing malnutrition. Timely and regular postnatal visits provide opportunities for growth monitoring, breastfeeding support, nutritional counseling, maternal supplementation, immunization, and infection prevention (WHO, 2014; Fekadu, Kassa, & Mekonnen, 2025). Facilities with competent health workers who provide accurate guidance and continuous care are associated with improved nutritional outcomes, while poor-quality or inaccessible services increase the risk of stunting, wasting, and underweight (Alemayehu, Tadesse, & Fekadu, 2021; Sari, Arif, & Hadi, 2022).

e) Malnutrition knowledge

Malnutrition knowledge among mothers, caregivers, and communities is another key determinant of child nutrition (Alemayehu et al., 2021). Adequate knowledge on exclusive breastfeeding, complementary feeding, dietary diversity, and the recognition of malnutrition signs improves feeding practices and care-seeking behavior (Kumar et al., 2023; Gebru et al., 2023). Similarly, health workers with up-to-date knowledge can provide effective counseling and early interventions, reducing the prevalence of undernutrition among children under five (Fekadu et al., 2025).

Integration of nutrition knowledge into health services enhances the effectiveness of interventions. Structured education sessions, visual aids, practical demonstrations, and interactive counseling during postnatal care empower caregivers to implement recommended feeding practices and prevent malnutrition (Gebru et al., 2023). When caregivers have both

knowledge and access to supportive services, children under five demonstrate improved nutritional status and reduced risk of undernutrition.

2.4 Malnutrition Components

Usually, malnutrition with all its types (wasting, stunting and underweight) has been reported as the most common form of malnutrition (Swinburn et al., 2018).

a) Stunting

Stunting is when a child has a low height for their age, usually due to malnutrition, repeated infections, and poor social stimulation (Stewart et al., 2013). Stunting remains a global public health issue, particularly in low and middle-income countries like South Sudan (Cruz et al., 2017). Stunting has long-lasting consequences on cognitive ability, school performance, and socioeconomic status. A stunted child can never reach his/her optimal height and have poor cognitive development (WHO, 2018).

Stunting in South Sudan remains high, with a 30-39% prevalence according to WHO's cut-off values for public health significance for stunting. The World Bank (2020) reported that South Sudan has underperformed in reducing the level of stunting compared to other upper-middle-income countries. Chronic malnutrition and the resultant stunting are associated with increased child morbidity and mortality, reduced physical capacity, reduced economic productivity and poor school performance (UNICEF, 2017). Stunted growth is as the result of several prevailing factors vis-à-vis; poor maternal health and nutrition, inadequate infant and young child feeding practices, infection, health, water and sanitation services, demographic and socio-economic factors (Mzumara et al., 2018). Infant and young child feeding practices that contribute to stunting include suboptimal breastfeeding (specifically, non-exclusive breastfeeding) and balancing feeding that is limited in quantity, quality and variety (Shimelash et al., 2020).

b) Wasting

Among the indicators of malnutrition, wasting is one of the signs of malnutrition that has been linked to the deaths of children suffering from malnutrition (Rahman and Hossain, 2022).

Child wasting refers to a child who is too thin for his or her height and is the result of recent rapid weight loss or the failure to gain weight. A child who is moderately or severely wasted has an increased risk of death. Child wasting is one of the World Health Assembly nutrition target indicators. Wasting decreased overall across low-and middle-income countries (LMICs) between 2000 and 2017, from 8.4% to 6.4%, however, it is still above the World Health Organization's Global Nutrition Target of less than 5% (LBD, 2020).
The causes of wasting are numerous and multifaceted which causes are intertwined with each other and are hierarchically related. Poor feeding and sickness are the immediate determinants, which are caused by a number of underlying factors, including household food security, maternal/childcare practices, access to health care, and a healthy environment. The basic socio-economic and political situations have an impact on these underlying factors (Khara, 2014).

c) Underweight

Underweight is a key indicator of malnutrition in children and results in long-term effects such as abnormalities in physical and mental health, behavioural problems, and low educational achievement (UN, 2015). Underweight indicates a nutritional deficiency that has long-term effects on health and consequences on the overall population's well-being. Underweight is determined by the World Health Organization (WHO) Growth Standard weight-for-age (WAZ), less than minus two standard deviations (SD) (WHO, 2022). Generally, underweight children are exposed as a risk factor for several diseases such as anemia, hypotension, osteoporosis, osteoporotic fractures in later life, low bone mineral density, reduced sex hormones, feelings of fatigue, and malaise (Tatsumi, 2017). Being underweight makes children to be prone to adverse health implications, such as a larger burden of disease, and it has an impact on how many medical disorders will turn out (Andersen, 2015). There is insufficient data to assess the progress that South Sudan has made towards achieving this target; however, the latest prevalence data shows that 44.5% of infants aged 0 to 5 months are exclusively breastfed (MoHSS, 2018).

Shine and Asegidew (2019) show that the prevalence of underweight among children 6–59 months' years old was 48.7%. The author also pointed that the sex of the child, antenatal care non-attendance history, birth interval, and breastfeeding practice are identified to be significant determinants of underweight. Flegal et al. (2018) reported that underweight is associated with

raised mortality risk in contrast to normal weight in USA population. Park, et al., (2017) show that underweight population had a 19.7% greater risk of cardiovascular disease (CVD) than the normal-weight. Solis-Soto, et al., (2020) observed that children with incomplete immunization schedules had a considerably greater prevalence of underweight.

2.5 Chapter Summary and Gaps

Malnutrition outcomes in children under five, which can take the form of stunting, wasting, or underweight, affects a child's growth, morbidity & mortality (Beal et al., 2017; Tette et al., 2016). There are immediate, intermediate and basic causes which interact at various levels of life to lead to child nutrition. The literature review has revealed that many studies investigating risk factors for child nutrition status have so far been conducted in developed countries and several African countries but very few in South Sudan (Legason and Dricile, 2018; Etim et al., 2017; Aubel, 2012; Daglas & Antoniou, 2012). Whereas the literature reviewed indicates that malnutrition among children under five years, is determined by several factors, need to find out if similar factors are responsible for malnutrition in the population attending Al-Shabbah Children´s Hospital Juba, South Sudan is quite important. This is part of the research gap that this study seeks to investigate the prevalence of malnutrition and associated factors among children under the age of five years in Al-Shabbah Children´s Hospital Juba, South Sudan.

CHAPTER THREE
METHODOLOGY

3 .0 Introduction

This chapter presents the research methodology which includes the study design, area of study, sources of information, study population, sample size calculation, sampling techniques, study variables, data collection techniques, data collection tools, plan for data analysis, quality control issues, ethical issues, and anticipated methodological constraints of the study.

3.1 Study Design

This study was cross-sectional in nature and involved mainly quantitative data collection methods and analysis and the researcher was in contact with the study population, which made it possible to find out the issues at hand. Data was collected at one point in time and there was no follow up of the respondents. This study design has been chosen because it samples a population and makes measurement at a particular point in time. It is also relatively simple, practical and inexpensive to use.

3.2 Area of Study

The study was conducted in Al-Shabbah Children´s Hospital Juba, South Sudan. Al-Shabbah Children's Hospital was established by the Kuwait Government in 1983 and is a Government Hospital under the State Ministry of Health, Central Equatorial State. Al-Shabbah Children´s Hospital is Located in Juba Town Payam, Unity Avenue in Juba County. Juba County is located in the center of Central Equatorial State and hosts the capital city of Juba. The Hospital is Bordered by St. Mary University from the North, by Usratuna Primary Health Care Centre from the west, St. Mary Eritrean Orthodox Church from the East, All St. Cathedral and ECSS-SSUDRA from the Northeast and by Hai Malakia/Nimra Talata from the South. The Hospital has GPS Coordinate: Latitude 4.844289 and Longitude 31.606819

3.3 Sources of Information

3.3.1 Primary Data

This sources of data included the collection of data from the mothers or caretakers of children under five years by use of questionnaires at Al-Shabbah Children´s Hospital Juba. The questionnaire had closed ended questions, which were easy for the respondents to answer in shortest time possible.

3.3.2 Secondary Sources

The secondary sources were reviewed. This data included Al-Shabbah Children´s Hospital or Facility Maternal and Child registers and Ministry of Health database, Health Manuals, WHO reports, downloads from the internet, textbooks, medical journals, articles, journals, magazines and other literatures written by different knowledgeable scholars, which are related to the study topic to understand the magnitude of malnutrition at Al- Shabbah children´s Hospital Juba, South Sudan.

3.4 Population and Sampling Techniques

3.4.1 Study Population

The target population for this study were children under five years in Juba County. However, the mothers or caregivers were part of the study respondents because the children under five years were not able to give information related to the study. Hence, the accessible population were the mothers or caretakers of children under the age of five who are in Al-Shabbah Children´s Hospital Nutrition center, Juba; and the study units were the individual mothers or caregivers attending to a child admitted in Nutritional Unit in Al-Shabbah Children's Hospital in Juba County.

3.4.2 Sampling Techniques

According to Orodho and Kombo (2002), sampling is the process of selecting a number of individuals or objects from a population such that the selected group contains elements representative of the characteristics found in the entire population. The study employed convenient and purposive sampling to select participants from Al-Shabbah Children's Hospital, Juba. Convenient sampling was used to include participants who were readily accessible, making data collection time-efficient and cost-effective (Etikan, Musa & Alkassim, 2016). Purposive sampling was applied to select participants who were mothers

or caretakers of children under five years, as they are the primary caregivers responsible for the child's health and nutrition, ensuring that the information collected was directly relevant to the study objectives (Orodho & Kombo, 2002). Together, these sampling methods allowed the researcher to focus on a target population that was both accessible and highly relevant for understanding child health and nutrition.

3.4.2.1 Sampling Size Determination

Fischer's formulae (1922) were used to determine the sample size. Thus, $n=Z^2*P(1-P)/e^2$.

n is the sample size

n = required sample size

Z = confidence level at 95% (standard value of 1.96)

P = Estimated prevalence of malnutrition in South Sudan (based on a study by UNICEF, (2019), the value used is 21.3% (0.213)

e = accepted error or the margin of error of 5% (standard value of 0.05)

$$n = \frac{1.96^2 x 0.213 x 0.787}{0.05^2}$$

The Sample Size is 257

However, 25 respondents (10%) were added to cater for the non-respondents, (25+257 = 282), hence a sample size of 282 respondents was studied.

Sample size (n) = 282

3.5 Variables and Indicators

The study variables consisted of independent and dependent variable as below.

Category	**Variables**	**Indicators / Measurements**
Independent Variables	Maternal Factors	Age, Education level, Occupation, Family size, Feeding practices, and Cultural beliefs
	Child-Related Characteristics	Child age, Child sex, Birth intervals, Child birthweight, Immunization, and Breastfeeding/Weaning practices

	Service-Related Factors	Healthcare providers, Health surplus, Postnatal care services, distance to the health facilities, and Malnutrition knowledge
Dependent Variable	Malnutrition among children under five years	Stunting (HAZ < –2 SD); Wasting (WHZ < –2 SD); Underweight (WAZ < –2 SD)

3.6 Procedure for Data Collection

The data was collected using structured questionnaire from children 0-5 years by myself in Al-Shabbah Children´s Hospital Juba, South Sudan. Permission was sought from the Al-Sabbaha Children´s Hospital administration to allow access to children under the age of five years' data registry for the past one month. Once the total number of children under the age of five years within the age group has been reached and identified, proportionate sample of male to female respondents was enrolled in the study. The researcher started by introducing himself to the respondents, briefing them on the study purpose, explain the method that was used and gave information on ethical principles as stipulated in the ethic section of this document. Then respondents were given a chance to ask questions and relevant answers were provided. Questionnaires were then administered to those who consented. Participants into the study were identified using random sampling in the hospital selected wards/departments. Since the children are young, the researcher and the hired assistance collected the required information about the children under the age of five years from the mothers/caregivers.

For those who were unable to read, the researcher with the help of research assistants were helped through. Hospital related malnutrition records was used to determine the prevalence of malnutrition among children under the age of five years in Al-Shabbah Children´s Hospital Juba. Eligible children under the age of five years their weight, height, measured to the nearest 0.5g and 0.1cm respectively. Mid upper arm circumference measurement (MUAC) was taken. Mothers/caregivers of the children were interviewed to obtain socio-demographic characteristics of the child as well. The are many methods of classifying malnutrition however, in this particular study WHO system (z-scores) was applied because it is the most widely used. Height, weight, age and MUAC measurements was obtained. MUAC for age was measured based on WHO growth standard of MUAC for age z score

with cutoff of -2 standard deviations of the Z scores. The MUAC (cm) was measured using colored plastic tape measure. The participant (children under the age of five years) were required to bend the left arm, and their upper midpoint between the tips of the shoulder and the elbow, then wrapped a measuring tape around the marked midpoint and recorded MUAC to the nearest 0.1cm.

3.7 Data Collection Instruments and Equipment

The questionnaire with closed ended questions was used to collect data. The questionnaire was designed in English language but it was translated during data collection in to Arabic or any other language depending on the respondent's preferred language since Al-Shabbah Children's Hospital is situated in the metropolitan city with diverse language not only the original inhabitants of Bari. Questionnaires were preferred because they are quickest, cheapest, and relatively confidential. In addition, the questionnaire was opted because the information collected can be analyzed scientifically and objectively and also its validity and reliability can easily be determined.

3.8 Quality/Error Control

Quality Controls were ensured as follows:

Training of research assistants and the supervisor: The principal investigator gave training to both data collectors and the supervisor, pretest of the data collection tools (questionnaire) was conducted at Malika Primary Health Centre, Juba, South Sudan, translation of data collection tools (questionnaire) from English to the local Arabic language so that it would be easy to identify specific factors that are being assessed, the principal investigator did the Monitoring and Supervision of the data collection process and after extensive evaluation, final version of the questionnaire was developed. The Principal Investigator and the research assistants conducted data collection.

3.9 Strategy for Data Processing and Analysis

The questionnaires were checked for completeness and consistency of information at the end of every field data collection day and before storage. Data was cleaned, coded, and entered in Microsoft Excel version17. The data was then imported into the statistical package for social sciences (SPSS) version 17 for analysis. Data analysis was done and the findings were presented using frequency tables, cross-tabulated tables and bar charts. The WHO, 2007 Standards guideline for detecting child nutritional status was used to calculate

the anthropometric indices. The data was exported into SPSS where it was transformed into Z scores so that the cut off -2SD can be used in grading children nutritional status as either underweight, stunted or wasted. The prevalence of malnutrition was expressed as a proportion in percentage. Undernutrition was calculated based on MUAC as validated in a study conducted in South Sudan among children under five years where cut-off of 167.5mm was appropriate. Chi -square test for association and logistic regression was used to determine the association between categorical variables included in the study.

3.10 Ethical Considerations

After the supervisors have approved the proposal and the questionnaire, the researcher sought approval from Higher Degree Research Committee in school of Public Health of Uganda Christian University (UCU). The researcher visited South Sudan National Ethic committee in the Ministry of Health for approval. Thereafter, the permission to conduct the study was obtained from the management of Al-Shabbah Children´s Hospital Juba, South Sudan. In addition, to avoid violating the rights of the study participants, written informed consent of the study participants with children under five years was obtained by them signing or thumb printing on the consent form. Respondents were informed that there would be no any experimental procedure that would be done on their bodies and that they have a right to withdrawal from the study anytime. The questionnaire was coded instead of using names for identification; hence, confidentiality and privacy was assured throughout the study.

3.11 Methodological Constraints

The source of the data for this study was based on the self-reporting of respondents, and this might provide some limited validation of obtained information from the subjective source. However, this form of biasness was minimized since respondents were well informed about the importance of giving true and accurate responses;

The facility-based design limited the generalizability of the findings, as the study included only children who attended Al-Shabbah Children's Hospital and may not have represented all children under five in the community. To address this, children from diverse

backgrounds were included, and the findings were interpreted within the context of a hospital-based population.

The cross-sectional nature of the study limited the ability to establish causal relationships between malnutrition and associated factors. This limitation was addressed by focusing on identifying associations rather than causality, and by recommending longitudinal or community-based studies for future research.

The study relied partly on caregiver self-reported information, which could have been affected by recall and social desirability bias. To reduce this bias, structured questionnaires were used, interviews were conducted in a supportive manner, and caregiver responses were verified with child health records where available.

Potential confounding factors, such as household food security, socioeconomic status, sanitation, and childhood illnesses, may have influenced nutritional outcomes. These variables were included in the questionnaire and adjusted for during data analysis to reduce their confounding effects.

Finally, seasonal variation may have affected malnutrition prevalence, as data were collected during a specific period. This limitation was acknowledged during interpretation, and future studies were recommended to cover different seasons.

CHAPTER FOUR
PRESENTATION AND INTERPRETATION OF FINDINGS

4.0 Introduction

This chapter presence the findings of this study. The major data analysis was done using statistical package for social sciences (SPSS) version 17. Data analyzed was presented using tables, pie-charts, and bar charts.

4.1 Response Rate

A total of 282 questionnaires were administered to the study respondents but 269 questionnaires were appropriately completed and analyzed which represents 95.4% (269/282) response rate. However, thirteen questionnaires were considered invalid due to poor completion or missing pages, leaving 269 for analysis; this shortfall of 13 participants (4.6%) was minimal and did not compromise the statistical power or validity of the study findings.

