How does feeding habit affect infants' nutrition? Evidence from Tanzania

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Disclaimer:

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LIST OF ACRONYMS

HBM	-	Health Belief Model
LMI	-	Low- and Middle-Income Countries
MDD	-	Minimum Dietary Diversity
OLS	-	Ordinary Least Squares
SCT	-	Social Cognitive Theory
SDG	-	Sustainable Development Goals
TDHS	-	Tanzania Demographic Health Survey and Malaria Indicator Survey
UN	-	United Nations
WHO	-	World Health Organization

ABSTRACT

The main objective of the study was to investigate the contribution of feeding habits to nutrition status of children under the age of five in Tanzania. Specifically, the study aimed to analyze the contribution of demographic factors of caregivers/parents and to examine the influence of breastfeeding counseling on nutrition indicators of children under the age of five. The study employed a health belief model theory and social cognitive theory to gain insight on the relationship between feeding habits of caregivers/ parents and the nutrition status of children. This research used causal inference design with a view of determining causal relationship between the variables under study. Sample population includes under five year's children, from households living across all over Tanzania. From the Tanzanian Demographic Health Survey (TDHS) edition of 2022 that covered 40,394 households, we utilized the data for household with at least one child below the age of five. This data, TDHS 2022, was collected by the National Bureau of Statistics in collaboration with the Ministry of Health. The relationship between feeding habits and nutritional status of children under five years were examined using Ordinary Least Squares (OLS) technique. In addition, the study integrated quantile regression for robustness check of the results estimated with OLS. The study found a statistically significant relationship between wealth status, gender of the infants and malnutrition, where male children are affected slightly differently with nutrition issues. The study also found that breastfeeding counseling has a positive influence on minimizing stunting and underweight in early age children. Furthermore, Vitamin A supplementation increases the nutritional value connected to improved child health, a promising factor alongside breastfeeding counsel to boost nutrition. The study recommends enhanced supportive network, this involves policymakers to create intervention such as income generating activities and nutritional supplements targeting low-income households. In addition, the study recommends strengthening breastfeeding and nutritional counseling programs that include education activities with comprehensive counseling for breastfeeding and Vitamin A supplementation in health programs.

RELEVANCE TO DEVELOPMENT STUDIES

Generally, research on how feeding habit affect the infant's nutrition status indicate that proper feeding habit such as effective breastfeeding, early introduction of nutritious food (complementary feeding habit) and economic stability, ensure growth of infants which lead to proper development. However, poor feeding habit and economic instability (poverty) may cause great problem of malnutrition to the infants, specifically stunting, wasting and underweight hence act as obstacles in development. Such findings need to be taken into account in designing programs and policies targeting health aspects of human capital development.

Keywords

Stunting, Wasting , Underweight ,Feeding habit, Infant nutrition, Tanzania

CHAPTER ONE
INTRODUCTION

1.1 Background of the Study

Nutrition is vital element in the world, it is considered as one of the critical pillars of life for human being from health to development status on human life span. The benefits of nutrition span from infancy stages to adulthood of human being. A proper feeding habit that focuses on consuming proper food with all essential element is significant for physical growth and mental development for survival, wellbeing, and productivity. World Health Organization (WHO) underscores the importance of good health for every person to attain highest level of heath (WHO, 2022). Similarly, the significance of nutrition as described by United Nations (UN) in Goal 2 of the Sustainable Development Goals (SDGs) indicates that by end of 2030 the world should end all form of malnutrition- advocating for Zero Hunger in the world (UN, 2022). However, while various stakeholders show their concern and introduced different initiatives to promote zero hunger and enhancing nutrition status of the society; malnutrition continues to be one of the significant problems globally (Adedokun & Yaya, 2021).

Malnutrition is one of the major concerns for global health. It has significant effects on the health outcome of children and their development (Amoah, et al., 2024). Malnutrition is complex condition concerning nutritional imbalance associated with elements such as inadequate food intake, poor dietary choices, and a failure to contain critical substances. According to WHO (2022), about 149 million under five children are stunted, and 45.4 million are wasted worldwide (WHO, 2022). The malnutrition problem is affecting developing countries significantly and it has less impact on developed countries (Mrema, 2017). For example, Germany has achieved tremendous improvement on the reduction of malnutrition in children, reporting only less than 1 percent undernutrition because of active health promotion in communities (Global Nutrition Report, 2022). While developing countries still experience high rate of malnutrition. For instance, according to UNICEF, 90% of stunted children live in Asia and Africa (UNICEF, 2024). Looking at individual countries, for example, India continues to face high rate of malnutrition with an estimate of 38% stunting rate for children under five years (Kalu & Etim, 2018). Relatedly, Pakistan reported high malnutrition rate of 50% to 60%, 42% for stunting and 14% for wasting (Kishoyian, Osinyo, Kishoyian, & Otieno, 2017).

Malnutrition has a critical effect on children under five years old, affecting children's immune systems, making them vulnerable to infections and chronic diseases which have consequences on their health, development and ultimate productivity (Abdirahman, 2023; Onis, et al., 2019). WHO (2022) report indicates that 22.3% of children worldwide are stunted, 6.8% are wasted and 12.9% are underweighted (WHO, 2022; Sunday, et al., 2024). Malnutrition, particularly, undernutrition contributes to 45% of death of under 5 year old children, making it a priority public health challenge (Ahmad & Mishra, 2022). The prevalence of undernutrition is alarmingly high in many parts of the world, especially, low- and middle-income countries. It is particularly common in Sub-Saharan Africa (SSA) where 31% of the world's stunted children live (Pessa & Mweya, 2021; Hussein, Darwish, & HakimAbdou, 2022). The high rate of stunting for under 5 children in SSA is associated with inadequate healthcare and poor sanitation, pervasive poverty, and food insecurity which are common in the region (Pessa & Mweya, 2021).

According to Asoba et al (2024), health, growth, and development of children are influenced largely by the parents or caregivers in following appropriate feeding habits. Feeding habit involves controlling and modification of children's diet and eating pattern according to need of the children (Berti & Socha, 2023). Feeding habit has interrelationships in framing effective strategies for nutrition, thus, it is considered important in combating malnutrition (Ahmad & Mishra, 2022). More specifically, feeding habit is described as the process involving general pattern of food choice, preparation as well as intake. If the caregivers or parents failed to maintain standard feeding habit to the children, for example, poor breastfeeding, early initiation on complementary foods, and low dietary diversity, it would result in children suffering from malnutrition.

Previous studies, for example, a study by Asoba et al (2024) describe that nutrition status of individual is impacted by the food eaten compared to the individual's nutrition need. When children are fed poorly, it would result in malnutrition; either overnutrition or undernutrition resulting in stunting, underweight, and wasted children. This makes it a necessity for developing culturally appropriate and nutritional foods for children under the age of five years. The poor feeding habit have various determinants that play a role in feeding behaviors and the nutritional status of children. These include wealth status, maternal age, size, and marriage status of the family that determine the resource base for food and nutrition. Furthermore, the educational level or literacy among parents or caregivers is an important determinant of awareness relating to feeding and nutrition. A study of Khamis et al (2019) show that caregivers with high readable level are better placed to seek and apply the nutritional information that is passed on to them. Also, breastfeeding counseling and the community nutrition program have closely effects on feeding pattern and child nutritive value in general.

The problem of malnutrition is affecting East African countries significantly. Countries such as Kenya, Uganda, Rwanda, Burundi, Sudan, and Democratic Republic of Congo are ranked high on malnutrition. For example, Uganda reported that 29% children below the age of five are stunted, and that for Rwanda stands at 33% (Amoah, et al., 2024; Maniragaba, Atuhaire, & Rutayisire, 2024). Kishoyian et al. (2017) described that Kenya face 35% malnutrition rate for children under five, while overall effect of the malnutrition led to 52 deaths per 1000 live birth and mortality rate of 441 death per 100000 live births in Kenya. Some socio-economic factors, cultural believes, and unfavorable health care systems are the reasons that have been stressed by the geographic studies in the region exploring why ideal feeding patterns cannot be practiced. This is even compounded by the cultural differences and levels of food insecurity that exist in the different countries that make up this diverse region, which also need a region-specific remedy (Wainaina, 2019).