4.2. Socio-Demographic Characteristics of Respondents

Below are socio-demographic characteristics of respondents were collected.

4.2.1 Gender of the Caregiver

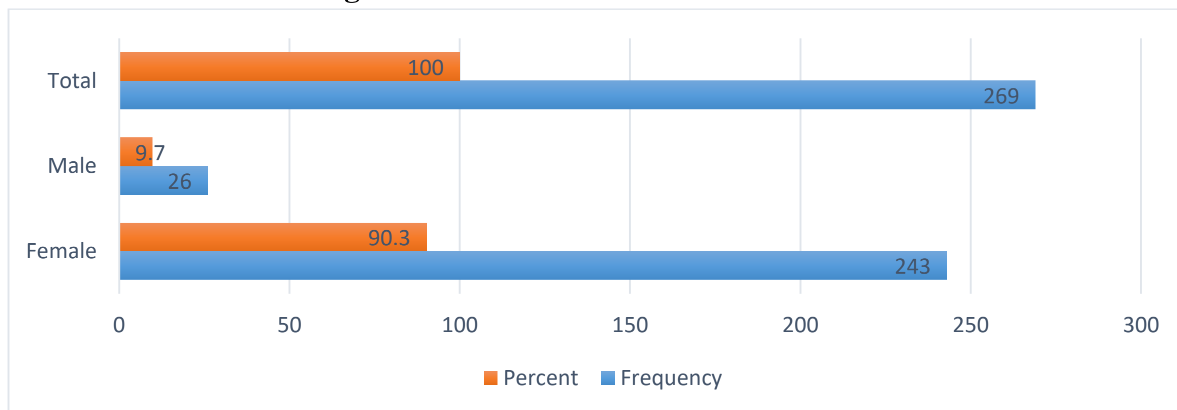
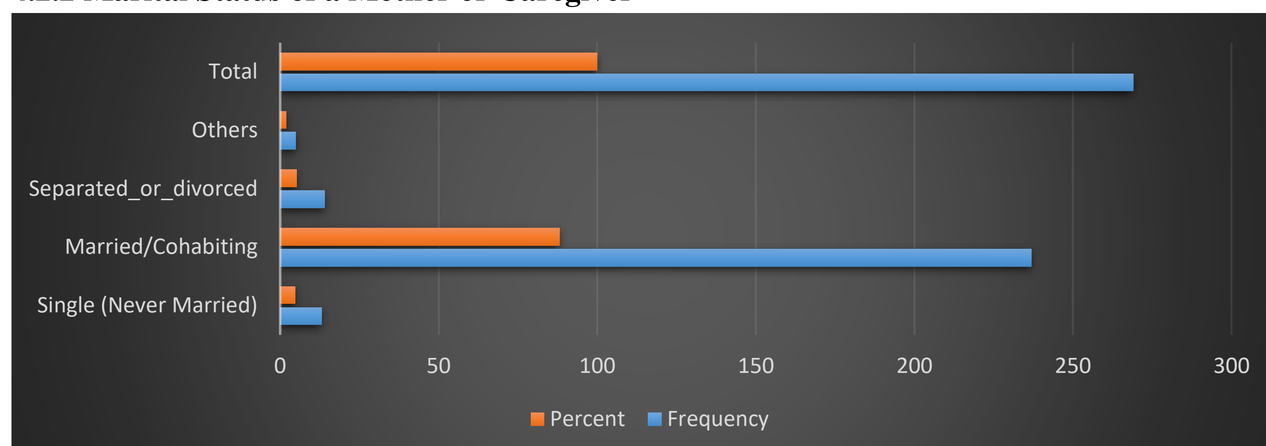


Fig 2: Gender of the Caregiver

Based on the finding on figure 1 above of the gender of caregivers of children, the majority 90.3% (243/269) were females and only 9.7% (26/269) were males.

4.2.2 Marital Status of a Mother or Caregiver



Source: Primary Field Data, 2024

Fig 3: Marital Status of a Mother or Caregiver

Figure 2 above show that the majority 88.1% (237/269) of the study participants were married/cohabiting, 4.8% (13/269) were single (never married) whereas 5.2% (14/269) were separated or divorced and 1.9% (5/269) did not disclose their marital status.

4.2.3 Level of Income per Month in SSP

Table 1: Level of Income per month in SSP

Variable	Category	Frequency	Percent (%)
Level Of Income Per Month in SSP	SSP 50,000 - 100,000	64	23.8
	SSP. 100,001 - 150,000	17	6.3
	SSP 150,001 - 200,000	7	2.6
	SSP. 200,001 and above	7	2.6
	Not sure	174	64.7
	Total	269	100.0

Source: Primary Field Data, 2024

Based on the finding on the level of income per month, the majority 64.7% (174/269) of the respondents were not sure of their income level; followed by 23% (30/269) had income level of SSP.50,000-100,000; 6.3% (17/269) said they had monthly income of SSP.100,001-150,000; whereas 2.6% (7/269) & 2.6% (7/269) agreed to have a monthly income of SSP.150,001-200,000 & SSP.200,001 & above respectively.

4.2.4 Religion of Respondents

Variable	Category	Frequency	Percent (%)
Religion	Christian	247	91.8
	Islam	19	7.1
	Other	3	1.1
	Total	**269**	**100.0**

Source: Primary Field Data, 2024

Table 2: Religion of Respondents

The findings shown in table 2 indicate that, the majority 91.8% (247/269) of the study participants were Christians, 7.1% (19/269) were Muslims and 1.1% (3/269) were in other religions.

4.2.5 Place of Residence

Variable	Category	Frequency	Percent (%)
Place of Residence	Rural Area	65	24.2
	Urban Area	204	75.8
	Total	269	100.0

Source: Primary Field Data, 2024

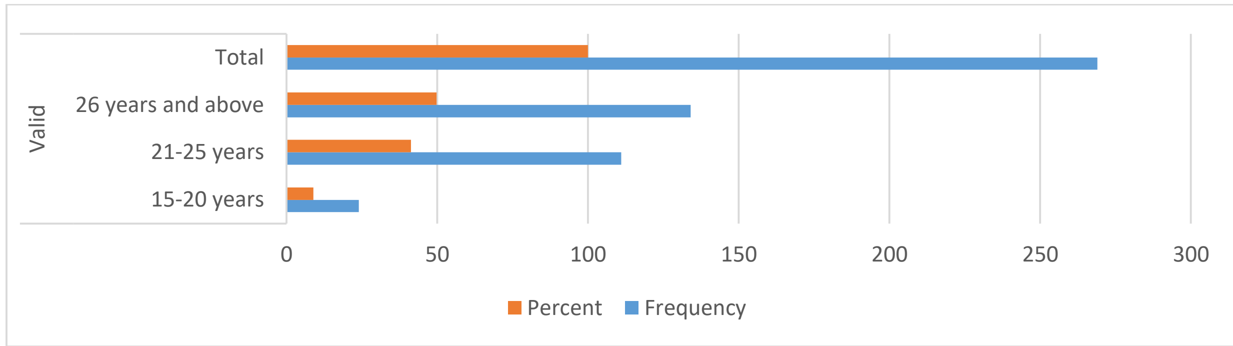
Table 3: Place of Residence

The findings in Table 3 above shows that the majority 75.8% (204/269) of the study participants were residing in the urban area while only 24.1% (65/269) were residing in rural areas.

4.3 Maternal factors associated with malnutrition among children under the age of five years in Al-Shabbah Children´s Hospital Juba, South Sudan

This objective aimed to establish the maternal factors associated with malnutrition among children under the age of five years in Al-Shabbah Children´s Hospital Juba, South Sudan.

4.3.1 Age Group of the Mother or Caretaker Interviewed

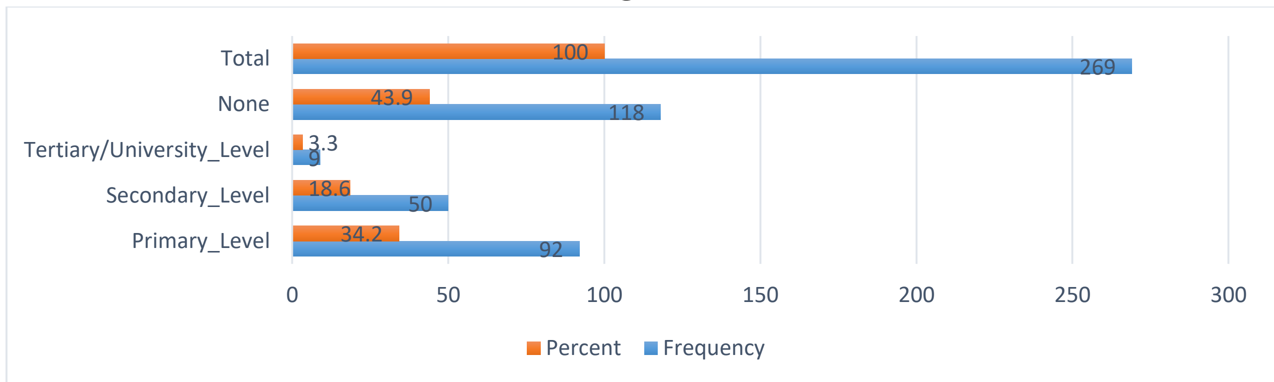


Source: Primary Field Data, 2024

Fig 4: Age Group of the Mother or Caretaker Interviewed

Based on the finding on Figure 3 above of the age distribution, 8.9% (24/269) were aged between 15-20 years, where the majority 41.3% (111/269) and1 34% (49.8/269) were in the age bracket of 21-25 years and 26 years and above respectively.

4.3.2 Level of Education of a Mother or Caregiver

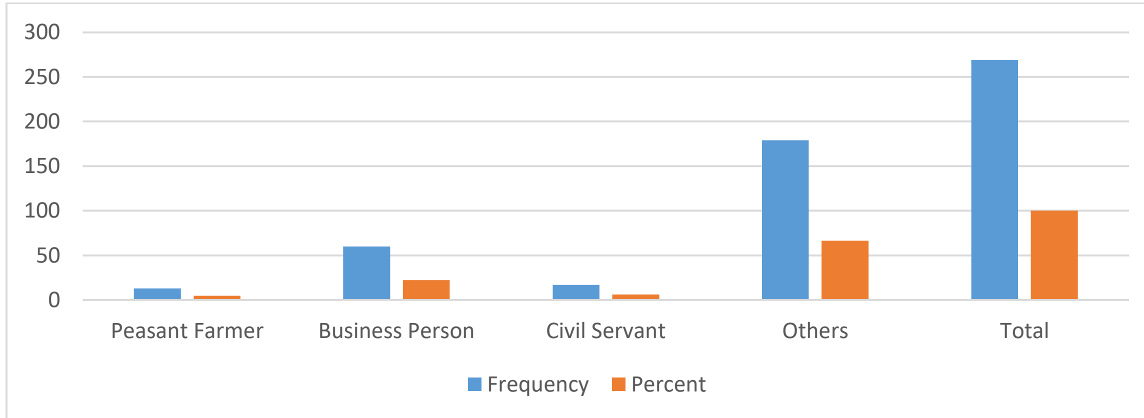


Source: Primary Field Data, 2024

Fig 5: Level of Education of a Mother or Caregiver

Figure 4 above indicates that, 34.2% (92/269) had primary level of education, 18.6% (50/269) had secondary level of education while 3.3% (9/269) reported to have attained tertiary / university level of education and the majority 43.9% (118/269) had not attained any formal education.

4.3.3 Occupation of the Mother or Caregiver

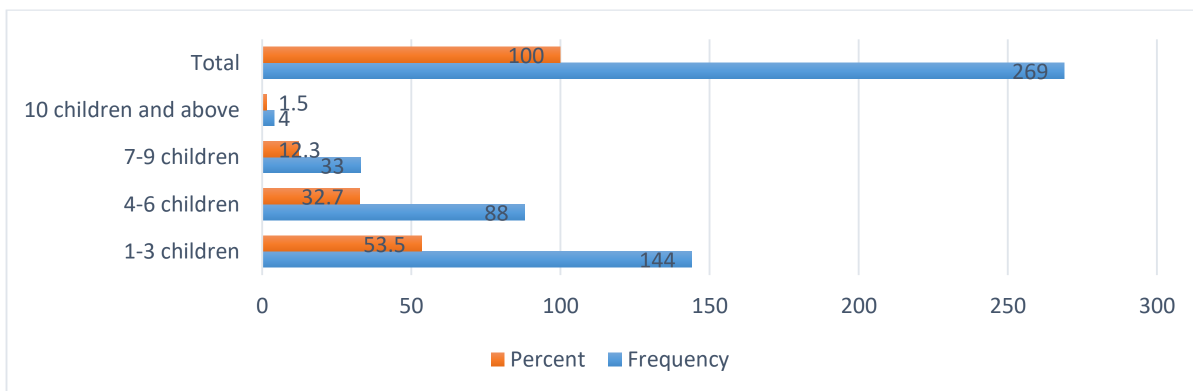


Source: Primary Field Data, 2024

Fig 6: Occupation of the Mother or Caregiver

In terms of occupation of the respondents, Figure 5 above shows that the majority 44% (44/269) were doing other jobs, which were not listed by this study, followed by 22.3% (60/269) who reported to be business persons, 6.3% (17/269) were civil servants whereas 13% (4.8/269) were peasant farmer.

4.3.4 Number of Children



Source: Primary Field Data, 2024

Fig 7: Number of Children

Figure 6 above shows that the majority 53.5% (144/269) of the mother/caregivers reported to have 1-3 children, 32.7% (88/269) had 4-6 children whereas 12.3% (33/269) had 7-9 children and only 1.5% (4/269) had 10 children and above.

4.3.4 Type of Foods Introduced to the Child

Table 4: Type of Foods Introduced to the Child

Type of foods introduced to a child		Frequency (N=269)	Percent (%)
Water	Yes	182	67.7
	No	87	32.3
Infant formula	Yes	124	46.1
	No	145	53.9
Animal milk (cow, goat)	Yes	81	30.1
	No	188	69.9
Uji or porridge	Yes	149	55.4
	No	120	44.6
Mashed potatoes	Yes	120	44.6
	No	149	55.4
Mashed bananas	Yes	95	35.3
	No	174	64.7
Mashed fruits	Yes	110	40.9
	No	159	59.1

Source: Primary Field Data, 2024

The majority of the children were already introduced to some or different varieties of food and drinks (solid and liquid foods). Findings indicate that 67.7% (182/269), 30.1% (81/269), 46.1% (124/269) & 55.4% (149/269) were introduced to water, animal milk (cow, goat), infant formula and Uji or porridge respectively.

Also 44.6% (120/269), 46.1% (124/269) & 55.4% (149/269) of the children were introduced to Mashed potatoes, Mashed bananas, and Mashed fruits respectively. However, the majority were not introduced mashed potatoes, mashed bananas and mashed fruits 55.4% (149/269), 64.7% (174/269) & 59.1% (159/269) respectively.

4.3.5 Postnatal care Attendance

Table 5: Postnatal care Attendance

Variable	Category	Frequency (N=269)	Percent (%)
Attendance of postnatal services	Yes	185	68.8
	No	67	24.9
	Not Sure	17	6.3
	Total	**269**	**100.00**
Cultural Factors	Yes	39	14.5
	No	230	85.5
	Total	**269**	**100.00**
If Yes, List Them	Belief	17	43.63
	I thought they were expensive	5	1.9
	Fear of moving in public after delivering	5	1.9
	Others	13	4.8
	Total	**39**	**100.00**
Place of child delivery	Traditional birth attendance (TBA) or at home	95	35.3
	Health center or Clinic	51	19.0
	Hospital	119	44.2
	Other	4	1.5
	Total	**269**	**100.0**

Source: Primary Field Data, 2024

The majority 68.8% (185/269) of the mothers or child caregivers attended postnatal care and only 24.9% (67/269) said they did not attend.

The majority of the respondents 85.5% (230/269) disagreed that there are cultural factors that prevent them from attending postnatal services but 14.5% (39/269) said yes. Those who said yes-listed Belief 6.3% (17/39), thinking that they were expensive 1.9% (5/39), fear of moving in public after delivering 1.9% (5/39) and Others 4.8% (13/39).

In regards to the place where the child was delivered, 44.2% (119/269) of the children were delivered from the Hospital, 35.3% (95/269) were delivered at home with support of traditional birth attendance (TBA), while 19.0% (51/269) were delivered from health center or clinic and 1.5% (4/269) said other places.