Tanzania, as one of the developing countries in Sub-Sahara Africa, is facing challenges of malnutrition among children, particularly, those under the age of five. According to the Tanzania Demographic Health Survey and Malaria Indicator Survey (TDHS, 2022), 30% of infants are stunted, and 9% of them are severely stunted (TDHS, 2022). Also, 3% of infants are wasted, while 1% of them are severely wasted; 12% are underweight, including 3% of severely underweight infants (TDHS, 2023). Although the rates of stunting have reduced from 42% in 2010 to 30% in 2022, the problem of malnutrition still remains a big challenge especially in low-income families and those families headed by women as observed to face 34% stunting rate than those households with high income which show a 10% rate (Masuke, et al., 2021). Moreover, teen birth has been noted to contribute to the incidences of wasting and underweight by 11% and 21% respectively in

Tanzania. Additionally, according to Mrema (2017) stunting is an issue across all regions with a higher prevalence in the rural areas (33%) as compared to urban areas (21%) and in the Southern Highlands. In Zanzibar, stunting rate is 46% with 8% prevalence of wasting (Mrema, 2017).

Based on the background information provided above, there is a critical need to introduce measures to address the issue of malnutrition in the country. With the consideration of the need to address the issues of malnutrition among children under five years, this study aims to establish the role played by feeding habits in malnutrition among children under the age of five in Tanzania.

1.2 Statement of the Problem

Tanzania continues to experience one of the highest rates of malnutrition in Sub-Saharan Africa. The problem impacts the health, physical growth and development of children under the age of five. 34% of the children under five years in Tanzania suffer from stunted growth due to malnutrition, 5% suffer from wasted growth due to sever malnourishing, and 14% of these children are under weight (TDHS, 2023). These point to a nutritional emergency that continues to impact the lives and future prospects of children, and self-development that can result to stunt national development. According to UNICEF (2024), about 450,000 children in Tanzania are severely malnourished and more than 100,000 are in severe acute malnutrition (UNICEF, 2024). This shows that Tanzania needs a proper intervention program to mitigate the magnitude of malnutrition. Government of Tanzania together with other stakeholders such as UNICEF, USAID, Feed the Hunger program introduced various interventions such as nutrition-sensitive intervention that promote homestead production of nutrition-rich food and offering of food aid in rural areas. While those efforts have resulted in positive outcomes by bringing progressive improvements in some aspects of the population's health, the problem of malnutrition remains urgent. For instance, Tanzania managed to reduce stunting by 5 percent from 42 percent in 2010 to 34 percent in 2015. This shows that the reduction is quite slow to meet international nutrition goals (Bukuku, Prasopkittikun, Payakkaraung, & Lenwari, 2023). This shows that there is an enduring nutrition crisis which requires intervention.

Previous studies show that proper feeding practices to children has significant health outcomes, but most of the diet for children in Tanzania lack necessary micronutrition substance. According to Bukuku et al (2023), in Dar es salaam, only 38.4% of the children aged 6 to 23 months are consuming minimum accepted diet with essential elements and vitamins. Studies also pointed out that several factors lead to malnutrition in Tanzania. For instance, according to Abdoli et al (2023), inadequate feeding habit are considered to be the main causes of undernutrition while according to Masuke et al (2021), poor feeding practices are the major determinants of morbidity and mortality among children. Govender et al. (2021) echoed the need to enhance parents' awareness and personal behaviors about child feeding for the purpose of achieving the best feeding among children.

However, despite the wealth of information regarding the nutritional status of children and various factors influencing malnutrition, there exists a notable gap in the literature concerning the specific influence of feeding habits on child nutrition. While previous research has focused on breastfeeding practices, complementary feeding, and micronutrient content, there is a lack of comprehensive studies that explicitly investigate how various feeding practices interact to affect the overall nutritional status of children in Tanzania. The complexities of feeding habits and their

implications for child health have not been sufficiently explored, leaving a critical gap in understanding the dynamics of malnutrition to children. Thus, the aim of this study is to investigate the contribution of feeding habits to malnutrition among children under the age of five in Tanzania. By examining the specific feeding habits of parents/caregivers, alongside demographic and socio-economic factors, this research seeks to elucidate the relationship between feeding habits and children's nutritional outcomes.

1.3 Objective of the Study

1.3.1 Main Objective

The main objective of this study is to investigate the contribution of feeding habits to malnutrition among children under the age of five in Tanzania.

Specific objectives

1. To analyse the prevalent feeding habits among caregivers/parents of children under five.
2. To examine the relationship between feeding habits and the nutritional status of children.
3. To identify socio-economic, cultural and environmental factors influencing feeding habits.
4. To propose ways for improving feeding practices to reduce malnutrition.

1.4 Research Questions

The following research questions will be addressed in order to achieve the research objectives:

1) What are the common feeding habits practiced by caregivers/parents of children under five in Tanzania?
2) How do these feeding habits impact the nutritional status of children under five?
3) What factors influence feeding habits?
4) What strategies can be implemented to improve feeding habits and reduce malnutrition in children under the age of five?

1.5 Significant of the Study

Understanding the role of feeding habits in the continuing prevalence of malnutrition cases among children under the age of five is fundamentally important for designing interventions. This study will contribute to the body of this knowledge by providing an understanding into how specific feeding practices affect child nutrition and highlight the socio-cultural factors that shape these habits. The findings for this study could inform policymakers, and healthcare providers, in creating more effective nutritional programs and policies tailored to the needs of populations in need in Tanzania.

1.6 Scope of the Study

This study will focus on investigating feeding habits among parents and caregivers of children who are under the age of five in Tanzania. The study will explore various socio-economic, demographic and other factors that influence feeding habits and their impact on child nutrition. While the study

will primarily focus on undernutrition, it will also consider the broader context of malnutrition, including micronutrient deficiencies and their long-term effects.

1.7 Limitation of the Research

Obtaining recent secondary data on the nutritional status of children under the age of five in developing countries, specifically Tanzania, is challenging for various reasons. These include inconsistent data collection methods, limited access to recent datasets and potential delays in reporting of the data, which would affect the accuracy and timeframe of the research findings.

In addition, since the study was based on secondary data that was obtained from the 2022 Tanzania Health and Demographic Survey; most of the variables on their own do not have direct alignment with nutrition status. Thus, the study mitigated these challenges by widening the dataset to include multiple metrics to complement each other.

1.8 Organization of the Study

This research paper is organized in five chapters each focusing on different aspects of the study. The first chapter introduces the research topic, nature of study, statement of the problem, research objectives, research questions and limitation of the study. It provides the context of the research and sets the foundation for the following chapters. Chapter two presents a comprehensive review of the nutrition concept, theoretical, and empirical literature on feeding practices and malnutrition. It also identifies the research gap that this study aims to contribute. The third chapter covers the methodology and data used, including sampling and data collection processes. The fourth chapter presents the findings from the statistical analysis of the data in relation to the research questions. The fifth chapter summarizes the study's key findings and provides recommendations for policy and practices.

CHAPTER TWO
LITERATURE REVIEW

2.1 Introduction

This chapter aims to present a synthesis of different articles and documents that are reviewed for this study in relation to nutrition, feeding practices and habits, and malnutrition among children under the age of five. In particular, the chapter presents an overview of key concepts, theoretical and empirical review. In addition, the chapter presents a conceptual framework and identifies the research gap the which the current research tries to contribute to.

2.2 Overview of Key Concepts

Feeding Habits

Feeding habits are described as the specific patterns and choices associated with food consumption pattern, especially, for infant and children that still rely on parents and caregivers for eating practices (Asoba, et al., 2024). Feeding habits in the context of children under the age of five involve decisions made regarding breast feeding or bottle feeding, when and what to introduce in the infant's diet, how often to feed the child, and kinds of foods/feeds to offer the child (Bukuku, Prasopkittikun, Payakkaraung, & Lenwari, 2023). Baby feeding practices particularly the exclusive breast feeding within the first six months of life and adequacy of complementary feeding from six months of age until the next two years are vital in the growth and development of a child. According to the WHO recommendation, there should be a minimum dietary diversity (MDD) for children in the age group of 6-23 months; they must take at least four of the seven types of foods. Habits regarding feeding that are improper or insufficient include early removal of the child from breastfeeding, late addition of supplementary foods, or a low number of groups of foods consumed and malnutrition. Some of the factors affecting feeding habits include maternal knowledge, perceived cultural practices, socio-economic difference and health services available to the mother.

Nutrition Status

Nutrition status encompasses the state of the body after absorption of nutrients in the body and it is mostly expressed in terms of growth and development in kids such as their height to age, weight to height, and weight to age (WHO, 2022). Nutrition status of a child can also be defined as the dietary quality, ability to absorb the nutrients consumed and his/her physical condition (Sunday, et al., 2024). Optimal nutritional status is reflected by a variety of macronutrients and micronutrients with specific energy values and essential ingredients for growth and physical integrity.

Malnutrition

Malnutrition is described as inadequacies or insufficiencies in energy and consumption of nutrients. It involves broad categories which includes stunting, wasting, underweight, overweight, and obesity (Maniragaba, Atuhaire, & Rutayisire, 2024). Among children below five years of age, malnutrition can be identified with stunting- chronic malnutrition, wasting - acute malnutrition, and underweight -a result of both stunting and wasting (Khamis, Mwanri, Ntwenya, & Kreppel, 2019). Figures provided by WHO reveal that, globally, 149 million children under the age of five years are stunted, 45 million are wasted and 38.9 million are overweight.