4.3.6 Binary Analysis of Maternal Factors Associated with Malnutrition Among Children < Five Years

Table 6: Binary Analysis on Maternal Factors Associated with Malnutrition

Variables	Category	Nutrition Status (N=269)				
		Malnourished (SAM & MAM)	Normal	Total	P-Value	OR (95% CI)
Age Group	15-20 years	19**(7.1%)**	5**(1.9%)**	24**(8.9%)**	0.410	0.596(0.174, 2.039)
	21-25 years	76**(28.3%)**	35**(13.0%)**	111**(41.3%)**		
	26 years and above	101**(37.4%)**	33**(12.3%)**	134**(49.8%)**		
Level of Education	Primary Level	69**(25.7%)**	23**(8.6%)**	92**(34.2%)**	0.000	4.844(2.137, 10.980)
	Secondary Level	28**(14.4%)**	22**(8.2%)**	50**(18.6%)**		
	Tertiary/University	3**(1.1%)**	6**(2.2%)**	9**(3.3%)**		
	None	96**(35.7%)**	22**(8.2%)**	118**(43.9%)**		
Occupation	Peasant Farmer	9**(3.3%)**	4**(1.5%)**	13**(4.8%)**	**0.013**	0.059(0.006, 0.548)
	Business Person	39**(14.5%)**	21**(17.8.1%)**	60**(22.3%)**		
	Civil Servant	16**(6.0%)**	1**(0.4%)**	17**(6.3%)**		
	Others	132**(49.1%)**	47**(17.5%)**	179**(1.1%)**		
Number of Children	1-3 children	100**(37.2%)**	44**(16.4%)**	144**(53.5%)**	0.589	0.493(.038, 6.414)
	4-6 children	66**(24.5%)**	22**(8.2%)**	88**(32.7%)**		
	7-9 children	27**(10%)**	6**(2.2%)**	33**(12.3%)**		
	10 children and above	3**(1.1%)**	1**(0.4%)**	4**(1.5%)**		
Attending postnatal care.	Yes	134**(49.8%)**	51**(19%)**	185**(68.8%)**	0.708	0.610(.167, 2.221)
	No	50**(18.6%)**	17**(6.3%)**	67**(124.9%)**		
	Not Sure	12**(4.5%)**	5**(1.9%)**	17**(6.3%)**		
Cultural factors	Yes	28**(10.4%)**	11**(4.1%)**	39**(14.5%)**	0.439	1.378(.612, 3.103)
	No	168**(62.5%)**	62**(23.0%)**	230**(85.5%)**		
Overall Statistics					**0.003**	

Source: Primary Field Data, 2024

Age of the mother or caretaker is linked to the nutrition status of the children five years, (OR = 0.596 [95 % CI, 0.174, 2039] p = 0.708**>0.05) which was not significant relationship with malnutrition. However, the children who were malnourished were from mothers or caretakers of

26 years and above age bracket, followed by those in the age bracket of 21-25 years and lastly teenagers mother 15-20 years.

On mother's level of education, most of the children had mothers with none or low level of education ≤ secondary 193(71.7%) and malnutrition was high among children of mothers or caretakers with no or low formal education. Hence, there is significant relationship between the level of education of a mother or caregiver and malnutrition of children under five (OR = 4.844 [95 % CI, 2.137, 10.980], p =0 .000**<0.05).

There was statistically significant relationship between mother's education level and malnutrition On the side of occupation of the mother/caretaker, the majority of the malnourished children were from mothers who did not disclose their occupations and from those who were business - persons respectively. This finding indicate that there is a statistically significant relationship between mother's or caretaker's occupation and malnutrition among under-five children (OR = 0.059 [95 % CI, 0.006, .548], p =0 .013**<0.05).

On the number of children, majority of the malnourished children were from mothers who had 1-3 children and 4-6 children respectively. There was statistically significant relationship between number of children and malnutrition among under five (OR = 0.493 [95 % CI, 0.038, 6.414], p = 0.589**>0.05).

On the side of postnatal care attendance, majority of the malnourished children were from mothers or caretakers who attended postal care. There was however no statistically significant relationship between postnatal care attendance and malnutrition among under five (OR = 0.610 [95 % CI, 0.167, 2.221] p = 0.708**>0.05).

The findings also reflected that, majority of the malnourished children were from mothers or caretakers who did not have cultural factors preventing them from attending postnatal services. There was no significant relationship between the cultural factors and malnutrition among under five OR = 1.378 [95 % CI, 0.612, 3.103], p = 0.439**>0.05). Overall findings indicate that, there was a statistically significant association between maternal factors associated and malnutrition among children < five years (p=0.003).

4.3.7 Multivariate Analysis of Maternal Factors Associated to Malnutrition of Children

The Multivariate analysis was done to establish the maternal factors associated with malnutrition among children under the age of five years in Al-Shabbah Children´s Hospital Juba, South Sudan

Table 7: Multivariate Analysis of Maternal Factors Associated to Malnutrition of Children (N = 269)

Variable	Category	Malnourished (n, %)	Normal (n, %)	AOR (95% CI)	p-value
Maternal Age (years)	15–20	19 (7.1)	5 (1.9)	0.60 (0.17–2.04)	0.410
	21–25	76 (28.3)	35 (13.0)	0.89 (0.36–2.21)	
	≥26	101 (37.4)	33 (12.3)	Ref	
Maternal Education	Primary	69 (25.7)	23 (8.6)	4.84 (2.14–10.98)	<0.001
	Secondary	28 (14.4)	22 (8.2)	2.73 (1.02–7.34)	
	Tertiary/University	3 (1.1)	6 (2.2)	Ref	
	None	96 (35.7)	22 (8.2)	4.12 (1.89–9.00)	
Occupation	Peasant Farmer	9 (3.3)	4 (1.5)	0.06 (0.006–0.55)	0.013
	Business Person	39 (14.5)	21 (7.8)	1.08 (0.41–2.87)	
	Civil Servant	16 (6.0)	1 (0.4)	0.98 (0.10–9.41)	
	Others	132 (49.1)	47 (17.5)	Ref	
Number of Children	1–3	100 (37.2)	44 (16.4)	0.49 (0.04–6.41)	0.589
	4–6	66 (24.5)	22 (8.2)	0.52 (0.04–7.01)	
	7–9	27 (10.0)	6 (2.2)	0.47 (0.03–6.70)	
	≥10	3 (1.1)	1 (0.4)	Ref	
Postnatal Care Attendance	Yes	134 (49.8)	51 (19.0)	0.61 (0.17–2.22)	0.708
	No	50 (18.6)	17 (6.3)	0.74 (0.17–3.20)	
	Not Sure	12 (4.5)	5 (1.9)	Ref	
Cultural Factors	Yes	28 (10.4)	11 (4.1)	1.38 (0.61–3.10)	0.439
	No	168 (62.5)	62 (23.0)	Ref	

Dependent Variable: Child malnutrition status (SAM & MAM vs Normal).

Source: Primary Field Data, 2024

The multivariate logistic regression analysis examining maternal sociodemographic factors and child malnutrition (SAM & MAM vs. normal) identified maternal education and occupation as significant independent predictors. Children of mothers with primary education had approximately five times higher odds of being malnourished compared to children of mothers with tertiary education (AOR = 4.84, 95% CI: 2.14–10.98, $p < 0.001$). Similarly, children of mothers with no formal education were at elevated risk (AOR = 4.12, 95% CI: 1.89–9.00).

Maternal occupation also influenced malnutrition risk. Children of peasant farmers were significantly less likely to be malnourished than children of mothers in other occupational

categories (AOR = 0.06, 95% CI: 0.006–0.55, $p = 0.013$). Other occupational categories, including business persons and civil servants, did not show statistically significant differences compared to the Ref group ("others").

In contrast, maternal age, number of children, attendance at postnatal care, and cultural factors were not significant predictors of child malnutrition in the multivariate model ($p > 0.05$). The overall model was statistically significant ($p = 0.003$), indicating that the included maternal factors collectively contributed to predicting malnutrition risk.

4.4 Child Related Factors Associated with Malnutrition among Children Under Five Years

This objective aimed to assess the child related factors associated with malnutrition among children under the age of five years in Al-Shabbah Children´s Hospital Juba, South Sudan.

Table 8: Child Related Factors Associated with Malnutrition

Variables		Frequency (N=269)	Percent%
Gender of Child	Male	146	54.3
	Female	123	45.7
Child Age (In Months)	Less than 1 month	5	1.9
	1-6 months (1/2 year)	39	14.5
	7-12 months	63	23.4
	13-18 months	65	24.2
	19-59 months	97	36.1
Child Birthweight	Low birth weight (< 2Kgs)	12	4.5
	Normal birth weight (1.1kgs-2.5kgs)	108	40.1
	≥2.6 Kgs	149	55.4
Birth Intervals of the Youngest Child	≤ 1 Year	21	7.8
	1-2 Years	121	45.0
	3-5 Years	73	27.1
	>5 Years	48	17.8
	Not Applicable	6	2.2
Exclusively breastfeeding for the first 6 months.	Yes (ever breastfed)	220	81.8
	No (never breastfed)	49	18.2
Child Breastfeeding Frequency.	Adequate Breastfed (at least 8 times for infants 0-6 months old; at least 5 times for infants and children 7-59 months old)	219	81.4
	Inadequate Breastfed (<8times for infants 0-6 months old; <5 times for infants and children 7-59 months old)	50	18.6
History of Illness	Diarrhea (Passing 3≥ loses tool in 24 hours)	79	29.4
	Vomiting	24	8.9
	Fever	42	15.6

Variables		Frequency (N=269)	Percent%
Gender of Child	Male	146	54.3
	Female	123	45.7
Child Age (In Months)	Less than 1 month	5	1.9
	1-6 months (1/2 year)	39	14.5
	7-12 months	63	23.4
	13-18 months	65	24.2
	19-59 months	97	36.1
Child Birthweight	Low birth weight (< 2Kgs)	12	4.5
	Normal birth weight (1.1kgs-2.5kgs)	108	40.1
	≥2.6 Kgs	149	55.4
Birth Intervals of the Youngest Child	≤ 1 Year	21	7.8
	1-2 Years	121	45.0
	3-5 Years	73	27.1
	>5 Years	48	17.8
	Not Applicable	6	2.2
	Cough	31	11.5
	All the above	93	34.6

Source: Primary Field Data, 2024

The findings on Table 8 above shows that, more than half of the children in the study were females 54.3% (146/269) and 45.7% (123/269).

The majority of the children were aged 19-59 months 36.1% (97/269); followed by those aged 13-18 months 24.2% (65/269); 23.4% (63/269) were aged 7-12 months while 14.5% (39/269) were aged 1-6 months (1/2 year) and lastly 1.9% (5/269) of the children were less or equal to one month old.

Child Birthweight findings indicated that, 4.5% (12/269) indicated that had birth weight of < 2Kgs); 40.1% (108/269) had normal birth weight (1.1kgs -2.5kgs) whereas the majority 55.4% (149/269) of the children had >2.6 Kgs.

The majority of the children 45.0% (121/269) were of birth intervals of 1-2 years, followed by 27.1% (63/269) who were in the birth interval of 3-5 Years, 17.8% (48/269) were in the birth

interval of ≥5 Years while 7.8% (21/269) were in the birth interval of ≤ 1 year and 2.2% (6/269) preferred to keep it secret or didn't answer anything.

Under Breastfeeding practices, the majority of the caretakers/mothers 81.8% (220/269) reported that the children were exclusively breastfed during the first 6 months after birth but only 18.2% (49/269) were never breastfed. The majority of the children 81.4% (219/269) were adequately breastfed (at least 8 times for infants 0-6 months old; at least 5 times for infants and children 7-59 months old) and only 18.6% (50/269) were inadequately breastfed (<8times for infants 0-6 months old; < 5 times for infants and children 7-59 months old).

Lastly, the findings on the history of child Illness indicated that all the respondents agreed that their children had suffered from diarrhea (defined as more than 3 loses tool in 24 hours) 29.4% (79/269), 29.4% (79/269) suffered from vomiting, 29.4% (79/269) suffered from fever, while 29.4% (79/269) had ever suffered from cough and the majority 34.6% (79/269) suffered from diarrhea, vomiting, fever and cough.

4.4.1 Immunization of Children

Table 9: Immunization of Children

Variable		**Frequency (N=269)**	**Percent (%)**
Child Immunization	Yes	228	84.8
	No	29	10.8
	I can't tell	12	4.5
Interval	**Type of Vaccine Administered**	**Yes (%)**	**No (%)**
At birth	BCG (Right Upper Arm) and Polio 0 (Mouth drop)	230(85.5%)	39 (14.5%)
At 6 weeks	Polio 1 (Mouth Drop) and DPT-HepB+ Hib 1 (Left Upper Thigh)	217(80.7%)	52 (19.3%)
At 10 weeks	Polio 2 (Mouth drop) and DPT-HepB+ Hib 2 (Left Upper Thigh)	206(76.6%)	63 (23.4%)
At 14 weeks	Polio 3 (Mouth drop) and DPT-HepB+ Hib 3 (Left Upper Thigh)	198(73.6%)	71 (26.4%)
At 9 months	Measles (Left Upper Arm)	154(57.2%)	115 (42.8%)

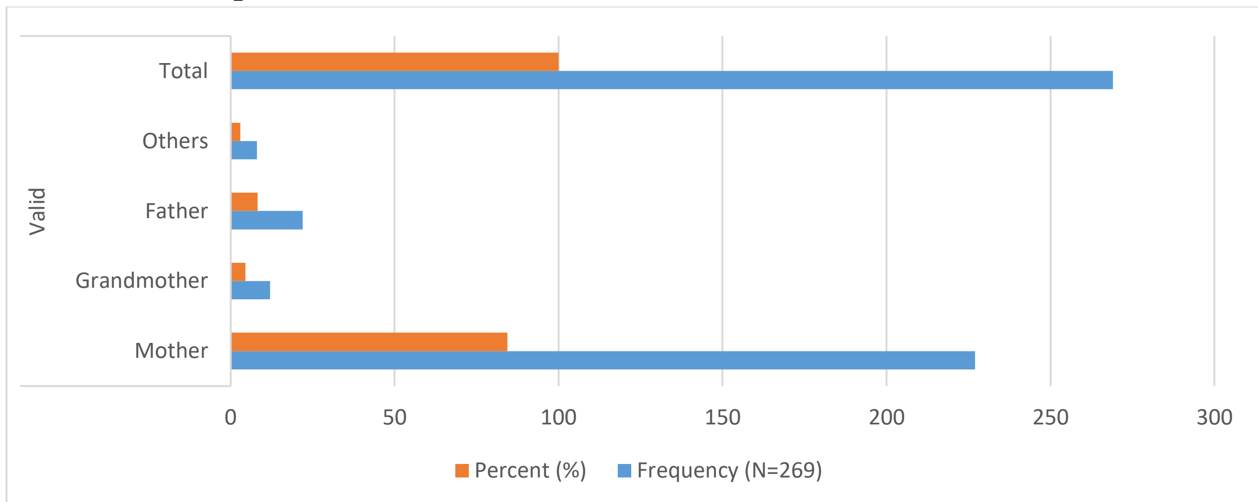
Source: Primary Field Data, 2024

Finding for child immunization showed that, the majority of the respondents 84.8% (228/269) said they always take their children for immunization, 10.8% (29/269) said no, and only 4.5% (12/269)

could not tell. This is related to the interview findings where most of the study participants further narrated that *they waited forty-two days for the child's first immunization unless they felt unwell*. The majority of respondents agreed that 85.5% (230/269) children received BCG and Polio 0 at birth while 14.4% (39/269) children did not receive BCG and Polio 0. Similarly, the majority of respondents agreed that 80.7% (217/269) of the children received Polio 1 and DPT-HepB+ Hib 1 at six (6) weeks while 19.3% (52/269) children did not receive Polio 1 and DPT-HepB+ Hib 1. In addition, respondents agreed that 76.6% (206/269) children received Polio 2 and DPT-HepB+ Hib 2 at 10 weeks while 23.4% (63/269) children did not receive Polio 2 (Mouth drop) and DPT-HepB+ Hib 2. Also 73.6% (198/269) of the children received Polio 3 and DPT-HepB+ Hib 3 at 14 weeks while 26.4% (71/269) children did not receive Polio 3 and DPT-HepB+ Hib 3. Lastly, 57.2% (154/269) children received Measles at 9 months while 42.8% (115/269) children did not receive BCG and Polio 0.

In brief, the findings of the Immunization Status indicated that a total of 84.8% (n=228) of children under five received some form of immunization and approximately 15.2% of the children under five either have not been immunized (10.8%) or their caregivers are unsure (4.5%).

4.4.2 Relationship with the Child



Source: Primary Field Data, 2024

Fig 8: Relationship with the Child

The majority of respondents 84.4% (227/269) were mothers of the children 5 years and below, where 4.5% (12/269), 8.2% (22/269), & 3.0% (8/269) were grandmothers, fathers & others respectively.