While nutrition is an essential component of the children's opportunity to grow, learn and be productive; malnutrition means long-term health, developmental and economic loss. According to Adedokun and Yaya (2021), malnutrition has adverse impact on health outcome of human beings. This includes delayed mental and physical development, frequent episodes of illnesses, and early childhood deaths.

Overview of infant's malnutrition in Tanzania

As is the case for many other Low- and Middle-Income Countries (LMICs), the phenomenon of malnutrition remains to be an essential problem in Tanzania. According to various reports such as Leah and Kilama(2019) carryout institutional analysis based on Tanzania infants nutrition shows, Tanzania is one of the countries with high level of malnutrition. For example, the 2016 Tanzanian Demographic Health Survey shows that at least 34% of children under the age of 5 are stunted, 14% are underweight, 5% are wasted and 4% are overweight. This implies a very high rate of malnutrition in Tanzania (Faustini et al., 2022). A more detailed and disaggregated information is provided in the 2022 episode of the Tanzania Demographic Health Survey. According to this latter survey, 30% of the infants suffered from stunting, whereby 9 % are severely stunted. In addition, the survey shows that 3% of the infants suffered from wasting, with 1% suffering from severe wasting. Moreover, 12% of the infants are found to be underweight, with 3% of them being severely underweight. Although these figures in 2022 show a decline compared to the figures in 2010 (which shows 42% for stunting and 16% for underweight), the figures for 2022 still remain high and indicate the persistence of the problem in the country. As could be expected, the survey shows that, households with mothers lacking formal education suffer a higher stunting rate than those with formal education, 36% and 21% respectively.

Underweight mothers tend to have infants who will suffer from wasting and underweight than mothers with good weight, 11% versus 2% for wasting and 21% versus 12% for underweight respectively. Similarly, the rate of stunting in rural areas, 33%, is higher than that in urban areas, 21%. The rate is also higher when comparing existed more in Mainland Tanzania (30%) and Zanzibar (18%). However, Zanzibar suffers from a higher level of wasting (8%) as compared to Mainland Tanzania (3%). Prevalence of stunting, underweight and wasting also show variations across the Zones in the country. For example, rate of stunting is high in the Southern Highlands (46%) as compared to Southern lowlands (22%).

Monitoring and promotion of nutrition status

The World Health Organization (WHO) introduced in the 1970s the growth and promotion programme for the purpose of controlling and monitoring infants who have suffered from malnutrition issues (WHO, 2017). The aim of this programme is to minimize and solve the malnutrition problem to the children under 5. It involves the information which consist of measurement of infants' physical growth hence the data obtained helps health care specialist to provide effective counselling to the infants' care giver on which mechanisms they can use to avoid infants' malnutrition. Also, it helps to discover the infants with the critical condition so as they can get quickly referral. The most common measurements are children weight and length/height. Tanzania, like other developing countries who suffered from this problem, tries to implement this program.

Overview of feeding habit and micronutrient supplements

Feeding habit and micronutrient supplements relate to the time whereby a child should start to receive some soft foods which can be solid and semisolid. This starts mostly six months after birth. This is because milk alone will not be sufficient for the survival of a child since it will not contain all the nutrients (WHO &UNICEF, 2021). Hence giving supplementary food will ensure proper nutrition to the infants which will protect them from malnutrition problems. In Tanzania, it is shown that around 89% of the infants were given some soft foods within 6-8 months, which can be considered as the implementation of complementary feeding practices (TDHS, 2022). In some instants, infants were given unhealthy foods such as sweet drinks and salty food which are not good for their health.

2.3 Theoretical Review

This study employed health belief model theory and social cognitive theory to gain insight on the relationship between feeding habits of caregivers/parents to the nutrition status of children.

2.3.1 Health Belief Model theory

The Health Belief Model (HBM) was developed in 1950 by group of psychologists known as Rosenstock and Kegels to understand why people fail to observe good health measures. The theory focuses on exploring health-related behavior of individuals and their perceptions on the health conditioned action to mitigate those issues (Rimer & Glanz, 2005). The HBM posits that individuals' behaviors are influenced by two main factors: fear from getting sick and perceived effectiveness of certain health behaviors in either preventing or controlling a particular health problem (Green, Murphy, & Gryboski, 2020). The model has subsequently been used across a range of health-related domains such as disease prevention, screening, and long-term conditions management, and is therefore a core model used to explain health behavior (Glanz, Rimer, & Viswanath, 2008). The HBM introduces six constructs that influence health behaviors, those constructs included perceived susceptibility (likelihood of contracting a condition), perceived severity (assessment of the gravity of the condition), perceived benefits (credibility of the health behavior change), perceived barriers (challenges to adopting the health behavior), cues to action (prompts that encourage change) and self-efficacy (confidence in ability to adopt a particular behaviors). These constructs offer a context by assuming the roles explaining why people initiate certain healthy or avoid other behaviors, for example, proper feeding for children.

In this study, the HBM is applied to understand how the feeding behavior of caregivers affect the nutritional status of children aged 5 years and below in Tanzania. The model makes it possible to evaluate how caregivers approach the risk and severity of malnutrition, and their attitudes towards the advantages of recommended feeding practices such as exclusive breastfeeding and the introduction of complementary foods. Also, the obstacles to delaying these practices and the stimulants to reappraising the nutrition of a child are discussed in the study. By employing these constructs, the study posits the HBM in accordance with its aims of examining the breastfeeding counseling, demographic factors, and caregiver's literacy that frames child nutritional status.

However, there are few drawbacks of HBM, one of those criticism is that it does not factor in emotional and other learnt attributes tied to health behavior, e.g., cultural feeding norms or

affective responses to eating (Green, Murphy, & Gryboski, 2020). In addition, the model takes fairly little account of individual perceptions and experiences that are related to social and indeed environmental forces like structural unemployment or an absence of food. Also, model assume that everyone gets the same information about health and that health is the biggest reason for altering decision making processes which can be misleading. Also, the HBM does not have action plans on how to facilitate behavioral change as stated above (Glanz, Rimer, & Viswanath, 2008).

Nevertheless, these criticisms do not downplay the usefulness of the HBM because the theory offers straightforward and comprehensible conception of health behavior decision-making process (Glanz, Rimer, & Viswanath, 2008). However, for effectiveness in explaining the research theme, it needs to be used in conjunction with other models. Thus, the study adopted Social cognitive theory to aid HBM in explaining how caregivers' perceptions shape their feeding practices.

2.3.2 Social cognitive theory

Social cognitive theory provides a foundation for understanding behavior change; it explains the cognitive processing of knowledge and how knowledge is then transformed into behaviors as individuals are comforted with new knowledge, skills, and tasks (Bandura, 2001). The theory was developed by Bandura (1991) was the guiding theoretical framework in this study, the theory highlights practical relationships between various unique variables for instance cognition, perceived norms as well as behavioral enactment (Conner & Norman, 2015). SCT emphasizes the role of self-organizational behaviors and perceived self-efficacy for performing the prescribed tasks, both of which are central in the processes of adopting and sustaining of health behaviors. SCT is more applicable in this study in that, it describes how caregivers gain new knowledge in child feeding and how they put this knowledge into practice to enhance the nutritional status of their child (Schunk, 2001).

The theory introduced the concept of self-efficacy which implies the level of confidence that an individual has to perform a certain behavior is remarkable in driving health practices such as feeding. A study of Silva et al (2023) and Hendriyani et al (2020) shown that self-efficacy is an indicator of nutrition behaviors, including diet selection as well as child feeding especially for young ones. Also, self-regulation is associated with managing eating psychology and portion control and guaranteeing an ideal uptake of fruits and vegetables.

In this study, SCT was used because this theory describes how individual variables such as knowledge, beliefs, social context, and other behaviors interact to prompt healthy feeding patterns among the caregiving segment of the population. These are purely distinguishable factors that are of most importance in determining a child's nutritional status. From this context, self-regulation and self-efficacy help the caregivers to regulate their feeding behaviors which has a direct influence of the measures such as low weight-for-age, low height-for-age and wasting (underweight). The theory also bought into the notion that as a result of family based behavioral interventions including caregiver knowledge and self-efficacy, there could be a more enduring change on children nutritional status including reduction of undernutrition.

2.4 Empirical Review

The empirical review looked on various past studies related to the nutrition status of the children under the age of five years. The empirical review is important in the study as it show what has been done by other authors in their previous work in the related field, also, it helps to determine what were the results of their studies.