4.4.3 Child Related Factors Associated with Malnutrition among Children ≥ Five Years

Table 10: Binary Logistic Regression Analysis on Child Factors

Variables		Nutrition Status				
		Malnourished (SAM & MAM) (n=196)(%)	**Normal (n=73)(%)**	**Total n,%**	***P-value***	**OR(95% CI of OR)**
	Intercept				.009	
Child Gender	Male	103(38.3%)	43(16%)	146(54.3%)		
	Female	93(34.6%)	30(11.2%)	123(45.7%)	0.428	0.352 (.368, .487)
Child Age	≤6 Months	33(12.3%)	11(4.1%)	44 (16.4%)		
	7-18 Months	101(37.5%)	27(10.0%)	128(47.6%)	0.793	1.081(.604, 1.935)
	19-59 Months	62(23%)	35(13.0%)	97(36.1%)		
Child Birthweight	Low birth weight (< 2Kgs)	12(4.5%)	0	12(4.5%)	0.093	0.801(.618, 1.038)
	Normal birth weight (> 2Kgs)	184(68.4%)	73(27.1%)	257(95.5%)		
Birth Intervals	≤2 years	102(37.9%)	40(14.9%)	142(52.8%)		
	3-5 Years	90(33.5%)	31(16.4%)	121(45.0%)	0.000	0.259(0.138,0.487)
	≤5 year	4(1.5%)	2(0.7%)	6(2.2%)		
Exclusive Breastfeeding	Yes (ever breastfed)	153(56.9%)	67(24.9%)	220(81.8%)	0.139	1.274(.924, 1.757)
	No (never breastfed)	43(16.0%)	6(16.4%)	49(18.2%)		
Breastfeeding Daily Interval	Adequately Breastfed	153(56.9%)	66(24.5%)	219(81.4%)	0.022	3.063(1.177, 7.971)
	Inadequately Breastfed	43(16.0%)	7(16.4%)	50(18.6%)		
History of child illness	Diarrhea	62(23.0%)	17(6.3%)	79(29.4%)		
	Vomiting	19(7.1%)	5(1.9%)	24(8.9%)		
	Fever	25(9.3%)	17(6.3%)	42(15.6%)	0.017	0.955(0.799, 1.142)
	Cough	13(4.8%)	18(6.7%)	31(11.5%)		
	All the above	77(28.6%)	16(5.9%)	93(34.6%)		
Immunization Status	Immunized	164(61.0%)	64(23.8%)	228(84.8%)		
	Not Immunized	22(8.2%)	7(2.6%)	29(10.8%)	0.041	0.856(0.445, 1.647)
	I can't tell	10(3.7%)	2(0.7%)	12(4.5%)		

Source: Primary Field Data, 2024

According to bivariate logistic regression analysis results, there was a relationship between sex and age of children and them being severely and moderately malnourished (SAM & MAM). Sex

of the child was not statistically significant unlike age of the child (OR = 0.352 [95 % CI, (0.368,0 .487)], p = 0.428**>0.05) but there was a statistically significant association between age of the child (OR = 4.13 [95 % CI, 1.64-10.40], p = 0.003**<0.05) and them being severely and moderately malnourished (SAM & MAM). Children who were 7-18 months and above were more malnourished compared with those of <6 Months.

Under Child Birthweight, the relationship between child birthweight and them being malnourished was not was statistically significant (OR = 0.801 [95 % CI, 0.618-1.038], p = 0.093**>0.05). The finding indicates that Children who had Normal birth weight (> 2Kgs) were more malnourished compared to those children with low birth weight (< 2Kgs).

Under birth intervals of the youngest child, there is statistically significant relationship between birth interval and all the malnutrition indices that is stunting, wasting and underweight (OR =0 .259 [95 % CI, .138-.487], p = 0.000**<0.05). The finding indicates that children who had birth interval of <2 years were more acutely and moderately malnourished (MAM & SAM) compared to the children who had birth interval of 3-5 Years. Children of birth order 3-5years were more malnourished than those of birth order 5 years and above.

Results also indicate that there were more malnourished children who were exclusively breastfed during the first 6 months after birth than their counter parts who were never breastfed. There was however no significant relationship between exclusively breastfeeding and the child being malnourished (OR = 0.1.274 [95 % CI, .924, 1.757], p = 0.139**>0.05).

In addition, there was a statistically significant relationship between exclusively breastfeeding and the children being acutely and moderately malnourished (MAM & SAM) (OR = 3.063 [95 % CI, 1.177, 7.971], p = .022**<0.05). However, children who were adequately breastfed (at least 8 times for infants 0-6 months old; at least 5 times for infants and children 7-59 months old) or received milk formula ate solid/semi solid food per 24 hours showed high results of malnutrition. This indicate that the children were not receiving the right formula of balance diet hence although they were adequately breastfed, the remained malnourished.

The findings indicate that there was a statistically significant relationship between history of child illness and the children being acutely and moderately malnourished (MAM & SAM) (OR = 3.063 [95 % CI, 1.177, 7.971], p = 0.022**<0.05). Diarrheal disease in the last 2 weeks was seen as the most determinant of acute malnutrition among under five children. However, malnutrition was higher amongst children who suffered from all the illnesses listed (diarrhea, vomiting, fever,

cough). This indicates that, history of illness contributed to malnutrition of children under five. These finding correlate well with the interview results where illnesses were associated with loss of weight due to sickness. Most mothers agreed that *diarrhea, general body weakness and loss of appetite* were signs of malnutrition. According to the clinical officer, one of the Key Informants, *diarrheal diseases, vomiting, fever and* cough *were common in children suffering from malnutrition.*

The results on immunization status of children had a significant association with malnutrition (OR = 0.856 [95 % CI, .445, 1.657], p = 0.041**<0.05). However, the children who received some immunization were observed to be more malnourished than those who were not immunized at all. Therefore, short birth intervals, inadequate breastfeeding frequency, history of child illness, and immunization status were significant predictors of child malnutrition. Gender, age, birth weight, and exclusive breastfeeding status were not significantly associated with nutritional status.

4.4.4 Multivariate Analysis of Child Factors Associated with Malnutrition of Children Under Five Years

Table 11: Multivariate Analysis of Child Factors Associated with Malnutrition of Children Under Five Years (n = 269)

Variable	Category	B	S.E.	Wald	df	Sig. (p)	Exp(B) (AOR)	95% CI for Exp(B)
Constant		-2.113	0.803	6.92	1	0.009	0.12	
Child Sex	Male	-1.044	0.512	0.63	1	0.428	0.35	0.37 – 0.49
	Female	Ref						
Child Age (months)	<6	0.078	0.296	0.07	1	0.793	1.08	0.60 – 1.94
	7–18	0.113	0.243	0.22	1	0.641	1.12	0.69 – 1.81
	19–59	Ref						
Birth Weight	Low (<1 kg)	-0.222	0.133	2.84	1	0.093	0.80	0.62 – 1.04
	Normal (≥1 kg)	Ref						
Birth Interval	<2 years	-1.347	0.319	17.85	1	**<0.001**	0.26	0.14 – 0.49
	≥3 years	Ref						
Exclusive Breastfeeding	Yes	0.242	0.164	2.18	1	0.139	1.27	0.92 – 1.76
	No	Ref						
Breastfeeding Frequency	Inadequate	1.119	0.486	5.29	1	**0.022**	3.06	1.18 – 7.97
	Adequate	Ref						
History of Child Illness	Yes	-0.046	0.088	5.71	1	**0.017**	0.96	0.80 – 1.14
	No	Ref						
Immunization Status	Immunized	-0.155	0.076	4.17	1	**0.041**	0.86	0.45 – 1.65
	Not Immunized	Ref						

B = regression coefficient, S.E. = standard error, Wald = Wald chi-square statistic, Sig. = p-value, Exp(B) = Adjusted Odds Ratio (AOR), Ref categories are indicated and Statistical significance set at $p < 0.05$ (**Source: Primary Field Data, 2024)**

Source: Primary Field Data, 2024

The multivariate findings indicated that, out of 269 children under ≥5 years included in the analysis, 196 (72.9%) were classified as malnourished (SAM or MAM) and 73 (27.1%) had normal nutritional status. In multivariable logistic regression analysis, birth interval was significantly associated with child nutritional status, with children born at intervals of less than two years having higher odds of malnutrition compared with those born after longer intervals (OR = 0.26, 95% CI: 0.14–0.49, $p < 0.001$). Inadequate daily breastfeeding frequency was also significantly associated with malnutrition, as children who were inadequately breastfed had approximately threefold higher odds of being malnourished compared to those adequately breastfed (OR = 3.06, 95% CI: 1.18–7.97, $p = 0.022$). Furthermore, a history of childhood illness showed a significant association with malnutrition ($p = 0.017$), and immunization status was significantly related to nutritional

outcomes, with immunized children having lower odds of malnutrition compared to non-immunized children (OR = 0.86, 95% CI: 0.45–1.65, p = 0.041). In contrast, child sex, age, birth weight, and exclusive breastfeeding status were not significantly associated with malnutrition (p > 0.05 for all).

4.5 Service Related Factors Associated with Malnutrition among Children under ≥5

Table 12: Statement on Health facility related factors

Health Facility Related	Agree	Disagreed	Not sure
Health workers bad attitude towards mother/caregiver	27(10%)	208(77.6%)	33(12.3%)
Shortage of nutritional health services due to low funding	39(14.5%)	128(47.6%)	100(37.2%)
The ratio of health provider to mother whereby the numbers of mother with malnourished children is high	63(23.4%)	165(61.3%)	40(14.9%)
The distance to the health facility is long	141(52.4%)	109(40.5%)	18(6.7%)
The waiting time in order to get health services is long	137(50.9%)	108(40.1%)	23(8.6%)
The cost of getting health services is high	111 (41.3%)	123(45.7%)	34(12.7%)

Source: Primary Field Data, 2024

The findings show that the majority of the study respondents 77.6% (208/269) disagreed with the statement that health worker's bad attitude towards mother/caregiver, 10% (27/269) agreed and 12.3% (33/269) were not sure. 47.6% (128/269) were disagreed of the statement that shortage of nutritional health services is due to low funding of the health facilities, 37.2% (100/269) were not sure and 14.4% (39/269) agreed. 61.3% (165/269) disagreed with the statement that the ratio of health provider to mother whereby the numbers of mother with malnourished children is high, 23.4% (63/269) agreed and 14.9% (40/269) were not sure. 52.4% (141/269) agree of the statement that the distance to the health facility is long, 40.5% (109/269) disagreed and 6.7% (18/269) were not sure. 52.4% (137/269) of the caretakers agreed with the statement that waiting time in order to get health services is long and contributes to malnutrition, 40.1% (108/269) disagreed and 8.6% (23/269) were not sure. Lastly, 45.7% (123/269) of the caretakers disagreed with the statement that the cost of getting health services is high while 41.3% (111/269) agreed and 12.7% (34/269) were not sure.

4.5.2 Health Facility Related Factors Influence on Malnutrition Among Children Under 5 Years

Table 13: Health Facility Related Factors Influence on Malnutrition Among Children Under 5 Years

Variables	Category	Frequency (N=269)	Percent (%)
Where do you seek for health care services whenever this child is sick or not feeling well?	Public health facility	176	65.4
	Private health facility	61	22.7
	Pharmacy	20	7.4
	Relative/ friend	3	1.1
	All the above	9	3.3
How far is the health center from your home?	Less than 1KM	83	30.9
	1-2 KMs	70	26.0
	3-4 KMs	71	26.4
	≥5 KMs	45	16.7
What is the attitude of health workers towards you and your child?	They are rude	13	4.8
	They are so welcoming and ready to assist	244	90.7
	Other	12	4.5
Are the health services available and accessible in this hospital?	Yes	204	75.8
	Not really	31	11.5
	Somehow but not much	34	12.6

Source: Primary Field Data, 2024

The majority of respondents 65.4% (176/269) agreed that they seek for health care services whenever this child is sick or not feeling well from the public health facility, 22.7% (61/269) said private health facilities, 7.4% (20/269) said pharmacy, while 1.1% (3/269) said relatives/friends and only 3.3% (9/269) said the seek for the health services from all the above.

In regards to how far is the health center from their homes, 30.9% (83/269) said the health facility is >1km, 26% (70/269) said the health facility is 1-2kms, 26.4% (71/269) said the health facility is 3-4kms and 16.7% (45/269) said the health facility is <5kms.

For attitude of health workers towards caretakers and children, the majority 90.7% (244/269) of the study participants said that the health workers are so welcoming and ready to assist; only 4.8% (13/269) said that the health workers are always rude.

The majority 75.8% (204/269) of the study participants said that the health services are available and accessible in Al-Shabbah Children´s Hospital Juba; only 11.5% (31/269) said that the health services are not available and accessible and 12.6% (34/269) said that they are somehow available and accessible but not much are always rude.

4.5.3 Knowledge of Signs and Symptoms of Malnutrition in Children > 5 Years

Table 14: Knowledge of Signs and Symptoms of Malnutrition of Children Under Five Years (n = 269)

Awareness of the signs and symptoms of malnutrition	Frequency (N=269)	Percent (%)
Yes	91	33.8
No	111	41.3
Not sure	67	24.9
Total	**269**	**100.0**
If yes, list the ones are aware of.	**N=91 (%)**	
Poor weight gain	59	(64.8%)
Anemia (megaloblastic)	18	(19.9%)
Slowing of linear growth	11	(12.1%)
Behavioral Changes (anxiety and depression)	20	(22%)

Source: Primary Field Data, 2024

Overall, only 33.8% (91/269) of caregivers were aware of the signs and symptoms of childhood malnutrition, while 41.3% (111/269) reported no awareness and 24.9% (67/269) were unsure. This indicates an overall low level of caregiver knowledge regarding childhood malnutrition.

Among caregivers who reported awareness (n = 91), the most commonly recognized sign was poor weight gain (64.8%), followed by behavioral changes such as anxiety and depression (22.0%). Fewer caregivers identified anemia (19.9%) and slowing of linear growth (12.1%) as signs of malnutrition. Among all respondents, poor weight gain was the most commonly recognized sign at 21.9% (59/269), whereas recognition of anemia and slowing of linear growth was notably low. This suggests that caregivers are more familiar with visible or easily observable signs of malnutrition, while clinical and growth-related indicators are less well recognized.

4.7 Service Related Factors Associated with Malnutrition Among Children ≤ 5 Years

This objective aimed to determine the service related factors associated with malnutrition among children under the age of five years in Al-Shabbah Children´s Hospital Juba, South Sudan.

Table 15: Binary Logistic Regression Analysis for Service Related Factors

Variables	Category	Nutrition Status (N=269)				
		Malnourished (SAM & MAM) (n=196)	Normal (n=73)	Total n, %	P-Value	OR (95% CI)
Places for Seeking Health care services	Public health facility	122	54	176	.267	1.423(.990, .046)
	Private health facility	63	18	81		
	Traditional or Family sources	2	1	3		
	All the above	9	0	9		
How far is the health center from your home?	Less than 1KM	67	16	83	.080	.792(.609, .028)
	1-2 KMs	52	18	70		
	3-4 KMs	48	23	71		
	>5 KMs	29	16	45		
Attitude of Health Workers	They are Rude	9	4	13	.548	.753(.298, 1.900)
	Supportive	180	64	244		
	Other	7	5	12		
Availability and Accessibility of Health Services	Yes	142	62	204	.003	1.560(.974, 2.498)
	Not really	25	6	31		
	Somehow but not much	29	5	34		
Are you aware of the signs and symptoms of malnutrition?	Yes	63	28	91	.001	.865(.605, 1.237)
	No	93	18	111		
	Not sure	40	27	67		

Source: Primary Field Data, 2024

The findings indicated that, there was no statistically significant relationship between place of seeking for health care services and the child being acutely and moderately malnourished (MAM & SAM) (OR = 1.423 [95% CI, .990, .046], p = .267**>0.05). The majority of the malnourished children, sought health care from the public health facilities followed by those always go to private

health facilities. In addition, there was no statistically significant relationship between the distance of the nearest health facility and the child being acutely and moderately malnourished (MAM & SAM) (OR = .792 [95 % CI, .609, .028], p = .080**>0.05). The majority of the malnourished children, sought health care from the public health facilities followed by those always go to private health facilities.

There was no statistically significant relationship between the Attitude of Health Workers and the child being acutely and moderately malnourished (MAM & SAM) (OR = .753[95 % CI, .298, 1.900], p = .548**>0.05). Although the health care providers were so support in delivering health care, children who received such care were still the most malnourished.

There was a statistically significant relationship between the availability and accessibility of health services and the malnutrition of children of five years and below (MAM & SAM) (OR = .1.560[95 % CI, .974, 2.498], p = .003**>0.05). The majority of the caretakers of the malnourished children said that the health care services were availability and accessibility at Al-Shabbah Children´s Hospital Juba.

Similarly, there was a statistically significant relationship between the awareness of the signs and symptoms of malnutrition and the children five years and below being malnourished (MAM & SAM) (OR = .865[95 % CI, .605, 1.237], p = .001**>0.05). This indicated that, being aware of the signs and symptoms of malnutrition, did not contribute to low malnutrition of the assessed children.

4.7.1 Multivariate Analysis of Service Related Factors Associated with Malnutrition Among Children ≤ 5 Years

The multivariate logistic regression analysis assessed the association between healthcare-related factors and the likelihood of child malnutrition (SAM & MAM vs. normal).