2.4.1 Contribution of Demographic Factors of Parent/Caregivers to Nutrition Status of Children

A study of Anietor and Animu (2021) examined the effect of demographic variables on the nutritional status of school aged children in Abuja with variables like age, gender, maternal education, income and marital status. This study adopts a descriptive cross-sectional design which sampled 320 children from three government schools for assessment of their nutritional status using BMI measurements; those were classified as underweight, normal weight or overweight. Results suggested that age, gender, mothers' education, income and marital status positively affected children's nutritional status and class level had no effect. The study recommended for the further research with a larger sample and targeted health education for mothers. While this study points to demographic influences which provide the base for insight on the influence of malnutrition, but it was conducted in Nigeria; which is different social-economic nature to Tanzania.

Aaraj and Halim (2021) aimed to determine the nutritional situation of children under five and assess the influence of several demographic factors on their nutrition. The method used was a cross-sectional design, which was undertaken among children under five at Shifa Falahi and Community Health Center, Islamabad. A self-designed questionnaire was used to collect information from mothers and the weight and height of the children recorded and classified against WHO Z scores. The independent effect of each predictor on the outcome was determined using univariate analysis and data were analyzed using SPSS 20. From among the 280 children enrolled, 162 (57.9%) were malnourished. The cases were stunted (24.6%), underweight (26.1%) and wasted (19.6%). Low household income, poor maternal education, living in a joint family system, unboiled drinking water and repeat diarrheal episodes were significant factors leading to malnutrition. Adequate knowledge of breastfeeding and vaccination was found amongst most mothers.

Hastuti et al (2024) investigated the relationship between socio demographic characteristics, dietary diversity score (DDS) and nutritional status among children under five years in the coastal area of Demak, Indonesia. The study was a cross-sectional study on 130 families containing children aged 2 to 5 years. Mothers or caregivers interviewed were asked about socio-demographic factors and then anthropometric measurements of children were obtained. A 24-hour food recall method was used to calculate the DDS. The analysis included descriptive statistics, independent samples t-test and Chi-square tests. The study found that maternal education was significantly associated with the children's DDS ($P = 0.016$). Also, it was found that there is a very strong association between history of acute respiratory infection (ARI) and nutritional status as measured by HAZ ($P = 0.023$), and association between history of exclusive breastfeeding and family type with nutritional status as measured by WHZ ($P < 0.05$) was observed.

Islam et al (2016) aimed to establish how socio-demographic factors influence the nutritional status of early childbearing mothers in Bangladesh with reference to BMI. The study

used data from the Bangladesh Demographic and Health Survey 2011 and included only married women aged 15-49 years and mothers aged 24 or younger who gave birth at or before 20 years. Underweight mothers were classified by BMI ≤18.5 kg/m² and divided into Chronic Energy Deficiency (CED) groups: mild, moderate, and severe. The socio-demographic predictors of nutritional status were determined using multiple logistic regression analysis. The study found that one in three early childbearing mothers was underweight, and most had mild CED (62.2%). It also showed that mothers from rural areas, poor families, with low education, working or married with unemployed husbands had higher odds ratios of being underweight. Age at marriage, in particular marriage at an early age and having children at higher parity also had a higher risk. The study finds that to help raise the nutrient status of early childbearing mothers it is important to look at the socio-demographic factors that include education, income, and marriage practices.

Omondi and Kirabira (2016) analyzed the associations between socio-demographic characteristics and nutritional situation, stunting, wasting, underweight among children, in urban slums. The cross-sectional analytical study entailed 400 households in which data was analyzed descriptively as well as inferentially by the use of odds ratio. The study show that income was causes of stunting in the child and underweight as well with odds ratio of 0.47 and 0.44 respectively, Also, wasting was reported to be greatly influenced by the mother's Age and education level with odds ratio of 1.07 and 0.34 respectively. Sex of the child and religion were not an issue. The study affirmed that income and its related aspects, maternal age, and education would require intervention for impacting the survival and nutrition of children.

Sayeed et al (2023) explore the association of socio-demographics and economic factors on under and over nutrition of mothers and children in Bangladesh. The study was conducted to assist the Bangladesh Demographic and Health Survey (2017–18), the study sampled 8321 children aged between 0–59months and 7800 mothers aged 15–49 years by using multiple logistic regression. In mothers, underweight was observed in 14.09% and overweight in 26.35% of women. The study found that child stunting was related to mother's BMI, parent's education standard, and the wealth index whereas child wasting was most closely related to mother's BMI and sex of the child. Furthermore, the study found that mothers age, education, residence, and wealth significantly predicted underweight whereas occupation, father education and wealth equally predicted overweight among children. The findings of the study reveal that in addition to nutrition inputs, various socio-economic, and demographic characteristics need consideration.

2.4.2 The Influence of Breastfeeding Counseling on the Nutrition Status of Children Under Five

A study of Nuzhat et al (2019) assessed the usefulness of councilor regarding the breastfeeding practices in the infants who were admitted due to diarrheal disease. The cross-sectional data chart review of this research work was carried out in the Dhaka Hospital using; Breastfeeding Counseling Unit which enrolls mothers and their infants less than 6 months old between 2011 and 2015, from the data chart, the study sampled the sample comprised 3,420 infants. The findings showed that organic counseling had been given to only 12.5% of the participants, 71.8% were partially breastfed and only 0.1% received exclusive breast feeding. Counselling led to an enhanced rate of exclusive breastfeeding at discharge with 65% of the infants thus placed on exclusive breast milk feeding. The study investigated the relationship between maternal perception and the success of exclusive breastfeeding based on logistic regression analysis and revealed that a perceived

inadequate supply of milk and poor suckling greatly reduced the probability of the success of exclusive breastfeeding. The study showed that the Breastfeeding Counseling Unit lead to a substantial change in the breastfeeding practices even during acute illnesses. The study emphasizes on the need of comprehensive and sound breastfeeding counseling for re-lactation of non-breastfed infants.

Suryani et al (2018) assessed the impact of counseling on level of mother's knowledge, attitude and practice towards ASI in the work place of Bengkulu SawahLebar Health Center. This research employed a time series quasi-experimental design, one group, and the sample was made up of 28 pregnant women in their third trimester. Data were described using basic statistics and compared between groups using paired t-tests where data met the assumption of normality. Therefore, the findings of this study were that the intervention had led to an increase in the overall average level of knowledge, attitude belief, and practice from 84.46%, 31.61%, and 69.76%, to 92.14%, 33.96 % and to 83.81% respectively. Interpersonal counseling also demonstrated a positive influence on the individual's knowledge, attitude and practice of breastfeeding (P 0.000). The study recommended that health workers should extend their nutritional counseling activities through participation in pregnancy classes, discouraging mixed feeding at community centers, and formation of exclusive breastfeeding groups to encourage exclusive breastfeeding among mothers.

Maidelwita et al (2022) explored the impact of counseling with demonstrations of complementary feeding on the nutritional status of the infants that were aged 6–12 months. This quasi-experimental study employed a control group pretest posttest design and was carried out at the Health Center Pakan Rabaa Solok Selatan in July, August, and September, 2020. The study indicated that before the counseling there was a difference of 0.21 between the two groups and in the post, counseling showed that there was a difference of 0.52. Although, the average birth weight between the groups was compared, the study did not differentiate between the two groups considerably in this parameter. The study concluded that when nutrition counselling was combined with demonstrations, it was more effective in enhancing the nutrition outcomes as compared to regular counselling.

Kumar et al (2020) examine the differences in the complementary feeding practices of these mothers with children between 6 months to 2 years of age, before and after they received individualized nutrition counselling. The study employed interview methods, with 30 mothers attending an immunization clinic and the Breastfeeding Promotion Network of India's Complementary Food Counseling checklist which was used to evaluate feeding practices and each index was scored before and after counselling. Then, feeding practices were reviewed after four weeks at the end of individualized counseling sessions that took 30–40 min per participant. The findings revealed enhancements on food group selections and the overall scores rose from an initial 4.3 to a final count of 5.6. Also, the total frequency of consumption of junk food and baby foods reduced dramatically ($p = 0.001$). Thus, the study established that personalized counselling can improve complementary feeding practices and food diversity among the mothers.

2.5 Research gap

While the study reviewed the health belief model and social cognitive theory, those theories were focused on limited variables; particularly, individual behavior. However, there is a gap in general

theoretical frameworks for feeding practices considering different socio-economic, cultural and environmental factors. Many theories are more compartmentalized targeting certain factors without concern with the interaction between these variables in the Tanzanian environment. Also, majority of the articles that established the relationship between feeding practice and nutrition status are conducted in different geographical context (in other countries than Tanzania); thus, the finding of those studies cannot be generalized to Tanzania to a great extent. These demonstrate that the social and economic environment in Tanzania is under-researched. Moreover, most of the studies focus on the nutritional state with very few approaches examining the determinants of feed intake or behavior. There is also scarce evidence that explores how demographic factors, breastfeeding counseling, and parental literacy levels have impacts on malnutrition of children below the age of five years. Therefore, this study was conducted to help fill this literature gap by concentrating on the above-mentioned critical variables to give a broader view of the role played by these factors on malnutrition of children in Tanzania.