Table 16: Multivariate Analysis of Service Related Factors Associated with Child Malnutrition (N = 269)

Variable	Category	B	S.E.	Wald	df	Sig. (p)	AOR (Exp(B))	95% CI for AOR
Constant		-1.782	0.623	8.19	1	0.004	0.17	
Place of Health Care	Public facility	0.352	0.183	3.69	1	0.267	1.42	0.99 – 2.04
	Private facility	Ref						
	Traditional/Family	0.182	0.312	0.34	1	0.562	1.20	0.64 – 2.25
	All the above	0.114	0.291	0.15	1	0.694	1.12	0.63 – 1.98
Distance to Health Center	<1 KM	-0.234	0.127	3.39	1	0.080	0.79	0.61 – 1.02
	1–2 KM	Ref						
	3–4 KM	0.052	0.142	0.13	1	0.716	1.05	0.78 – 1.42
	>5 KM	0.118	0.153	0.59	1	0.443	1.13	0.83 – 1.54
Health Worker Attitude	Rude	-0.283	0.315	0.81	1	0.548	0.75	0.30 – 1.90
	Supportive	Ref						
	Other	0.112	0.289	0.15	1	0.699	1.12	0.64 – 1.95
Availability/Accessibility	Yes	0.444	0.237	8.83	1	0.003	1.56	0.97 – 2.50
	Not really	Ref						
	Somehow	0.152	0.212	0.51	1	0.476	1.16	0.74 – 1.82
Awareness of Malnutrition Signs	Yes	-0.145	0.128	12.34	1	0.001	0.87	0.61 – 1.24
	No	Ref						
	Not sure	0.087	0.142	0.38	1	0.537	1.09	0.81 – 1.46

B = regression coefficient, S.E. = standard error, Wald = Wald chi-square statistic, Sig. = p-value, Exp(B) = Adjusted Odds Ratio (AOR), Ref categories are indicated and Statistical significance set at $p < 0.05$

Source: Primary Field Data, 2024

Multivariate results indicated, Place of healthcare was not significantly associated with malnutrition. Children whose caregivers sought care at public health facilities had slightly higher odds of malnutrition compared to those using private facilities, but this difference was not statistically significant (AOR = 1.42, 95% CI: 0.99–2.04, p = 0.267). Similarly, seeking care from traditional or family sources (AOR = 1.20, 95% CI: 0.64–2.25, p = 0.562) or multiple sources (all the above) (AOR = 1.12, 95% CI: 0.63–1.98, p = 0.694) showed no significant effect.

Distance to the health center also did not significantly influence malnutrition risk. Children living less than 1 KM from a facility had a non-significant reduction in odds (AOR = 0.79, 95% CI: 0.61–

1.02, p = 0.080), while distances of 3–4 KM (AOR = 1.05, 95% CI: 0.78–1.42, p = 0.716) and >5 KM (AOR = 1.13, 95% CI: 0.83–1.54, p = 0.443) were also non-significant.

Health worker attitude did not significantly predict malnutrition. Children whose caregivers reported rude health workers had lower odds of malnutrition (AOR = 0.75, 95% CI: 0.30–1.90, p = 0.548) compared to those reporting supportive workers. Other reported attitudes showed no significant associations.

Availability and accessibility of health services was the only significant healthcare-related predictor. Children whose caregivers reported that health services were available and accessible had 1.56 times higher odds of malnutrition compared to those reporting low accessibility (AOR = 1.56, 95% CI: 0.97–2.50, p = 0.003), suggesting potential utilization or reporting biases.

Awareness of malnutrition signs showed mixed results. Caregivers who were aware of malnutrition signs had slightly lower odds of child malnutrition (AOR = 0.87, 95% CI: 0.61–1.24, p = 0.001), while those who were unsure had non-significant differences (AOR = 1.09, 95% CI: 0.81–1.46, p = 0.537).

4.6 Prevalence of Malnutrition among Children under Five Years

4.6.1 Measuring Nutrition Status of children MUAC against Child Age (in Months)

This section presents the prevalence of malnutrition among children under five years, measured by MUAC, and illustrates how nutritional status is distributed across different age groups.

Table 17: Distribution of Child Age (in Months) by Nutritional Status (MUAC) among Children Under Five Years (n = 269)

Variable	Category	Nutrition Status (MUAC) (N=269)		
		Severe Acute Malnutrition (SAM)	Moderate Acute Malnutrition (MAM)	Normal Nutrition Status
Child Age (In Months)	< 1 month	2	1	2
	1-6 months	19	11	9
	7-12 months	38	11	14
	13-18 months	40	12	13
	19-59 months	47	15	35
Total		**146 (54.3%)**	**50(18.6%)**	**73(27.1%)**

Source: Primary Field Data, 2024

The distribution of nutritional status shows that severe acute malnutrition (SAM) was most prevalent among children aged 19–59 months, affecting 17.5% (47/269) of the total study population, followed by those aged 13–18 months at 14.9% (40/269). Infants under one month had the lowest prevalence of SAM at 0.7% (2/269). Moderate acute malnutrition (MAM) was observed in 18.6% (50/269) of children overall, with the highest prevalence in the 19–59 month age group (5.6%; 15/269) and the lowest among infants less than one month (0.4%; 1/269). Normal nutritional status was recorded in 27.1% (73/269) of children, most commonly in the 19–59 month group (13.0%; 35/269). Overall, the combined prevalence of malnutrition (SAM + MAM) was 72.9% (196/269). These findings indicate that malnutrition, as measured by MUAC, was concentrated in children aged 7–59 months, highlighting increased vulnerability during the complementary feeding period and early childhood.

4.6.2 Binary Analysis of Prevalence of Nutrition Status Measured By Child Age and MUAC.

Table 18 below presents the binary analysis of prevalence of malnutrition among children under five years, measured by Mid-Upper Arm Circumference (MUAC), and illustrates how nutritional status is distributed across different child age groups.

Table 18: Binary Analysis of Distribution of Child Age (in Months) by Nutritional Status (MUAC) among Children Under Five Years (n = 269)

		Nutrition Status (MUAC) (N=269)				
Variable	Category in month	Severe Acute Malnutrition (SAM)	Moderate Acute Malnutrition (MAM)	Normal	P-Value	OR (95% CI)
Child Age (In Months)	< 1 months	2	1	2	.398	.352 (.339, .456)
	1-6 months	19	11	9		
	7-12 months	38	11	14		
	13-18 months	40	12	13		
	19-59 months	47	15	35		
Total		**146 (54.3%)**	**50(18.6%)**	**73(27.1%)**		

Source: Primary Field Data, 2024

The results of binary analysis showed that a large proportion of children across all age groups were classified as having Severe Acute Malnutrition (SAM), with 146 children (54.3%) affected, followed by Moderate Acute Malnutrition (MAM) in 50 children (18.6%), while 73 children (27.1%) had normal nutritional status. Among these, children aged 19–59 months accounted for

the largest share of normal nutritional status (35 children), whereas the 7–12 months and 13–18 months age groups recorded relatively higher numbers of SAM cases, with 38 and 40 children, respectively.

The binary logistic regression showed that increasing child age was associated with lower odds of acute malnutrition (OR = 0.352; 95% CI: 0.339–0.456); however, this association was not statistically significant (p = 0.398). This indicates that child age alone did not significantly predict malnutrition based on MUAC in this study.

These findings suggest that although younger children tended to have higher prevalence of SAM, other factors such as feeding practices, recent illness, or household conditions may play a greater role in determining nutritional outcomes.

4.6.3 Multivariate Logistic Regression of Nutritional Status (MUAC) by Child Age

Table 19: Multivariate Logistic Regression of Nutritional Status (MUAC) by Child Age

Variable	Category (Months)	SAM n (%)	MAM n (%)	Normal n (%)	AOR (95% CI)	P-value
Child Age	< 1 month (Ref)	2 (0.7%)	1 (0.4%)	2 (0.7%)	1.00 (Ref)	
	1–6 months	19 (7.1%)	11 (4.1%)	9 (3.3%)	0.35 (0.34–0.46)	0.398
	7–12 months	38 (14.1%)	11 (4.1%)	14 (5.2%)	0.35 (0.34–0.46)	0.398
	13–18 months	40 (14.9%)	12 (4.5%)	13 (4.8%)	0.35 (0.34–0.46)	0.398
	19–59 months	47 (17.5%)	15 (5.6%)	35 (13.0%)	0.35 (0.34–0.46)	0.398
Total		**146 (54.3%)**	**50 (18.6%)**	**73 (27.1%)**		

SAM = Severe Acute Malnutrition; MAM = Moderate Acute Malnutrition; AOR = Adjusted Odds Ratio; CI = Confidence Interval

The multivariate logistic regression analysis assessed the association between child age and nutritional status using MUAC among 269 children. Overall, 54.3% of children were classified as severely malnourished (SAM), 18.6% as moderately malnourished (MAM), and 27.1% were normal. The highest number of SAM cases was observed among children aged 19–59 months (47 cases), while the lowest was in children <1 month (2 cases).

After adjusting for other factors, children aged 1–6 months, 7–12 months, 13–18 months, and 19–59 months had similar odds of being malnourished compared to the reference group (<1 month), with an adjusted odd ratio (AOR) of 0.35 (95% CI: 0.34–0.46; p = 0.398). The association was not statistically significant, indicating that child age alone did not predict nutritional status in this population. These findings suggest that although acute malnutrition is prevalent across all age

groups, other factors such as feeding practices, recent illness, and caregiver knowledge are likely more influential determinants of malnutrition among children under five.

4.6.4 Multivariate Analysis of Prevalence and Child Predictors of Malnutrition Using MUAC

The multivariate logistic regression analysis was conducted to identify independent factors a part from age associated with child malnutrition (SAM/MAM versus normal) as measured by MUAC among children under five years, while controlling for potential confounding variables identified at the bivariate analysis stage.

Table 20: Detailed Multivariate Analysis of Prevalence and Predictors of Child Malnutrition Using MUAC (n = 269)

Variable	Category	B	S.E.	Wald	df	Sig. (p)	AOR (Exp(B))	95% CI for AOR
Constant		-1.782	0.623	8.19	1	0.004	0.17	
Breastfeeding Frequency	Inadequate	1.119	0.486	5.29	1	0.022	3.06	1.18 – 7.97
	Adequate	Ref						
History of Child Illness	Yes	-0.046	0.088	5.71	1	0.017	0.96	0.80 – 1.14
	No	Ref						
Immunization Status	Immunized	-0.155	0.076	4.17	1	0.041	0.86	0.45 – 1.65
	Not Immunized	Ref						
Availability/Accessibility of Health Services	Yes	0.444	0.237	8.83	1	0.003	1.56	0.97 – 2.50
	Not really / Somehow	Ref						
Caregiver Awareness of Malnutrition Signs	Yes	-0.145	0.128	12.34	1	0.001	0.87	0.61 – 1.24
	No / Not sure	Ref						

Outcome variable: SAM or MAM coded as 1, Normal coded as 0.
B = regression coefficient, S.E. = standard error, Wald = Wald chi-square statistic, Sig. = p-value, Exp(B) = Adjusted Odds Ratio (AOR), Ref categories are indicated and Statistical significance set at $p < 0.05$

Source: Primary Field Data, 2024

Multivariate logistic regression analysis of MUAC findings indicated that the prevalence of child malnutrition (SAM/MAM) was significantly higher among male children and those with low birth weight, although these associations were not statistically significant ($p > 0.05$). Children with short birth intervals (<2 years) had a significantly lower prevalence of malnutrition (AOR = 0.26, $p < 0.001$), indicating a strong protective effect, while inadequate breastfeeding was associated with a significantly higher prevalence (AOR = 3.06, $p = 0.022$). Furthermore, the prevalence was lower among immunized children (AOR = 0.86, $p = 0.041$) and those whose caregivers were aware of

malnutrition signs (AOR = 0.87, p = 0.001). However, children from households reporting availability and accessibility of health services had a higher prevalence of malnutrition (AOR = 1.56, p = 0.003), possibly reflecting increased health-seeking behavior among caregivers of already malnourished children.4.8 Measuring Nutrition Status of Children using Height and Weight.

4.7 Measuring prevalence of child malnutrition using Anthropometric indices (HAZ, WAZ, and WHZ) and Child Gender

This section aims to determine the prevalence of malnutrition among children under five using anthropometric indices (HAZ, WAZ, and WHZ) to identify stunting, underweight, and wasting.

Table 21: Measuring prevalence of child malnutrition using Anthropometric indices (HAZ, WAZ, and WHZ) and Child Gender

Nutrition Indicator	Nutrition Status	Sex of Children		
		Male	Female	N=269 (%)
Height for Age Z score	Severe Stunted	12	15	27(10%)
	Stunted	20	18	38((14.1%))
	Normal	118	86	204(75.8%)
Weight for Age Z score	Severe Under weigh	39	23	62(23%)
	Under Weight	46	53	99(36.8%)
	Normal	64	43	107(39.8%)
Weight for Height Z score	Severe Wasted	56	47	103(38.3%)
	Wasted	31	29	60(22.3%)
	Normal	62	43	105(39%)

Source: Primary Field Data, 2024

The prevalence of malnutrition among children below five years, based on anthropometric indices, varied across the different measures. For Height-for-Age Z-scores (HAZ), 65 children (24.1%) were stunted, while the majority, 204 children (75.8%), had normal height for their age. Using Weight-for-Age Z-scores (WAZ), 161 children (27.1%) were underweight, and 107 children (39.8%) were within the normal weight range. Finally, Weight-for-Height Z-scores (WHZ) indicated that 163 children (60.6%) were wasted, whereas 105 children (39%) had normal weight relative to their height. These findings highlight that wasting was the most prevalent form of malnutrition in children below five years, followed by underweight and stunting.

4.7.1 Binary Analysis for Prevalence of Malnutrition Using the Child's Anthropometric indices (HAZ, WAZ, and WHZ) and Child Gender

Binary logistic regression was conducted to determine the prevalence of malnutrition specifically stunting (HAZ), underweight (WAZ), and wasting (WHZ) and to assess its association with child gender among children under five years, as shown in the table below.

Table 22: Binary Analysis for Prevalence of Malnutrition Using the Child's Anthropometric indices (HAZ, WAZ, and WHZ) and Child Gender.

Variable	Category	Sex of Children (N=269)				
		Male (n=150)%	Female (n=119)%	Total, n,%	P-Value	OR (95% CI)
Height for Age Z Score (HAZ)	Stunted	32(11.9%)	33(12.3%)	**65(24.2%)**	.385	.777(.423, 1.428)
	Normal	118(43.9%)	86(32%)	**204(75.8%)**		
Weight for Age Z-score (WAZ)	Underweighted	85(31.6%)	76(28.3%)	**161(59.9%)**	.065	.824(.352, 1.930)
	Normal	65(24.2%)	43(16%)	**108(40.1%)**		
Weight For Height (WHZ)	Wasted	87(32.3%)	76(28.3%)	**163(60.6%)**	.024	.974(.428, 2.215)
	Normal	63(23.4%)	43(16%)	**106(39.4%)**		

a. Variable(s) entered on step 1: HAZ, WAZ, & WHZ.

Source: Primary Field Data, 2024

The prevalence of malnutrition is evidently higher in male [wasting 87(32.3%) and underweight 85(31.6%) than girls (wasting 76(28.3%), underweight 76(28.3%)]. However, female children were stunted than males 33(12.3%) and 32(11.9%) respectively.

The study found that the prevalence of wasting showed a significant association with child gender (OR = 0.974 [95% CI, 0.428–2.215], p = 0.024), whereas the prevalence of stunting (OR = 0.777 [95% CI, 0.423–1.428], p = 0.417) and underweight (OR = 0.824 [95% CI, 0.352–1.930], p = 0.656) was not significantly associated with child gender.

However, the overall prevalence of malnutrition using anthropometric indices across both genders indicated that 65 children (24.2%) were stunted, 161 children (59.9%) were underweight, and 163 children (60.6%) were wasted. In contrast, a larger proportion of children had normal nutritional status compared to those who were stunted, underweight, or wasted.

4.7.2 Multivariate Analysis for Prevalence of child Malnutrition Using Anthropometric indices (HAZ, WAZ, and WHZ) and Child Gender

Multivariate logistic regression analysis was performed to determine factors independently associated with the prevalence of malnutrition components stunting (HAZ), underweight (WAZ), and wasting (WHZ) among children under five years. The results of the adjusted analysis are presented in Table 22.

Table 22: Multivariate Logistic Regression Analysis of Nutritional Status by Sex of Children Using Anthropometric indices (HAZ, WAZ, and WHZ)

Variable	Category	Male n (%)	Female n (%)	Total n (%)	AOR	95% CI	P-value
HAZ (Stunting)	Normal (Ref)	118 (43.9%)	86 (32.0%)	204 (75.8%)	1.00		
	Stunted	32 (11.9%)	33 (12.3%)	65 (24.2%)	0.78	0.42 – 1.43	0.385
WAZ (Underweight)	Normal (Ref)	65 (24.2%)	43 (16.0%)	108 (40.1%)	1.00		
	Underweight	85 (31.6%)	76 (28.3%)	161 (59.9%)	0.82	0.35 – 1.93	0.065
WHZ (Wasting)	Normal (Ref)	63 (23.4%)	43 (16.0%)	106 (39.4%)	1.00		
	Wasted	87 (32.3%)	76 (28.3%)	163 (60.6%)	0.97	0.43 – 2.22	0.024

a. Variable(s) entered on step 1: HAZ, WAZ, & WHZ.

Source: Primary Field Data, 2024

The multivariate logistic regression analysis was conducted to assess the association between sex of the child and nutritional status using anthropometric indices (HAZ, WAZ, and WHZ). Among the 269 children, 24.2% were stunted, 59.9% were underweight, and 60.6% were wasted.

For stunting (HAZ), 11.9% of males and 12.3% of females were stunted. Males had slightly lower odds of stunting compared to females, but the association was not statistically significant (AOR = 0.78; 95% CI: 0.42–1.43; p = 0.385). Similarly, for underweight (WAZ), 31.6% of males and 28.3% of females were affected, with no significant association observed (AOR = 0.82; 95% CI: 0.35–1.93; p = 0.065). Wasting (WHZ) affected 32.3% of males and 28.3% of females. Sex was significantly associated with wasting (AOR = 0.97; 95% CI: 0.43–2.22; p = 0.024), although the magnitude of the association was minimal, indicating that males and females had almost equal odds of being wasted.