2.6 Conceptual Framework

The conceptual framework describes the cause-and-effect relationship between variables which was used to answer the research questions. The interaction between variables of the study is indicated in Figure 1 presenting the relationship between the dependent variable which is nutrition status of children under the age of five in Tanzania (captured by three main metrics, including stunting, underweight, and wasting); and the independent variables- Demographical factors such as wealth status, dominant gender, maternal age, family size, and marital status; healthy behavior variables such as infants receive vitamin A, infant receive multiple micronutrient supplement, frequency of breastfeeding counselling, and duration of breastfeeding.

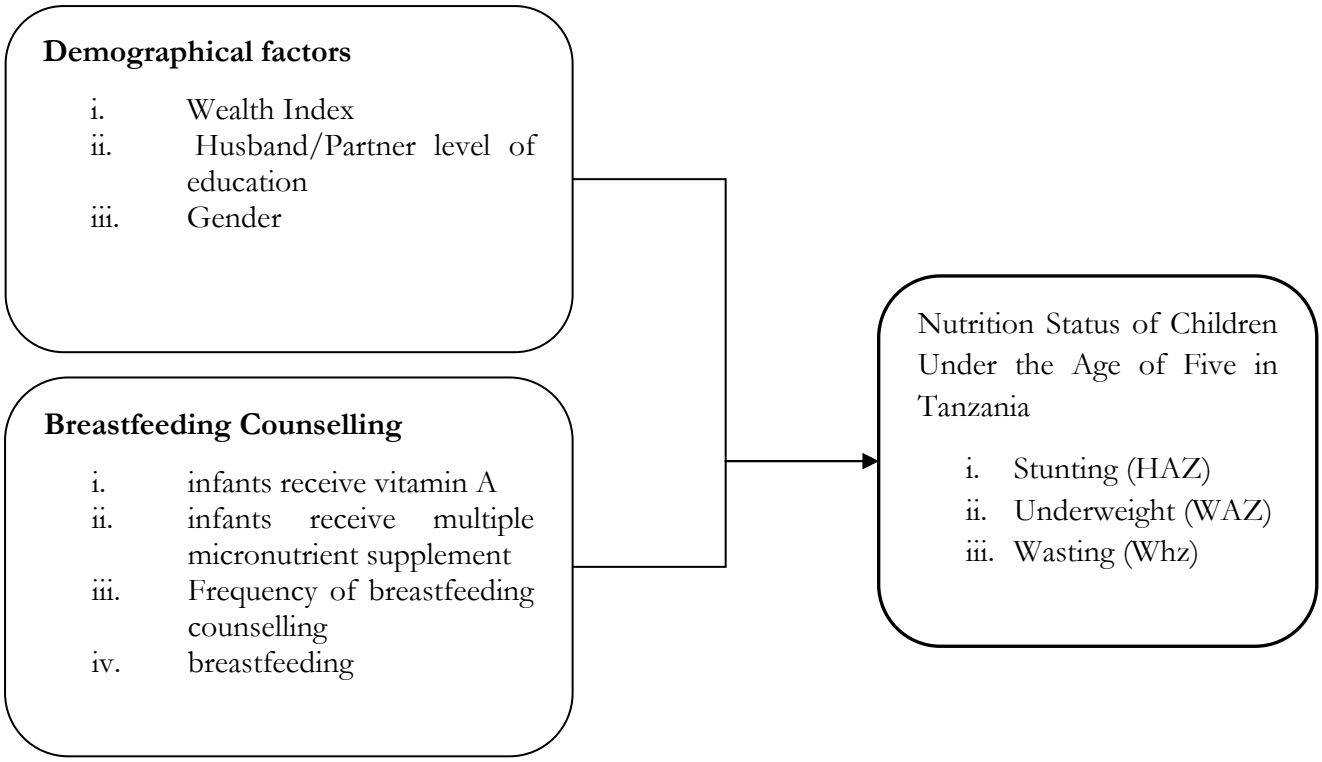

Figure 2. 2: Conceptual Framework

Source: Researcher contemplation through Literature review, (2024)

2.7 Summary of the Chapter

In this chapter, a critical review of the theoretical and empirical literature that is malnutrition among children under five in Tanzania has been well articulated. The theoretical literature review showed the importance of a multi-faceted approach that considers several social, economic, cultural and environmental factors that explain feeding practices. The chapter show that conceptual literature is relatively scarce, and the majority of available conceptual models are fragmented and address one or another aspect of nutrition without considering the complex system of variable relationships.

The empirical review presented a number of studies that examine malnutrition, although the majority of the studies was conducted in other countries than Tanzania. While these studies primarily focus on the nutrition status of children, most of them fail to pay attention to the important contributors to feeding patterns such as demographic factors, counseling on breastfeeding, and the levels of parent literacy. The limited attention given to the above-mentioned elements in the Tanzanian context makes it more crucial for research to demonstrate the essence of carrying out studies to identify the burdens and situations under which caregivers are facing in context of nutrition status of the children.

The synthesis of the theoretical and empirical developments emphasizes the importance of localizing research at the local level that does not only aim to evaluate the nutritional state of children, but also, paying attention to the variety of determinant factors influencing feeding habits. Thus, the study contributed on filling the presented research theoretical, contextual, and literature

gaps with useful findings that would be helpful in the design of useful interventions for addressing the issue of child malnutrition in Tanzania.

CHAPTER THREE
DATA AND METHODOLOGY

3.1 Introduction

This chapter provides a description of the methods used in the study to determine the effect of feeding habits on malnutrition among children in Tanzania below the age of five years. The chapter includes the research design, source of data, population of the study, sampling method, sample size, variables and techniques of data analysis. As well as other relevant element of the research methodology.

3.2 Research Design

This research used causal inference quantitative research design with a view of determining causal relationship between the variables under study. The design is employed to establish a relationship between independent variables (for instance; demographic factors, breastfeeding counselling, and literacy level of caregivers/parents) and the dependent variable; for instance, the malnutrition status of children below the age of five years. This type of design is anchored on conditional statement of "if X then Y" which assists in comparing the changes that occurred in one phenomenon to changes that occurred in another. The condition which is adopted in this study to explain how malnutrition within children in Tanzania is conditioned by particular feeding habits.

3.3 Types and sources of data

A quantitative research approach was selected for this study to provide statistical understanding of the research problem. The study adopted a cross-sectional secondary data that is used to observe and describe characteristics of the population at a single point in time. Secondary data was used in the study and the data was obtained from the website of the Tanzania Demographic and Health Survey (TDHS)[1] with the help from Research on Poverty Alleviation (REPOA). This secondary data was a cross-sectional data from Tanzania Demographic Health Survey (TDHS) of 2022 which covers a total sample of 40,394 children under the age of 5. The survey was conducted by the National Bureau of Statistics (NBS) in collaboration with the Ministry of Health. The main objective of the TDHS is to collect data that help monitor and evaluate trends in health outcomes as well as the nutrition status of the population.

For this research, we selected children under the age of five for the analysis since this is the standard cut-off age that the UNICEF and WHO uses to measure child health. Accordingly, nutritional status indicators such as measurement of weight, length/height, mid upper arm circumference (MUAC) were used. The TDHS socio-demographic data of respondents. And the interpretation was done using Z-score.

Although the data included information on family planning, fertility preferences and marriage issues, owing to the objectives of the research, we focused mainly on variables related to child health as well as nutrition status of the children. Hence, we selected variables that indicate the nutrition status of children under the age of 5 (Infants) and excluded other variables that have no bearing for our analysis.

[1] https://dhsprogram.com/data/dataset/Tanzania_Standard-DHS_2022.cfm?flag=0

It is worth mentioning here that the sample size changes for a different set of analysis which may be related to missing information for some of the variables used in our analysis.

3.4 Methods of data analysis

3.4.1 Ordinary Least Square (OLS) model

Owing to existing theories and empirical literature, the study uses an OLS model where nutrition status is used as the dependent variable and factors affecting feeding habits are used as the independent variables. As such, the econometric model applied in this study tries to show that nutrition status of infants can be determined by feeding habit factors such as demographic and socioeconomic factors, whether a child has been breastfed, has received essential nutrients such as Vitamin A and whether the mother has participated in breast feeding counselling. A detail description of the variables is provided below.

Data description: Variables of interest

Dependent Variables

Nutrition status of a child: Anthropometric measures are used to indicate the nutrition status of infants as well as their growth level. According to Duggan (2010), these measures can be divided into length, height and weight with respective indices of height for age, weight for height as well as weight for age measured in Z-scores using a population median. Accordingly, any Z-score value greater than -2 indicated the existence of malnutrition problem in a given area. Further, the levels of malnutrition were divided into 3 levels: stunting, wasting and underweight (WHO, 2014). In what follows, we give a detail description of each of these levels.

Stunting (Height for Age Z-Score–HAZ)

This is measured in height or length with respect to age of the child. The resulting Z-score is used to indicate the level of faltering. Stunting occurs when a child is too short compared to his/her age that can be attributed to chronic malnutrition. Accordingly, an HAZ below -2 is considered as moderate stunting and when it is below -3, it is considered as severe stunting.

Wasting (Weight for Height Z-Score–WHZ)

This is measured in weight with respect to height of a child. The resulting Z-score will be used to indicate whether a child is in the category of wasting or not. Accordingly, a WHZ of below -2 is considered as moderate wasting and when the score is below -3, it is considered as acute or severe wasting.

Underweight (Weight for Age Z-score–WAZ)

This is a case that occurs due to lack of micro nutrition such as lack of some vitamins and minerals that are essential for the functioning of the body. Underweight is a combination of wasting and stunting. As such, it is measured by WAZ and the Z-score needs to be within a given range of -2 and -3. Similar to HAZ and WHZ, a WAZ score below -2 is considered as moderately underweight while a score below -3 is considered as acute underweight.

Independent variables

Demographic factors

Gender (male dummy): This variable is used to capture the difference in feeding habits between male and female infants. It is a dummy variable which takes the value of 1, when the infant is male and 0 when female.

Wealth index: This is the categorical variable which explain the economic status of the household of a given child. The TDHS data categorizes households into five categories: poorer, poor, middle, rich and richest based on the value of consumer goods owned by the household. The wealth index variable therefore expresses whether the infant is from poor, poorer, middle, richer or richest household.

Husband /Partner level of education: This is a categorical variable which explains the highest education level attained by a given husband/partner. It shows whether the husband/partner has primary, secondary, higher or no formal education.

Received vitamin A & multiple micronutrients: This is a categorical variable which indicates whether a given infant has received important micronutrients, particularly Vitamin A, or not. It takes the value 1 if an infant has received Vitamin A and 0 otherwise. A report by the United States Agency for International Development, USAID (2019) shows that lack of micronutrients such as Vitamin A by infants can be main source of morbidity and mortality, which can arise from shortage in consumption of foods which have such vitamins and minerals.

Breastfeeding counselling variables: These variables are explained through optimal Infants and Young Child Feeding (IYCF). The WHO and UNICEF provide detail recommendations based on indicators accompanied by IYCF practices[2]. These recommendations are immediate breastfeeding at most one hour after birth, exclusive breastfeeding for 6 months after birth of the child, as well as prolong breastfeeding for at least two years. The benefit of this is to ensure good health of the infants through protecting them from malnutrition and hence increase the chance of the infants' survival. The following two indicators therefore capture the mechanisms that ensure proper health, effective survival and development of infants (WHO, 2023).

Breastfeeding dummy: This is a categorical variable that indicates whether a given child was exclusively breastfed for the first 6 months of life or not. WHO (2023) propound that breastfeeding ensures the growth of a child as well as improves the health of the mother. When breastfeeding starts early, it will create immunities for a child. The variable is defined as a dummy where it takes the value 1 if infants is not exclusively breastfed and 0 if the infants is exclusively breastfed for the first six months of life.

Breastfeeding counsel: This categorical variable is used to capture whether a given mother received counselling on breastfeeding from a healthcare provider or not. Counselling can act as interactive way between caregivers and mothers whereby more information and conditions on appropriate breastfeeding will be provided. Consequently, counselling has a potential to enhance effective breastfeeding and complementary feeding habits when it is provided by trained caregivers

[2] https://www.who.int/news-room/fact-sheets/detail/infant-and-young-child-feeding

(Chapman et al., 2010). This variable takes the value 1 if the mother receives the counselling on breastfeeding and 0 otherwise.

Gave a child baby formula: This is the categorical variable which express that, whether a given child receive baby formula or not. It has two categories which are yes and no. Yes, if a child received baby formula and no otherwise

Using the above variables, the OLS model that will be estimated is:

$$\begin{aligned} \boldsymbol{Y_{nts} = \beta_0 + \beta_1 Received\_vitamin_a + \beta_2 Breastfeeding\ dummy} \\ \boldsymbol{+ \beta_3\ breastfeeding\ counsel + \beta_4 Wealth\ index} \\ \boldsymbol{+ \beta_5 husband/partner\ level\ of\ education} \\ \boldsymbol{+ \beta_6\ Gender\ (male\ dummy) + \beta_7 \textbf{Gave a child baby formular} + \ ui} \end{aligned}$$

3.4.2 Robustness check: Quintile regression (QR)

In addition to the OLS model, we apply quantile regression model as a robustness check. This check is used to capture whether the estimated results vary across the different quantiles, such as q10, q25 and q50. A multivariate regression shows the effect at the mean of independent variables and the results are sensitive to the presence of outliers and the estimation heavily relies on the assumption of the normal distribution of the error term. On the other hand, a quantile regression model can be carried out in the existence of outliers and when the normal distribution assumption of the error term doesn't hold or is violated. The test for normality in distribution of the error term and presence of outliers is shown in the Appendix (see Appendix 1 and 2 for details). The tests justify the use of quintile regression.

Huang et al. (2017) explain that quantile regression model uses the conditional distribution of the outcome variable and hence may lead to more robust results given outliers. Moreover, its wider statistical power as compared to the traditional mean regression makes the results more robust. That is, QR regression can be applied to discover if there is heterogeneous effect of the covariates on the different quantiles.

We apply the quantile regression model as it will provide more insights on how feeding habit affects the nutrition status of infants in Tanzania. For example, we can show the effect of using Vitamin A on the nutrition status of infants based on the different quantiles and hence can differentiate the strength and size of the effect based on quintiles, which would have been difficult to obtain in the normal OLS. The following QR model will be estimated:

$\mathbf{Q_{nts}(\dagger/X) = \beta_0(\dagger) + \beta_1(\dagger)}$ **Received_vitamin_a** $\mathbf{+ \beta_2(\dagger)}$ **Breastfeeding dummy+** $\mathbf{\beta_3(\dagger)}$ **breastfeeding counsel +** $\mathbf{\beta_4(\dagger)}$ **Wealth index +** $\mathbf{\beta_5(\dagger)}$ **husband/partner level of education +** $\mathbf{\beta_6(\dagger)}$ **Gender (male dummy)+**$\mathbf{B_7(\dagger)}$ **Give the child baby formula +**$\mathbf{£(\dagger)}$

Where:

Nts is nutrition status for infants

$\mathbf{Q_{nts}(\dagger/X)}$ is the measure of Quantile for nutrition status of under 5 from the the fist to the last quantile († to the nth quantile)

$\mathbf{\beta_0(\dagger)}$ **to** $\mathbf{\beta_6(\dagger)}$ these are coefficient expressed in the quantile form († to the nth quantile)

$\mathbf{£(\dagger)}$ Error term in quantile form († to the nth quantile)

3.5 Econometrics concerns

Due to the application of Z-score in measuring the nutrition status and other related independent variables in the data set, the problem of normality in the distribution of the error term and heteroskedasticity may arise. This is due to the nature of the data set; this can be addressed applying the Shapiro-wilk test for normality in distribution. To address the problem, we apply the quantile regression model (section 3.5 above), which is very effective in addressing the issue of normality in distribution as well as heteroskedasticity. Endogeneity problem may arise due to the fact that some of the independent variables may be endogenous hence can be correlated with the error term. For example, it might be a case that when the mothers/caregivers see that their infants are not growing properly, they will be regularly searching for the counselling which may cause bias in the estimated results.

3.6 Ethical considerations

Although we used secondary data for this study, the data used was checked for ethical concerns. First, full permission to use the data for research was obtained from the National Bureau of Statistics and REPOA. Second, we have checked if the data fulfils criteria of privacy, confidentiality and anonymity and the data fulfils all the criteria.

3.7 Chapter summary

This chapter outlines the methodology adopted for the study, emphasizing the use of a nationally representative data from the Tanzanian Demographic Health Survey of edition 2022. The chapter presented methods and approaches utilized to answer research questions and attain the research objectives. These include the research design, targeted population, data sources and approach used to collect data, as well as data analysis approach employed to demonstrate the relationship between feeding habits and malnutrition in children under five years old in Tanzania.