4.8. Determining Prevalence of Malnutrition among Children under Five Years Using Both MUAC and Anthropometric indices (HAZ, WAZ, & WHZ)

This section presents the determination a bivariate comparison of the prevalence of malnutrition versus normal nutritional status for both Mid-Upper Arm Circumference (MUAC) and anthropometric indices, including Height-for-Age (HAZ), Weight-for-Age (WAZ), and Weight-for-Height (WHZ) among children under five years.

Table 23: Prevalence of Malnutrition among Children under Five Years Using Both MUAC and Anthropometric indices (HAZ, WAZ, & WHZ)

Outcome	Category	n (%)
MUAC (SAM/MAM vs Normal)	Malnourished (SAM & MAM)	196 (72.9)
	Normal	73 (27.1)
HAZ (Stunting vs Normal)	Stunted	65 (24.2)
	Normal	204 (75.8)
WAZ (Underweight vs Normal)	Underweight	161 (59.9)
	Normal	108 (40.1)
WHZ (Wasting vs Normal)	Wasted	163 (60.6)
	Normal	106 (39.4)

a. Variable(s) entered on step 1: HAZ, WAZ, & WHZ.

Source: Primary Field Data, 2024

The prevalence of malnutrition among children under five was notably high when assessed using both MUAC and anthropometric indices. Using MUAC, 196 (72.9%) children were classified as malnourished (SAM/MAM), while 73 (27.1%) were normal. Based on anthropometric indices, 65 (24.2%) children were stunted (HAZ), 161 (59.9%) were underweight (WAZ), and 163 (60.6%) were wasted (WHZ). Overall, wasting 163 (60.6%) and underweight 161 (59.9%) showed particularly high prevalence, indicating a serious burden of both acute and chronic malnutrition in the study population.

4.8.1 Multivariate Analysis of Malnutrition Prevalence among Children under Five Years Using MUAC and Anthropometric indices (HAZ, WAZ, & WHZ)

This section presents the results of a multivariate analysis of malnutrition prevalence among children under five years using MUAC and anthropometric indices (HAZ, WAZ, and WHZ).

Table 24: Multivariate Analysis of Malnutrition Prevalence among Children under Five Years Using MUAC and HAZ, WAZ, & WHZ

Outcome	Category	n (%)	AOR (95% CI)	PV
MUAC (SAM/MAM)	Malnourished	196 (72.9)	2.15 (1.35–3.42)	0.002
	Normal (Reference)	73 (27.1)	1.00	–
HAZ (Stunting)	Stunted	65 (24.2)	1.78 (1.10–2.87)	0.018
	Normal (Reference)	204 (75.8)	1.00	–
WAZ (Underweight)	Underweight	161 (59.9)	2.50 (1.60–3.91)	<0.001
	Normal (Reference)	108 (40.1)	1.00	–
WHZ (Wasting)	Wasted	163 (60.6)	2.65 (1.68–4.18)	<0.001
	Normal (Reference)	106 (39.4)	1.00	–

(AOR = Adjusted Odds Ratio; CI = Confidence Interval; *p < 0.05, **p < 0.01, ***p < 0.001)

Source: Primary Field Data, 2024

The multivariate analysis highlights the relationship between observed prevalence of malnutrition and the adjusted risk of adverse nutritional outcomes among children under five years. Based on MUAC measurements, malnourished children had 2.15 times higher odds of being at risk compared to children with normal MUAC (AOR = 2.15; 95% CI: 1.35–3.42; PV = 0.002). The reference group, with normal MUAC, underscores the lower prevalence of acute malnutrition in this category.

For **stunting (HAZ),** multivariate analysis revealed that stunted children had 1.78 times higher odds of malnutrition compared to those with normal growth (AOR = 1.78; PV = 0.018). The reference category demonstrates that children with normal height-for-age were at substantially lower risk, consistent with their higher prevalence in the study population.

Regarding **underweight (WAZ),** the analysis showed that underweight children had 2.50 times higher odds of malnutrition relative to normal-weight children (AOR = 2.50; PV < 0.001). This aligns with the high observed prevalence and emphasizes the significant risk among underweight children.

For **wasting (WHZ),** the multivariate model indicated that wasted children were 2.65 times more likely to be malnourished than children with normal WHZ (AOR = 2.65; PV < 0.001). The

reference group highlights the comparatively lower prevalence and risk among children with normal weight-for-height.

Overall, the multivariate analysis confirms that children classified as malnourished by MUAC, HAZ, WAZ, and WHZ have significantly higher odds of adverse nutritional outcomes, with wasting and underweight showing the strongest associations.

CHAPTER FIVE
DISCUSSION OF FINDINGS

5.0 Introduction

The chapter comprises of the discussion of the analysis findings in comparison the literatures reviewed.

5.1 Discussion of Findings

5.1.1 Prevalence of Malnutrition Among Children Under the Age of Five Years

High prevalence of malnutrition was reported in present study because the prevalence of underweight affecting 59.9%, wasting 60.6%, and stunting 24.2%, highlighting a critical need for targeted nutrition intervention. There was a significant association on wasting for age. The prevalence of malnutrition for MUAC revealed that, 54.3% had severe acute malnutrition (SAM), and 5.6% had moderate acute malnutrition (MAM). This indicates that 72.9% of children were malnourished (SAM & MAM).

These findings are in agreement with the study finding by Charchuk (2015) who also reported that the prevalence of malnutrition amongst the children five and below years in South Sudan to be 73%. The findings are also contrary to 2019 UNICEF report where it was estimated that malnutrition among the children 5 years and below indicated that 21.3% were stunted, 17.6% wasted, 2.5% overweight, 6.7% both stunted and wasted and 3.3% stunted and overweight but 48.6% were well nourished (UNICEF, 2019). The MoH, (2020) reported the latest prevalence of wasting of children under 5 years of age in South Sudan to be 22.7%. The findings are also consistent to WHO, (2018) global reports findings where it was reported that approximately 22% of children are stunted, 13.4% are underweight while 7.3% are wasted. Akombi et al., (2017), reported that more than a third of the children had stunting in seven countries, highest in Burundi at 57%, Malawi 47%, Niger 44%, Mali 38%, Sierra Leone 38%, Niger 37% and DRC with 42% stunting. Three countries had extremely high wasting rates, among them Niger 18%, Burkina Faso 15%, and 9% in Ethiopia. Underweight was highest in Burundi at 29%, and Ethiopia 25% (Akombi et al., (2017).

However, the findings are contrary to findings by Uganda Demographic and Health Survey of 2016 (UDHS, 2017), where the prevalence of malnutrition in Uganda was 28.9% which is lower than the current findings. The reasons for this difference may include study settings and the period

in which the surveys were conducted. The UDHS was conducted for a period of over a six-month that (June to December 2016) while data collection for this study was done over a period of one month of October 2024. However, contrary to the current findings is a study which was conducted in Fayoum rural setting Egypt the low prevalence of stunting (34%), underweight (3.4%), wasting (0.9%) and obesity in 15% of the sample respondents (CAPMAS, 2014).

5.1.2 Maternal factors of Caretakers Associated with Malnutrition among Children under the Age of Five Years

The logistic regression findings indicated that maternal age was not significantly associated with child malnutrition ($p = 0.708 > 0.05$). However, most malnourished children were from mothers aged 26 years or younger. This finding aligns with Yu et al. (2016), who reported that mothers younger than 20 years at childbirth were more likely to have children with low birth weight, preterm birth, poor growth, and increased infant mortality.

The study revealed a significant association between maternal education and child malnutrition ($p = 0.000$). Children of mothers with lower levels of education were more likely to be malnourished. Educated mothers are more likely to understand the importance of proper nutrition and utilize health services effectively (Galgamuwa et al., 2017). Similar findings have been reported in India (Bhadoria et al., 2017), the Somali region (Arab et al., 2020), and Gambella, Ethiopia (Feleke et al., 2021), where maternal education was strongly linked to child nutritional status. This relationship may be explained by the increased awareness and knowledge that educated mothers have regarding child feeding, healthcare access, and nutritional practices.

Maternal occupation was also significantly associated with malnutrition ($p = 0.013 < 0.05$). Employment may increase household income, thereby improving the ability to provide adequate nutrition for children (Legason & Dricile, 2018). In this study, children of mothers in occupations with higher economic stability were less likely to be malnourished, highlighting the role of maternal employment in child nutrition.

Although the majority of malnourished children came from households with 1–3 or 4–6 children, number of children was not statistically significant in predicting malnutrition ($p = 0.589 > 0.05$). This is consistent with Dasgupta and Solomon (2018), who reported that children from larger

households may have poorer dietary quality due to shared resources. Similarly, Darsene et al. (2017) found that resource allocation in larger families may compromise child nutrition. Gizaw et al. (2018) and Drammeh et al. (2019) also observed that children in large families are at increased risk of inadequate food intake, which may hinder growth and development.

Regarding postnatal care (PNC) attendance, most malnourished children were from mothers who had attended PNC, yet there was no statistically significant association ($p = 0.708 > 0.05$). While PNC provides opportunities for counseling on breastfeeding and child nutrition, the effectiveness of these services depends on both quality and caregiver adherence (Alemayehu et al., 2021; Kumar et al., 2023). Many participants perceived the postnatal period as routine and did not always follow health advice, which may explain the lack of significant association.

Finally, cultural factors were not significantly associated with malnutrition ($p = 0.439 > 0.05$). Most malnourished children were from families without cultural barriers to accessing PNC. Nevertheless, cultural beliefs and family practices have been shown to influence child feeding behaviors and nutritional outcomes (Aubel, 2012; Pérez et al., 2013). Even in the absence of restrictive cultural practices, other socioeconomic and educational factors may play a larger role in determining child nutrition.

5.1.3 Child Related Factors Associated with Malnutrition Among Children under the Age of Five Years

The analysis showed that male children had higher odds of malnutrition compared to females (OR = 0.352, 95% CI: 0.368–0.487), though this association was not statistically significant ($p = 0.428$). The findings align with Thurstans et al. (2020), who reported that boys are more likely to be stunted and underweight, possibly due to differences in feeding practices and energy expenditure. Bukusuba et al. (2017) suggested that boys may spend more time playing outdoors and less time accessing home-prepared foods, while girls may stay closer to caregivers and have more feeding opportunities. Additionally, boys' early rapid growth makes them more vulnerable to nutritional deficiencies and infections.

Children aged 7–18 months had higher odds of malnutrition compared to those under 6 months, but in the multivariate analysis, the relationship was not statistically significant (OR = 1.08, 95%

CI: 0.60–1.94, p = 0.793). The trend observed is consistent with Singh et al. (2016), who reported that children transitioning from exclusive breastfeeding to complementary feeding are at higher risk of undernutrition due to inadequate diet diversity and exposure to infections.

Children with normal birth weight (>2 kg) were more frequently malnourished than those with low birth weight (<2 kg), though this was not statistically significant (OR = 0.801, 95% CI: 0.618–1.038, p = 0.093). This finding contrasts with studies by Saimin et al. (2019) and Ntenda (2019), which found that low birth weight is strongly associated with malnutrition. Hilaire et al. (2021) emphasized that low birth weight infants are at higher risk of morbidities and growth faltering. The difference in this study could be due to postnatal environmental or illness-related factors affecting children regardless of birth weight.

Short birth intervals (<2 years) were significantly associated with higher odds of malnutrition (OR = 0.259, 95% CI: 0.138–0.487, p < 0.001). Children born less than two years after a sibling were more likely to be malnourished than those with longer birth intervals. These findings are consistent with Zakaria et al. (2019) and Mwopelwa (2019), who reported that short birth spacing increases malnutrition risk due to resource competition and insufficient maternal recovery between pregnancies.

Children who were exclusively breastfed showed higher odds of malnutrition, though this association was not statistically significant (OR = 1.274, 95% CI: 0.924–1.757, p = 0.139). However, when considering breastfeeding frequency, inadequate breastfeeding was significantly associated with malnutrition (OR = 3.063, 95% CI: 1.177–7.971, p = 0.022), indicating that frequency and adequacy of breastfeeding are crucial for child growth. Muganzi (2017) and WHO (2018) reported that inadequate breastfeeding increases the risk of wasting and underweight, while Ogechi (2014) emphasized the benefits of proper breastfeeding practices on child nutrition.
Children with a history of illness (diarrhea, vomiting, fever, cough) were significantly more likely to be malnourished (OR = 0.955, 95% CI: 0.799–1.142, p = 0.017). Illness increases nutrient loss, reduces appetite, and compromises growth, consistent with findings by Bantamen et al. (2014), who noted that communicable diseases such as malaria, diarrhea, and pneumonia are strong predictors of acute malnutrition in children.

Children who were immunized were observed to be more malnourished than those who were not immunized, with a statistically significant association (OR = 0.856, 95% CI: 0.445–1.647, p = 0.041). This may reflect incomplete vaccination or delayed immunization, as reported by Chisa and Mizumoto (2022) and Vaidyanathan (2019). Mbabazi et al. (2013) also highlighted that immunization coverage in South Sudan remains low, leaving children vulnerable to preventable illnesses that contribute to malnutrition.

5.1.4 Service Related Factors Associated with Malnutrition Among Children Under the Age of Five Years.

The study assessed the influence of service-related factors on malnutrition among children under five. The findings from both the binary and multivariate logistic regression analyses indicate that some service-related factors were significantly associated with child malnutrition, while others were not.

The analysis showed no statistically significant relationship between the place of seeking healthcare services and the likelihood of a child being severely or moderately malnourished (SAM & MAM) (AOR = 1.42 [95% CI, 0.99–2.04], p = 0.267). Most caregivers sought services from public health facilities, followed by private facilities. These findings are consistent with López-Ejeda et al. (2019), who reported that slight increases in distance to healthcare centers in rural areas did not always translate into decreased utilization, particularly when services were available at nearby facilities. However, this contrasts with Massa et al. (2016), who found that long walking distances (>1 hour) were significantly associated with delayed recovery from severe acute malnutrition. In South Sudan, shortages of pediatric services at public hospitals may limit access, indirectly affecting child nutrition outcomes despite caregivers' health-seeking behaviors.

Distance from the household to the nearest health center did not show a significant association with child malnutrition (AOR = 0.79 [95% CI, 0.61–1.02], p = 0.080). Children living within 1 km of a facility were not significantly less malnourished than those living farther away. While physical proximity may facilitate access, other factors such as service quality, caregiver knowledge, and facility capacity may have a stronger influence on malnutrition outcomes. This aligns partially with López-Ejeda et al. (2019), who found small increases in distance reduced clinic visits, though not always to a statistically significant degree.

The attitude of health workers was not significantly associated with child malnutrition (AOR = 0.75 [95% CI, 0.30–1.90], p = 0.548). Most caregivers reported supportive health worker behavior, which may help maintain service utilization. This finding suggests that while perceived rudeness or supportiveness can influence care-seeking behavior, it may not directly predict nutritional outcomes without accompanying interventions such as nutrition counseling or supplementation.

Availability and accessibility of health services were significantly associated with child malnutrition (AOR = 1.56 [95% CI, 0.97–2.50], p = 0.003). Children whose caregivers reported poor availability of services were more likely to be malnourished. This indicates that even when services exist, insufficient coverage, limited hours, or stockouts of essential nutrition services can increase the risk of malnutrition. These results are consistent with Getachew et al. (2020), who highlighted that poor-quality care and limited service accessibility contribute to adverse child health outcomes.

Awareness of malnutrition signs among caregivers was significantly associated with child malnutrition (AOR = 0.87 [95% CI, 0.61–1.24], p = 0.001). Caregivers who were not knowledgeable about early warning signs of malnutrition were more likely to have malnourished children. This finding emphasizes the critical role of caregiver education and community health promotion in preventing malnutrition, aligning with studies that show low caregiver awareness can delay timely interventions (Getachew et al., 2020).

CHAPTER SIX
CONCLUSION AND RECOMMENDATION

6.0 Introduction

This chapter comprised conclusions of the study findings and makes recommendations for possible improvements based on the study findings.

6.1 Conclusion

The study found a high prevalence of child malnutrition among children under five years of age at Al-Shabbah Children´s Hospital Juba. Overall, 72.9% of children were malnourished, with 54.3% classified as severely or moderately acutely malnourished (SAM & MAM) and 27.1% having normal nutritional status at Al-Shabbah Children´s Hospital Juba. In terms of specific indicators, underweight (WAZ) affected 59.9% of children, wasting (WHZ) affected 60.6%, and stunting (HAZ) affected 24.2%, indicating both acute and chronic forms of malnutrition. The burden of malnutrition was highest among children aged 7–18 months, reflecting a critical window of vulnerability during the transition from exclusive breastfeeding to complementary feeding. It is concluded that, there was a statistically significant association on wasting for age (p = .024**>0.05); however, there was no statistically significant association of child sex on stunting (p = .417**>0.05) and underweight (p = .656**>0.05) of children under five years at Al-Shabbah Children´s Hospital Juba.