CHAPTER FOUR
FINDINGS AND DISCUSSION

4.0 Introduction

This chapter provides the results of our analysis. Before providing the results from the estimated models, we provide descriptive statistics for both the independent and independent variables.

4.1 Descriptive Statistics

This section presents the descriptive statistics on the characteristics of the variables under study. It summarizes data into a meaningful and useful way through frequency tables capturing average values and percentage distribution

4.1.1 Description on nutrition status of children under the age of five

Table 4. 1: Summary on nutrition status of children under the age of five

Variable	observation	Mean	Std.dev	Min	Max
Stunting (HAZ)	4791	-1.36	1.25	-5.88	5.73
Underweight (WAZ)	4791	-0.78	1.06	-5.66	3.55
Wasting (WHZ)	4791	-0.01	1.13	-4.59	4.77

Source: Own computation using TDHS (2022)

The total number of data points for each indicator is 4,791. The average value for stunting (HAZ) is -1.36 with a standard deviation of 1.25 and it ranges between -5.88 and 5.73. In this regard, the negative mean for Height-for-Age Z-scores (HAZ) of -1.36 suggests the prevalence of stunting for our sample. This means children are, on average, shorter for their age than the international standard. Such stunting often indicates chronic malnutrition.

The average value for underweight (WAZ) is -0.78 with a standard deviation of 1.06 and it ranges between -5.66 and 3.55. The Weight-for-Age Z-score (WAZ) mean of -0.78 indicates moderate prevalence of underweight, suggesting that children in the sample weigh less for their age than the reference population.

The average value for wasting (WHZ) is -0.01 with a standard deviation of 1.13 and the value ranges between -4.59 and 4.77. The absolute value of the mean of Weight-for-Height Z-score (WHZ) is close to zero and it shows that wasting levels close to the reference value for the international standard. This measure of acute malnutrition suggests low prevalence variability in weight-for-height.

Each indicator highlights prevalence of malnutrition, with stunting and underweight issues observed more than wasting in this dataset.

Taking a close look at each of these indicators, Table 4.2 provides the frequency distribution for stunting categorizing the children into stunted and non-stunted. Accordingly, from the 4,791 children in our data, 3,410 (71.18%) are not stunted and the remaining 1,381 children (28.82%) are classified as stunted, indicating they have a lower-than-expected height for age score (HA)Z. That

is, about 29% of the children in the sample are affected by stunting, a condition often associated with malnutrition and growth-inhibiting factors.

Table 4.2: Stunting (HAZ) of children under the age of five

Child's Stunting Status	**Frequency**	**Percent**
Non-stunting	3410	71.18
Stunting	1381	28.82
Total	4791	100

Source: Own computation using TDHS (2022)

On the other hand, as can be seen from Table 4.3, out of the 4,791 children, 4,251 (88.73%) are classified as not underweight and a total of 540 children (11.27%) are considered underweight, indicating they have a lower-than-expected weight for their age. This distribution shows that, compared to stunting, a relatively small portion of the children (11%) in the sample are underweight, suggesting that the majority meet or exceed the weight expected for their age.

Table 4.3: Underweight (WAZ) of children under the age of five

Child's Underweight Status	**Frequency**	**Percent**
Non-underweight	4251	88.73
Underweight	540	11.27
Total	4791	100

Source: Own computation using TDHS (2022)

Turning to the indicator on wasting, as shown in Table 4.4, from the 4,791 children, 4,617 (96.37%) are not classified as wasted. This indicates that most children in the sample have a weight-for-height ratio that is within the normal range while only 174 children (3.63%) are classified as wasted with a lower-than-expected weight for their height. This distribution indicates that, compared to stunting and underweight, wasting is relatively uncommon in this sample, with only a small percentage (approximately 4%) of children affected by this condition.

Table 4.4: Wasting (WHZ) of children under the age of five

Child's Wasting Status	**Frequency**	**Percent**
Non-wasting	4617	96.37
Wasting	174	3.63
Total	4791	100

Source: Own computation using TDHS (2022)

The frequency distribution of the three malnutrition outcome indicators aligns with the descriptive statistics provided earlier, highlighting that stunting is the most serious issue, followed by underweight, with wasting being relatively rare in the sample under consideration.

Descriptive statistics of independent variables

Table 4.5 provides information on the distribution of the sample according to wealth ranking, ranging from poorest to richest.

Table 4. 5: Frequency distribution by Wealth Status

Wealth index combined	Frequency	Percent	Cum.
Poorest	1024	21.37	21.37
Poorer	946	19.75	41.12
Middle	991	20.68	61.80
Richer	972	20.29	82.09
Richest	858	17.91	100.00
Total	4791		

Source: Own computation using TDHS (2022)

The wealth distribution is relatively balanced across five categories, but with a heavier concentration in the "Poorest," "Poorer," and "Middle" categories, making 61.8% of the total sample combined. This distribution suggests that a substantial proportion of young children live in lower economic conditions, which could affect their nutritional status and access to health resources. Typically, children from lower socioeconomic backgrounds have reduced access to diverse, nutritious food, healthcare, and other resources essential for proper growth and development, potentially increasing the risk of malnutrition, stunting, and other related health issues. The remaining 38.2% are in the "Richer" and "Richest" categories, which may provide relatively better access to essential resources that support childhood growth and development. These higher categories can also positively impact their nutritional outcomes.

The summary statistics of household size categorized into five categories according to number of members in the household is provided in Table 4.6. Looking at each category, there are 547 (11.42%) households with a family size of below 3 members making up a small portion of the sample. These smaller families may be better off to provide sufficient nutritional resources per child, as fewer individuals compete for the family's food and healthcare resources. On the other hand, 2,854 households making up 59.57% the sample have a family size of 4 to 7 members. This shows that the majority of households (almost 60%) have between four to seven members. In this category, the distribution of resources is likely to be more balanced. Families in this range might still have the capacity to meet each child's nutritional needs, especially if the household is economically stable. Moreover, there are 1,099 households (22.94%) with a family size of 8 to 12 members. These are relatively larger, and resources are more likely to be stretched in these families and children in such households likely to face a greater risk of malnutrition or stunting due to limited food and healthcare resources per child, especially if the household is not wealthy.

Furthermore, 213 households in the sample (4.45%) are reported to have a family size of 12 to 20 members. Although a small portion of the sample, these families are likely to experience significant resource constraints, making it challenging to provide adequate nutrition for all children under five. Lastly, there are 78 (1.63%) households have reported a family size of more than 20 members. Although very small, children in such households are likely to be at a high risk for nutritional deficiencies due to extreme competition for resources.

In summary, most children under the age of five live in households with 4 to 7 members, where nutritional resources may be more accessible on a per-child basis. However, in the 23% of households with 8 to 12 members and the additional 6% with more than 12 members, the competition for resources increases, potentially putting young children at higher risk for undernutrition and affecting overall health outcomes.

Table 4.6: Frequency distribution of Household Size

Household size	**Frequency**	**Percent**
Below 3	547	11.42
4 to 7	2854	59.57
8 to 12	1099	22.94
12 to 20	213	4.45
20 and above	78	1.63
Total	4791	

Source: Own computation using TDHS (2022)

Table 4.7 provides the summary statistics of the distribution on the education level of parents/caregivers. As can be seen from this table, almost one-quarter of the individuals in the sample cannot read at all. This lack of literacy could impact their understanding of nutritional guidelines, healthcare practices, and resources for young children, potentially affecting the health and nutrition of children in these households. A small portion of the sample (7.87%) can read parts of a sentence but may have limited comprehension. These individuals might also struggle with written health or nutrition information, which could also impact childcare practices. The majority (67.75%) can read full sentences. This level of literacy is likely to be beneficial for understanding nutrition, healthcare information, and related educational materials, positively influencing children's health and nutrition. A negligible portion of the sample did not have access to materials in a language they understand, which may slightly hinder access to health information. And one individual is blind or visually impaired. Their access to literacy-based health information is limited and may require alternative support.

Table 4.7: Frequency distribution on Literacy rate

Literacy Level	**Frequency**	**Percent**
Cannot read at all	1164	24.30
Able to read only parts of sentence	377	7.87
Able to read whole sentence	3246	67.75
No card with required language	3	0.06
Blind/visually impaired	1	0.02
Total	4791	

Source: Own computation using TDHS (2022)

Therefore, the data presented in Table 4.7 reveals that most individuals (67.75%) are literate enough to read full sentences, suggesting that the majority of caregivers have the literacy skills necessary to understand written information on nutrition, health practices, and childcare. This literacy level could contribute to improved health and nutritional outcomes for children under five. However, nearly one-third of the sample either cannot read at all or has limited reading ability (32.16%), which may hinder their ability to access or understand important nutritional guidelines and healthcare practices.