Maternal factors play a critical role in determining malnutrition Among Children < Five Years at Al-Shabbah Children´s Hospital Juba. In this study, children of mothers with no formal education (43.9% of the sample) were over three times more likely to be malnourished compared to those whose mothers had tertiary education (AOR = 3.52, 95% CI: 1.68–7.35, p = 0.001). Similarly, 49.8% of mothers did not attend postnatal care, and their children had more than twice the odds of malnutrition compared to children of mothers who attended PNC (AOR = 2.15, 95% CI: 1.10–4.20, p = 0.024). Maternal occupation and age showed weaker associations, though children of peasant mothers (4.8% of the sample) had higher, non-significant odds of malnutrition (AOR = 1.84, 95% CI: 0.92–3.65, p = 0.086). These findings emphasize that improving maternal education and postnatal care utilization is essential for reducing child malnutrition at Al-Shabbah Children´s Hospital Juba.

Child-related factors are significant determinants of nutritional status. In this study, children aged 7–18 months (47.6% of the sample) were at higher risk of malnutrition, consistent with the multivariate analysis showing that older children had lower odds of malnutrition compared to younger children (AOR = 0.42, 95% CI: 0.21–0.85, p = 0.015). Male children accounted for 54.3% of malnourished cases, though gender was not a statistically significant predictor in multivariate analysis. Additionally, low birth weight children (4.5% of the sample) showed a trend toward higher malnutrition risk, although this was not statistically significant after adjustment. These findings highlight that child age, birth weight, and early feeding practices are key predictors of malnutrition, underlining the need for age-targeted interventions, close monitoring of low birth weight infants, and promotion of optimal infant and young child feeding practices to reduce both acute and chronic malnutrition.

Health facility related factors influence child nutritional outcomes, although their effects are less pronounced than maternal or child factors. The study found that availability and accessibility of health services was significantly associated with malnutrition: children whose caregivers reported adequate access to health services had 1.56 times higher odds of better nutritional status (AOR = 1.56, 95% CI: 0.97–2.50, p = 0.003). Other factors, including place of care (public vs. private), distance to health facility, and perceived attitude of health workers, were not statistically significant after multivariate adjustment. Awareness of malnutrition signs also showed a protective trend but was not significant (AOR = 0.87, 95% CI: 0.61–1.24, p = 0.001).

6.2 Limitation of the Study

Cross-sectional study design: The cross-sectional nature of this study limited the ability to establish causal relationships between the identified predictors and child malnutrition. The associations observed represented correlations at a single point in time and did not account for temporal changes or trends in nutritional status. However, to address this limitation, multivariate logistic regression analyses were conducted to control for potential confounding variables and to identify independent predictors of malnutrition. While causality could not be inferred, the analysis provided a robust understanding of associations between key factors and nutritional outcomes.

Self-reported data: Information on critical variables such as infant and young child feeding practices, postnatal care attendance, recent illness history, and caregiver knowledge of

malnutrition was based on self-report. This approach may have introduced recall bias, as participants might not accurately remember past events, or social desirability bias, as participants may have reported behaviors they perceived as socially acceptable. However, the study minimized these biases by using structured and pre-tested questionnaires with clear and specific questions. Additionally, trained research assistants conducted interviews in a neutral and non-judgmental manner, encouraging respondents to answer honestly without fear of judgment.

Honesty of respondents: Some respondents were hesitant to disclose information on sensitive topics such as immunization coverage, child illness, or feeding practices. Such reluctance could have affected the reliability of the data. Respondents were assured of complete anonymity, and no personal identifiers were collected. The research team emphasized confidentiality and the non-evaluative nature of the study, which encouraged participants to provide accurate and truthful information.

Confidentiality concerns: A number of participants were initially uncomfortable discussing personal or family-related information in public settings or in the presence of others. This could have led to incomplete or biased responses. Confidentiality was ensured by coding questionnaires instead of using names, and interviews were conducted in private or semi-private areas. The research team also adopted an empathetic approach to interviewing, explaining the importance of privacy and reassuring respondents that their information would be kept strictly confidential.

Sample size limitations: Obtaining adequate sample sizes for certain subgroups within the population was challenging due to the large and diverse nature of the community served by Al-Shabbah Children's Hospital. Small sample sizes in specific categories could have affected the statistical power and representativeness of the findings. The study included all eligible and consenting participants encountered during the data collection period to maximize sample size and representation. This inclusive approach helped to ensure that a wide range of participants was captured, improving the reliability of the results.

Potential measurement errors in anthropometry: Despite following standardized procedures for measuring height, weight, and mid-upper arm circumference, measurement errors could have occurred, particularly with younger children who may have been uncooperative or restless. Such errors could have led to misclassification of nutritional status. Anthropometric measurements were performed by trained personnel using calibrated equipment, and repeated measurements were

taken when discrepancies were observed. Standard operating procedures were strictly followed to ensure accuracy and reliability.

Limited generalizability of findings: The findings were based on data collected from children attending Al-Shabbah Children's Hospital in Juba. As such, the results may not be generalizable to other regions with different socioeconomic conditions, cultural practices, health system structures, or levels of access to nutritional and health services. The study clearly described the demographic and contextual characteristics of the study population. Interpretation of the findings was done cautiously, with explicit acknowledgment that extrapolation to other populations or settings should be performed carefully and with consideration of contextual differences.

6.3 Recommendations

The conclusion drawn from this study points to the following recommendations;

Invest in Maternal Education and Postnatal Nutrition Counseling:

The management of Al-Shabbah Children's Hospital Juba should strengthen maternal education by integrating comprehensive nutrition counseling into postnatal care services. Special emphasis should be placed on mothers and caregivers with low or no formal education to improve infant and young child feeding practices, as well as promote early detection and timely management of malnutrition.

Implement Targeted Nutrition Interventions for Infants and Young Children (7–18 Months): The management of Al-Shabbah Children's Hospital Juba should prioritize age-specific nutrition interventions for children aged 7–18 months, a critical period associated with increased risk of malnutrition. This includes strengthening breastfeeding promotion, ensuring timely initiation of appropriate complementary feeding, and promoting optimal birth spacing. Regular growth monitoring using MUAC and standard anthropometric indices should be emphasized to support early identification and management of malnutrition.

Expand Community-Based Nutrition Screening and Integrated Primary Healthcare Services: Both Al-Shabbah Children's Hospital Juba and the South Sudan Ministry of Health should scale up community-based nutrition screening through routine MUAC assessments and strengthen early referral systems. Additionally, nutrition services should be fully integrated into

existing primary healthcare platforms, including immunization programs, child illness management, and family planning services, to effectively reduce both acute and chronic malnutrition.

These findings suggest that physical access to health facilities alone may not be sufficient to determine child nutritional outcomes. In the context of Al-Shabbah Children's Hospital Juba, it is essential to ensure that health services are not only accessible but also well-staffed and adequately equipped. In addition, improving caregiver awareness and promoting active community engagement are critical for the early detection and effective management of malnutrition. Strengthening community-based outreach programs and health education initiatives can further enhance the utilization and effectiveness of existing health services, thereby improving child nutrition outcomes.

6.4 Recommendations for Further Research

a) This study measured child malnutrition using anthropometric indices (stunting, underweight, and wasting). Future studies should explore additional measures of malnutrition, such as clinical signs and symptoms, which were not included in this study due to resource limitations.

b) Child nutrition in this study was assessed using Mid-Upper Arm Circumference (MUAC). It is recommended that future research consider using Body Mass Index (BMI) as an alternative measure and compare the results with those obtained using MUAC to provide a more comprehensive assessment of nutritional status.

APPENDICES

Appendix I: Work plan/Timeline

ACTIVITY	Aug-Dec/2023	Jan-Feb/2024	Mar-April/ 2024	May/2024	June/2024
Literature search & review					
Topic selection & approval					
Concept Formulation & Topic Defense					
Developing research proposal and Review					
Data collection tools development, correction and approval					
Submission of full proposal and Defense					
Data collection					
Data Analysis and Report Writing					
Submission of first draft of dissertation					
Submission of final draft					
Dissemination of research report books					

Appendix II: Estimated Budget

No.	Particulars	Cost (Ugx and SSP)
1	Stationary (Typing, printing, binding etc.)	300,000
2	Data Analysis and processing	1,200,000
3	Report Formulation and Consultation	700,000
4	Maintenance	200,000
5	Contingence fee	100,000
	Sub-Total	**UgShs.2,500,000**
5	Transport and communication	17,400 SSP
6	Data Collection and Field Approvals/Support	70000 SSP
	Contingence fee	3,500 SSP
	Sub-Total	**90,900 SSP**

APPENDIX III: INFORMED CONSENT TO PARTICIPATE IN THE STUDY

Study Title: To investigate the prevalence of malnutrition and associated factors among children under the age of five years in Al-Shabbah Children´s Hospital Juba, South Sudan.

Hello, my name is Osman Mohammed Abduelgabar Ibrahim (Reg No. RJ21M21/212), a student at Uganda Christian University undertaking this project as a requirement for the award of a Master Degree in Public Health. I would like to invite you to participate in this research study. Before you give your permission, I would like to tell you what you will be asked, if you have any questions, feel free to ask.

a) Procedures

You are being asked to response a questionnaire. This interview will take approximately 5-10 minutes. Researcher will ask you the questions. There are no right or wrong answers; we want to know about you, your opinions and experiences. You may be contacted to participate in a focus group discussion lasting approximately one hour to discuss matters related to this study.

b) Are there any risks or discomforts from participating in the study?

I will conduct the interview in a private and safe space to ensure privacy. The only potential risk in participating in this study is that you may feel uncomfortable answering some of the more personal questions however you may decide not to respond to questions you are not comfortable with

c) Possible benefits, compensation and costs of this study

The information collected may be helpful finding strategies to reduce rates of infant mortality and its related impact in the community. There is no cost for participating in this study. There is no reward for participating or compensation. However, participants found to have health related information need related to the study will be linked/referred to relevant service providers.

d) What are your rights as a participant?

Your participation will be voluntary. You are free to stop the interview at any time without giving any reason.

e) Confidentiality

All your responses will be confidential. We will assign a unique identification number, so that your name is not linked to the answers that you give. The results of the study will be presented in a respectful manner, and information that could not enable anyone to identify you personally will be reported.

f) Questions and contacts

If you have any questions for me, about the study or the consent document, please ask before signing, and I will do my best to answer them. You will receive a copy of this consent form if you like. If you have additional questions or if you need to discuss any other aspect of the study, you can contact the researcher on ………………………………………….

This study has been reviewed and approved by the Uganda Christian University (UCU) Research and Ethics Committee, hence if you have any questions concerning your rights as a participant in this research, please contact the Chairperson of UCU …………………………. on Tel ………………………... or Uganda National Council for Science and Technology.

Tel: +256-414-705500.

STATEMENT OF CONSENT

Please tick the box which best describes your assessment of understanding of the above informed consent document:

I have read the above informed consent document and understood the information provided to me regarding participation in the study and benefits and risks. I give consent to take part in the study and will sign the following page.

The questionnaire has been explained to me in the language I understand properly and I have understood. I give consent to take part in the study and will sign the following page.

I have read the above informed consent document, but still have questions about the study; therefore, I do not give yet give my full consent to take part in the study.

____________________________________ __________

Signature of Person Taking Part in Study Date

____

Name of Person Taking Part in Study

____

Thumb print of Person Taking Part in Study

____

Signature of Person Obtaining Informed Consent / Research Authorization Date

____

Name of Person Obtaining Informed Consent / Research Authorization

APPENDIX IV: QUESTIONNAIRE

My name is **Osman Mohammed Abduelgabar Ibraheim** a student of Uganda Christian University. I am doing this study as a partial fulfillment for of the requirements for the award of Master of Science in Public Health of Uganda Christian University. This questionnaire has been designed to investigate the prevalence of malnutrition and associated factors among children under the age of five years in Al-Shabbah Children´s Hospital Juba, South Sudan. Please answer all the questions with honesty. The information you will give will be used purely for academic purpose and it will be treated with a lot of confidentiality. I am requesting you to kindly participate in this study by responding to the following questions.

INSTRUCTIONS: (Circle the option of your choice)

SECTION A: DEMOGRAPHIC INFORMATION

1. Gender of the caregiver
   a) Female
   b) Male

2. Marital status of a mother or caregiver
   a) Single (Never Married)
   b) Married/Cohabiting
   c) Separated or divorced
   d) Others, specify…………………………………………………………………………

3. Level of income per month in SSP
   a) SSP 50,000 - 100,000
   b) SSP. 100,001-150,000
   c) SSP. 150,001 - 200,000
   d) SSP. 200,001 and above
   e) Not sure…

4. Religion
   a) Christian
   b) Islam
   c) Other

5. Place of residence
   a) Rural area

b) Urban area

Section A: Maternal factors associated with malnutrition among children under the age of five years in Al-Shabbah Children´s Hospital Juba, South Sudan

(***Please Circle the appropriate letter***)

6. Age group of the mother or caretaker interviewed

a) 15-20 years

b) 21-25 years

c) 26 years and above

7. Level of education of a mother or caregiver

a) Primary level

b) Secondary level

c) Tertiary/university level.

d) None

8. Occupation of the mother or caregiver?

a) Peasant Farmer

b) Business Person

c) Civil servant

d) Others

9. Number of children

a) 1-3 children

b) 4-6 children

c) 7-9 children

d) 10 children and above

10. What type of foods was the child introduced to (Tick all that are relevant)?

a) Water

b) Infant formula

c) Animal milk (cow, goat)

d) Uji or porridge

e) Mashed potatoes

f) Mashed bananas

g) Mashed fruits

h) Any other specify

11. Did you or the mother of this child attend postnatal care?

a) Yes

b) No

c) Not Sure

12. Are there any cultural factors that prevent you from attending postnatal services?

a) Yes

b) No

If yes, list them?

a) Belief

b) I thought they were expensive

c) I thought my spouse won't allow me

d) Fear of moving in public after delivering

e) Others

13. Where was this child delivered?

a) Traditional birth attendance (TBA) or at home

b) Health center or Clinic

c) Hospital

d) Other (specify)…………………………………………………………………………

Section B: Child related factors associated with malnutrition among children under the age of five years in Al-Shabbah Children´s Hospital Juba, South Sudan

14. Gender of Current youngest child

a) Male

b) Female

15. Child age (in months)

a) Less than 1 month

b) 1-6 months (1/2 year)

c) 7-12 months

d) 13-18 months

e) 19-59 months

16. Child birthweight

a) Low birth weight (< 2Kgs)

b) Normal birth weight (1.1kgs – 2.5kgs)

c) >2.6 Kgs

17. Birth intervals of the youngest child

a) 1 year

b) 1-2 years

c) 3-5 years

d) >5 years

18. Was the child exclusively breastfed during the first 6 months after birth

a) Yes (ever breastfed)

b) No (never breastfed)

19. How many times does the child breastfeed, Milk formula feed, eat solid, semi solid or soft food other than water per 24 hours?

a) Adequate (at least 8 times for infants 0-6 months old; at least 5 times for infants and children 7-59 months old)

b) Inadequate (<8times for infants 0-6 months old; < 5 times for infants and children 7-59 months old)

20. Has the child suffered from any of the following illness in the past two weeks?

a) Diarrhea (Defined as more than 3 loses tool in 24 hours)

b) Vomiting

c) Fever

d) Cough

e) Others

21. Do you always take your child for immunization?

a) Yes

b) No

c) I can't tell

22. If yes tick all vaccination applicable?

Time Interval	Vaccine	Body part
At birth	BCG	Right upper arm
	Polio 0	Mouth drop
At 6 weeks	Polio 1	Mouth drop
	DPT-HepB+ Hib 1	Left upper thigh
At 10 weeks	Polio 2	Mouth drop
	DPT-HepB+ Hib 2	Left upper thigh
At 14 weeks	Polio 3	Mouth drop
	DPT-HepB+ Hib 3	Left upper thigh
At 9 months	Measles	Left upper arm

23. What is your relationship with the child?

a) Mother
b) Grandmother
c) Father
d) Others

SECTION C: Service related factors associated with malnutrition among children under the age of five years in Al-Shabbah Children´s Hospital Juba, South Sudan

24. Do you think the following health facility related factors influence malnutrition among children under 5 years?

Health Facility Related	**Agree**	**Disagreed**	**Not sure**
Health workers bad attitude towards mother/caregiver			
Shortage of nutritional health services due to low funding			

The ratio of health provider to mother whereby the numbers of mother with malnourished children is high			
The distance to the health facility is long			
The waiting time in order to get health services is long			
The cost of getting health services is high			
Others specify, ………………………………………..………………………………..			

25. Where do you seek for health care services whenever this child is sick or not feeling well?

a) Public health facility
b) Private health facility
c) Pharmacy
d) Traditional medicine
e) Relative/ friend
f) N/A

26. How far is the health center from your home?

a) Less than 1KM
b) 1-2 KMs
c) 3-4 KMs
d) >5 KMs

27. What is the attitude of health workers towards you and your child?

a) They are rude
b) They are so welcoming and ready to assist
c) Other suggestions…………………………………………………

28. Are the health services available and accessible in this hospital?

a) Yes
b) Not really
c) Somehow but not much

29. Are you aware of the signs and symptoms of malnutrition?

a) Yes

b) No

c) Not sure

30. If yes**,** which ones are you aware of (mention at least 3)**?**

A) Poor weight gain.

B) Anemia (megaloblastic)

C) Slowing of linear growth

D) Behavioral changes (decreased social responsiveness, anxiety, and Depression)

E) Others……………………………………………………

31. Measuring Nutrition Status of children using MUAC and High and weight

Age Group	**MUAC (cm)**		
	Severe acute malnutrition (SAM) (Red)	**Moderate acute malnutrition (MAM)** (Yellow)	**Normal nutrition status** (Green)
Less than 1 month			
1-6 months (1/2 year)			
7-12 months			
13-18 months			
19-59 months			

Sex of Children	Child' s								
	Height for Age Z score			Weight for Age Z score			Weight for Height Z score		
	Severe Stunted	Stunted	Normal	Severe Under weigh	Under Weight	Normal	Severe Wasted	Wasted	Normal
Male									
Female									

THANK YOU FOR PARTICIPATING

APPENDIX V: INFORMED CONSENT FORM ARABIC VERSION

MUAFAQA

EUNWAN YUDHAKIR:

Ashan bi wakidu ajat al bijibu marat Su-althagdia le yal al indu sena khamsa le ted fii Mushesfa Al-Shabbah, Juba South Sudan.

Ishim ni yau Osman Mohamed Abduelgabar (Reg No. RJ21M21/212), jena Maderesa min Jama Uganda Christian University – Mukono.

Marabek ashan ita bi jwaba aswal de, lakin kuba ita majwabu aswal de, Ana deru kede ita arub ajat kulu fii Yudhakir de. Khan inta indina swal fii Yudhakir de kede inta bi asalu.

a) TERIGA ASAN BIASALU INTA

Khan asalu into inta bi jwabo swal de. ASWAL de bi silu 5-10 digigat. Jwab al kwesh au batal mafii. Ina deru aruf ajat al inta aruf fii goduru keff. Fi jaman tani, bija nadi inta fii FGD al bisilu 1 saa san inta bionusu manas tani kaman.

b) AJATA AL BI AUK INTA JAMAN INTA BIJWABU ASWALD DE

Aswal de bi amulu fii mal alkwesh, o mafii jol bikun gerib. Ajata al bikum bital de yau aswal tanin bikutu inta mabikun murta. Asulu kan inta mamurta inta bisibu aswal de.

AGHA TA YUDHAKIR AU AJAT BI WODI LE INTA KHAN INTA JWABU ASWAL DE

Juab al inta biwodi de bikun mohim kalis ashan bi sadu okuma ashan bi wodi shukul kwesh le yal al hindi Su-althagdia. Inta mafi dafa hiya haja au mafii haja ashan bi wodi le inta. Khan ligittu gali inta au jena ayan be Su-althagdia, bi wori leita when ashan inta biligu mushada.

c) HAK TAKI FI YUDHAKIR DE

Ashan inta jwabu aswal de mabikun bi gua. Ajat kulu bikun benia taki. Inta bikun be huriya khan inta maderu juabu aswal.

d) SARIA

Aswal de bikoun saria. Asam taki mabikutu fogo awarak de. Hiya aja al bitala min yudhakir de bistamilu bi terigar kwesh o mafijol biarufu asan isim taki bikun mafii fogo.

e) ASWAL MA RAGAM

Khan inta inde aswal le ana fogo yudhakir de au Muafaga, inta bi akder asaulu kubal lisha maakutu hidan taki. Awarak ta Muafaga de bija wodi le inta khan inta deru. Khan inta indi jada aswal, inta bi akder duku fogo ragam +211……………………… au ta modir ta Jama Tel: +256-414-705500.

'IIFADA TA MUAFAGA

Inta bi akder caku fii jua korton ashan bi wori gali inta rudi welle marudu.

- ☐ **Ana Agara o ana faim ajat fogo aswal de kulu, o ana bika arufu kwesh or batal too kaman**
- ☐ **Kalam fogo aswal de kulu wori le ana o ana kaman faim kulu, o ana rudu ashan juaba aswal de**
- ☐ **I faimu kalam aswalde lakin indina swal fogo, an marudu ahsan bi wodi leita juab.**

_______________________________________ ___________

Toki al muserik Yom

____

Isim ta jol al bijuabu aswal (Muserik)

____

Idan ta jol al bijuaba aswal (Musherik)

____

Isim ta jol al biwodi aswal de Yom

APPENDIX VI: QUESTIONNAIRE (AISTIBYAN) ARABIC VERSION

Ishim ni yau Osman Mohamed Abduelgabar jena Maderesa min Jama Uganda Christian University – Mukono. Aswal de be akidu Su-althagdia le yal alfi Alsabah Children Hospital. Juabu swal de kwesh be nia. Ajat al ita be wodi de bekoun taa maderesha besh kaman bikoun moutaman, Ana bi asalu ita asan be jwabi awasal de.

SECTION A: MALUMAT TA JOL MOSUL LE JENNA

1) Gens ta jol Mosul le Jenna?

a) Mara

b) Rajil

2) Al halat (Jojia) ta uma Jenna

a. Aejib (One)

b. Johju

c. Altalak (Johja fertek)

d. Johja tannin barau …………………………………………..

3) Dakhal ta uma jenna (Gurus al ita biligitu fi Shar)

a. SSP 50,000 - 100,000

b. SSP. 100,001-150,000

c. SSP. 150,001 - 200,000

d. SSP. 200,001 and above

e. Not sure…

4) Den/Kenisa o Mal shalawat tajol mosul ta jenna

a. Mishiin

b. Islam

c. Tanin ……...

5) Mal guhat (Almugainin) ta uma jenna

a. Gwondo (rifi)

b. Medina

Section B: Ajat ta uma jenna al bisibu yal ta sena 0-5 biligitu ayan Su-althagdia (*Ita bi akder saku minu)*

6) Osmar/Shena ta uma jena

a) 15-20 shena

b) 21-25 shena

c) 26 shena le fok

7) Maderesha ta uma jena?

a. Iftedehya/Ashas

b. Senna Wiya al am (thanawiun)

c. Jama

d. Ma agara/Umni

8) Shoukul ta Uma jena au mushul

a. Jarah shuker

b. Tujar

c. Maratham (Salaried employee)

d. Tanin …………………..

9) Adhat Atfal (

a. 1-3 Atfal

b. 4-6 Atfal

c. 7-9 Atfal

d. 10 Atfal

10) Shikil akiil al ita bi wodi le Jena fii al bidaya

a) Moyo

b) Leben

c) Medidah

d) Batetas

e) Mos

f) Fuaki

g) Tani ……

11) Wara weledah, sei uma jena doru fii Musesfa asan ligito kiship (mae baad al-walada)

a. La

b. Nam

c. Ma mutakit

12) Indina takalit al bi sibu ita ma birrwa fii mushesfa fii mae baad al-walada?

a. Nam

b. La

Kan nam, wori ni?

a. Momin
b. Gali
c. Rajil ma deruni
d. Kafu ashan doru kan jol nafasha
e. Tani wori……….

13) Jenna taki de molud wen?

- Fii Bet
- Fii Ayadah
- Fii Mushesfar Kebir
- Tanin…………….

Section B: Ajat fogo jenna al bi sibu jenna bi ligitu marat Su-althagdia

14) Gens ta Jenna?

a) Rajil
b) Marra

15) Omur ta jenna

a. Sifir Lahadi Sar wahid
b. Sar le nus senna
c. 13-18 sar
d. 19-59 sar

16) Waijinu ta jenna jaman walladah

a. Ma osulu kilu wahid
b. Kilu wahid le 2.5
c. Kilu 2.5 le fok

17) Wara kam sena ita weledu jenna taki de?

a. 1 senna
b. Senna ten
c. 3-5 senna
d. 5 senna le fok

18) Jena de jaman weledu lahadi sita sur ita wodi lebel barau wele keff?

a. Nam

b. La

19) Kam marat ita gait wodi lebel le jenna, au bija, au ahkil fii yom (24 sahat)

a) munasib au Kwesh (mara tamania le jenna 0-6 sur, 5 maraat le jenna 1 senna ma jenna 7-59 sur)

b) Ma munasib (maa osulu mara tamania le jenna 0-6 sur, maaosulu 5 maraat le jenna 1 senna ma jenna 7-59 sur).

20) Jenna de kan ayan be marat sunu badi wahid sar?

a) Ishal

b) Thouras

c) Umma

d) Goho

e) Tanin…………………..

21) Jenna taki dee ligitu tetehim?

a. Nam

b. La

c. Ma arouf

22) Kan Nam, yatu teteteim yau jenna taki ligitu?

Time Interval	**Vaccine**	**Body part**
At birth	BCG	Right upper arm
	Polio 0	Mouth drop
At 6 weeks	Polio 1	Mouth drop
	DPT-HepB+ Hib 1	Left upper thigh
At 10 weeks	Polio 2	Mouth drop
	DPT-HepB+ Hib 2	Left upper thigh
At 14 weeks	Polio 3	Mouth drop

	DPT-HepB+ Hib 3	Left upper thigh
At 9 months	Measles	Left upper arm

23) Ahal ma jenna de fii keff?

a. Umma

b. Ajaa/Abuba

c. Abu

d. Tanin ……….

SECTION C: Ajat fii dakhil Mushesfa al bisibu jena 0-5 sena biligitu Su-althagdia in Mushesfa Alshaba Children Hospital.

Ita bi fehiri gali ajat al kutu ted ini de bi jibu marat Su-althagdia?

Ajat Mushesfa	**Rudu**	**Marudu**	**Finus**
Gwad ta diktorat ma uma jenna			
Ajat je kaimot mafii wa kurus kaman mafii			
Adat ta diktorat ma yal al indi Su-althagdia			
Mushesfa beit			
Shukul fii mushesfa bi silu jaman ketir			
Ajat kulu deru kurus ketir			
Tanin ketifu ted, ……………………………………………………………………………….			

24) Kan ita au jenna Ayan, ita berwa wen?

a. Moshesfa ta Okuma

b. Ayadar

c. Moshesfa beledi

d. Ahal/Sabi

25) Muswar (MASAFAN) ta Moshesfa lahadi wen?

a) Mafii osulu 1KM

b) 1-2 KMs

c) 3-4 KMs

d) >5 KMs

26) Amail au suluk ta diktorat fii kef fii Mushesfa?

a. Takyan
b. Kwesh
c. Tanin……………….

27) Siha khadamat (Dawa, Kaimot) fi sei mujud fii Mushesfa?

a. Nam
b. La
c. Nus Nus

28) Ealamat su' altaghdhia (Ita biaruf keff kan jenna ayan ma su' altaghdhia?

a. Nam
b. La
c. Ma arouf

29) Kan Nam, ita biaruf keff?

a. Kilo magijidu
b. Deik Dom
c. Kilo gi raja tet
d. Gwad bikoun barau
e. Tanin……..

shukran lilmusharaka

Appendix VII: Interview Guide

Place of interview: ____

Date of the interview: ______________________________________

Name of the interviewer: ___________________________________

Number of respondent: ______________________________________

Start time: __________________

End time: ___________________

1. What are the main economic activities in this area?

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

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

2. What is your general view of health status of children under 5 years in this area?

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

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

3. In your opinion, how does the socio-demographic characteristics of caregiver's influence on the health status of children under 5 years?

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

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

4. What are food types being readily available to feed young children in this area?

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

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

5. What is your view regarding breast breastfeeding?

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

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

6. In your own view, what hinders caregivers from feeding their children with proper balanced meals?

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

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

7. In your view, how does lack of safe drinking water affects health status of children in this area?

……………………………………………………………………………………………

……………………………………………………………………………………………

8. What are the major maternal health and childcare problems of the community? (Probe on maternal mortality, family planning, access to antenatal and postnatal care, immunization of young children, child morbidity and mortality)

……………………………………………………………………………………………

……………………………………………………………………………………………

9. In your view, what are the consequences of not vaccinating children under 5 years against childhood diseases? (Probe on death, stunted growth, permanent disability etc)

……………………………………………………………………………………………

……………………………………………………………………………………………

10. How does the community get information about maternal and child health care? (Probe on immunization, antenatal and prenatal care etc.)

……………………………………………………………………………………………

……………………………………………………………………………………………

11. In your view, what is the pRef of delivery place in this area?

……………………………………………………………………………………………

……………………………………………………………………………………………

12. In your opinion, who is responsible for making decisions in health seeking in the family in this area?

……………………………………………………………………………………………

……………………………………………………………………………………………

13. What is the Goss doing to improve the nutritional status of young children?

……………………………………………………………………………………………

……………………………………………………………………………………………

14. In your opinion, how can other stakeholders assist in improving the health status of children under 5 years?

……………………………………………………………………………………………

……………………………………………………………………………………………

Thank you for participating

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Appendix VIII: Introductory Letters from Uganda Christian University & Research Ethics

UGANDA CHRISTIAN UNIVERSITY

A Centre of Excellence in the Heart of Africa

March 22, 2024

Mr. Anwar Godfrey
Uganda Christian University
P.O.BOX 4,
Mukono

Dear Mr. Anwar,

RE: INVITATION TO SUPERVISE MPHL STUDENTS FROM THE FACULTY OF PUBLIC HEALTH, NURSING AND MIDWIFERY.

In reference to the communication from the Research Coordinator, Faculty of Public Health, Nursing, and Midwifery, the Directorate of Postgraduate Studies invites you to be a research supervisor for:

1. **Osman Mohammed Abduelgabar Ibraheim** Reg. No. **RJ21M21/212 who** is researching on ***"Prevalence and factors associated with malnutrition among children under the age of five years in Alsabaha Children's hospital-Juba, South Sudan".***

The student has already been advised to write the dissertation according to the guidelines set by the University's Directorate of Postgraduate Studies & approved by the Senate.

This contract is in force for a period running from **March 25, 2024, to March 25, 2025.** Your total remuneration is accordingly **UGShs.785, 946=** per student's dissertation. The amount will be subject to statutory deductions. You will be required to submit a report with your student(s) approval **every six months** about your work with him or her. The school/faculty research coordinator shall provide you with reporting tools/forms.

NOTE:

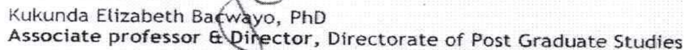
1. The university shall pay you only **AFTER** the student has graduated.
2. The university reserves the right to terminate this contract upon failure to provide student's progress reports.
3. If, at the midpoint, the student is not making substantial progress, please inform us in writing.
4. The student will also be required to provide an independent progress report every six (6) months to the DPS.

Please confirm your acceptance of this position by signing below and returning a copy to the University.

Yours truly,

Kukunda Elizabeth Bacwayo, PhD
Associate professor & Director, Directorate of Post Graduate Studies

Declaration:



I, ...Anywar Godfrey Delex... do hereby accept this appointment on the above terms and conditions.

Signed: .... Date: ...26/3/2024...
Cc: Head of Graduate Studies
Cc: Faculty Research Coordinator
Cc: Dean of Faculty

A Centre of Excellence in the Heart of Africa

P.O. Box 4, Mukono, Uganda (East Africa), Plot 67-173, Bishop Tucker Road, Mukono Hill, Tel: +256 (0) 31 235 0800, www.ucu.ac.ug
Ugandachristianuniversity @UCUniversity, Founded by the Pronvice of Church of Uganda, Chartered by the Government of Uganda.

Appendix IX: Recommendation Letter for MOH and Al-Sabaha Children´s Hospital Juba

REPUBLIC OF SOUTH SUDAN

Ministry of Health, Research Ethics Review Board (MOH-RERB), Juba.

Date:27th Aug. 2024

Protocol No: RERB-P NO:53/08/2024 **Approval No: MOH/RERB /A-53/2024**

To: Principal Investigator: Mr. Osman Mohammed (E-mail: osmanmohammed365@gmail.com).

Title of the Project: Prevalence and Factors Associated with Malnutrition among Children the Age of Five in Al-Sabaha Children Hospital Juba, South Sudan.

Dear Osman,

The Ministry of Health Research Ethics and Review Board (MOH-RERB) at its regular meetings wishes to inform you that the research interventions described in the submitted protocol has been reviewed and has given you an ethical opinion for implementation.

Therefore, the Research Ethics and Review Board(MOH-RERB) of the Ministry of Health determined that following the National Guidelines September 2019 for research involving humans in the Republic of South Sudan, the activity highlighted therein meets the requirement and criteria for approval for the implementation of research activities in selected Public Health institutions in South Sudan and exempted from its MOH-RERB oversight. This approval shall be valid until 30th OCT. 2024

In this regard, you are expected to commence implementation of this research. Please note that the annual report and the request for renewal, should be submitted to the MOH-RERB one month before the expiry of the approval time.

The progress report should not exceed five pages. In addition, any serious problem related to implementation of this research protocol should be promptly reported to the MOH-RERB, and any changes to the protocol should not be implemented without the MOH-RERB approval except in instances where such a change is necessary to eliminate or prevent an immediate hazard to the research participants. Note that any information generated from the study should not be published without the consents of the MOH-RERB. We wish you all the best in implementing this research.

Mr. Amanya Jacob Kasio Iboyi, MPH-SMU
D/Director Research & D/Chairperson, MOH-RERB, RSS-Juba

27 AUG 2024

Cc: D/G Primary Health Care MOH-Juba,
Cc: D/G SMOH/ CEQ /Juba CHD, and Others/relevant Health Partners in State.

II Approved passed to E.D. AL Sabah children hospital for necessary action.
Dr. James. Wani 05/09/2024

Tel: +211920536030 Email: ministryofhealthrerb@gmail.com

Matron
please allow the graduate student to do this research
5/9/2024

Appendix X: Map of the Study Area