Efforts to improve child nutrition in this population could benefit from tailored communication strategies, such as using visuals or spoken instructions for those with limited literacy, especially targeting households where caregivers may lack the literacy to fully comprehend written materials.

Descriptive statistics of other independent variables that are believed to affect the feeding habit of infants, consequently affecting the anthropometric measures of children's nutrition discussed in Chapter 3 is provided in Table 4.8.

Table 4.8: Summary on independent variables

Variable	Observation	Mean	Std. dev.
Gender	40,394	0.507	0.30
Breastfeeding Counselling	40,394	0.071	0.26
Vitamin A	40,394	0.074	0.26
Multiple Micronutrient	40,394	0.023	0.15
Breastfeeding	40,394	0.068	0.25

Source: Own computation using TDHS (2022)

Gender: As shown in Table 4.8, 50.7% of the sample are male. Gender is an important variable because it may capture how decision is made related to nutrition issues such as how resources are distributed across the different gender. Sometimes one group may be favoured than other group in gender wise hence cause the difference in nutrition status.

Breastfeeding counselling: As can be seen from the same table, the average value for the variable indicates that 7.1% of the parents have received counselling on breastfeeding. Due to the lower percentage of counselling on breastfeeding indicate that, most of the parents have low information on proper breastfeeding which may cause malnutrition problem to the infants.

Vitamin A: The average value of 0.074 indicates that only 7.4% of the infants received vitamin A supplement. Vitamin A is important for the growth of infants. However, the average in the Table shows that only a small group of the infants have the intake. This might accelerate the nutrition problem among the group of infants who did not take the vitamin.

Multiple micronutrient: The average value is 0.023 and it shows that around 2.3% of the infants have received multiple micronutrient supplement. This also indicates that only small percentage of infant get access to multiple micronutrient supplement which is an indication of lack of proper nutrition among the infants

Breastfeeding: The average value is 0.068 and it indicates that around 6.8% of the infants are breastfeed. This shows that, only small percent of the infants were breastfed which could lead to an increase in malnutrition among the infants due to the lack of proper nutrients from mother's milk.

4.2 Regression results

Table 4.9 provides the OLS regression results for the three outcome variables on child malnutrition indicators: HAZ, WAZ and WHZ estimated with the cetris paribus assumption (controlling for other factors). As shown in this Table, on average under five children from poorer, rich, richer and middle-income family do not seem to have malnutrition problem of stunting and underweight as compared to those from poorest family (the reference category). For the poorer households, the estimated coefficient for HAZ is 0.130, showing no problem of stunting, and statistically significant at the 10% level of significance. Relatedly, the figure for WAZ

Table 4.9: Factors affecting Child nutrition

VARIABLES	(1) HAZ	(2) WAZ	(3) WHZ
Wealth Index Combined			
Poorer	0.130*	0.134**	0.0373
	(0.0749)	(0.0663)	(0.0681)
Middle	0.169**	0.138**	0.0167
	(0.0787)	(0.0697)	(0.0717)
Richer	0.357***	0.271***	0.0557
	(0.0806)	(0.0716)	(0.0736)
Richest	0.615***	0.387***	0.0424
	(0.0941)	(0.0836)	(0.0860)
Husband/partners education level			
No education	-0.164	-0.0556	0.123
	(0.170)	(0.151)	(0.155)
Primary	-0.323**	-0.187	0.0192
	(0.158)	(0.140)	(0.144)
Secondary	-0.206	-0.190	-0.0600
	(0.157)	(0.139)	(0.143)
Don't know	-0.132	-0.423**	-0.350*
	(0.233)	(0.206)	(0.212)
Gave Child Baby formula (Yes)	-0.505**	-0.750***	-0.286
	(0.237)	(0.208)	(0.211)
Breastfeeding counsel	-0.0126	0.160***	0.177***
	(0.0563)	(0.0500)	(0.0514)
Received Vitamin A	0.210***	0.236***	0.259***
	(0.0515)	(0.0456)	(0.0470)
Multiple micronutrients	0.0698	-0.00265	-0.169*
	(0.0970)	(0.0860)	(0.0883)
Breastfeeding dummy	-0.333***	-0.110**	-0.0315
	(0.0624)	(0.0554)	(0.0571)
Gender	-0.148***	-0.0496	0.0185
	(0.0494)	(0.0438)	(0.0451)
Constant	-1.215***	-0.835***	-0.169
	(0.168)	(0.149)	(0.154)
Observations	2,682	2,698	2,700
R-squared	0.053	0.039	0.025

Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Source: Own computation using TDHS (2022)

for the same category of wealth is a positive value of 0.134, indicating no underweight, and statistically significant at the 5% level of significance. Similarly, the middle-income group, the coefficient is statistically significant at the 5% level of significance with a predicted HAZ score of 0.169 and WAZ score of 0.138. Again showing, the group having no significant issue of malnutrition compared to the poorer counterparts. For the richer category, the coefficient is statistically significant at the 1% level of significance with a HAZ score of 0.357 and WAZ score of 0.271 while the predicted coefficient for the richest category is statistically significant at the 1% level of significance with a HAZ score of 0.615 and WAZ score of 0.387. These values suggest

that poorest family mostly suffer from financial problems, which sometimes will hinder sustaining balanced diet, hence making under five children from those families to suffer from malnutrition issues.

Likewise, as shown in Table 4.9, on average under five children from the household with primary and those who don't know their education level seem to have malnutrition problem of stunting, wasting and underweight as compared to those from highest level of education (the reference category). For the primary education, the estimated coefficient for HAZ is -0.323, showing problem of stunting, and statistically significant at the 5% level of significance. Similarly, for those who don't know their education, the coefficient is statistically significance at the 5% level of significance with a predicted WAZ score of -0.423 and WHZ score of -0358. These predicted values suggest that mostly family with lower level of education may possibly lack proper information about infants' malnutrition, which sometimes will hinder sustaining balanced diet, hence making under five children from those families to suffer from malnutrition issues.

On the other hand, as can be seen from Table 4.9, on average under five children who have received baby formula seem to have malnutrition problem of stunting and underweight as compared to those who did not receive (the reference category). For those who receive the baby formula, the estimated coefficient for HAZ is -0.505, showing problem of stunting, and statistically significant at the 5% level of significance. Similarly, the estimated coefficient for WAZ is -0.705, showing problem of underweight. This effect may arise from several reasons such as parents lacking proper knowledge on how to prepare those baby formulas hence make it lack the proper nutrient. In addition, sometimes, the formula can be mixed with unclean water hence caused some problems to the infants.

In contrast, on average, under five children who have received Vitamin A do not seem to have malnutrition problem of stunting, wasting and underweight as compared to those who did not receive (the reference category). For those who received Vitamin A, the estimated coefficient for HAZ is 0.210, showing no problem of stunting, and statistically significant at the 1% level of significance. Relatedly, the figures for WAZ and WHZ for the same effect of Vitamin A intake are positive, 0.236 and 0.259 respectively, indicating no underweight and wasting, and statistically significant at the 1% level of significance. These findings indicate that there is a need for a strong emphasis on the uses of Vitamin A to the infants. Policy design should include policies and programs that ensure improved access to Vitamin A for infants.

Turning to the effect of breastfeeding, the estimated results in Table 4.9 show that on average under five children who are not exclusively breastfeed seem to suffer malnutrition problems of stunting and underweight as compared to those who are exclusively breastfeed (the reference category). For those who are not exclusively breastfeed, the estimated coefficient for HAZ is -0.333, showing problem of stunting, and statistically significant at the 1% level of significance. Relatedly, the figures for WAZ for the same category is -0.110 indicating underweight problem and statistically significant at the 5% level of significance. These results can be accompanied with several reasons such as poor procedures of infants breastfeeding. Therefore, more policy and interventions should be formulated to emphasize provision of proper education to the parents on breastfeeding

Furthermore, as shown in this Table 4.9, on average infants of parents who receive counselling on breastfeeding do not seem to have malnutrition problems of wasting and underweight as compared to those who did not receive (the reference category). For those who receive counselling, the estimated coefficient for WAZ is 0.160, showing no problem of underweight, and statistically significant at the 1% level of significance. Relatedly, the figures for WHZ for the same category is 0.177 indicating no wasting, and statistically significant at the 1% level of significance. These results mainly show the need for provision of more counselling related to breastfeeding that will help to reduce the case of infants' malnutrition, specifically underweight and wasting.

Lastly, reading the effect of gender from the same table, on average under five male children seem to have malnutrition problem of stunting as compared to female (the reference category). For male infants, the estimated coefficient for HAZ is -0.148, showing problem of stunting, and statistically significant at the 1% level of significance.

4.3 Quantile regression

Quantile regression is a statistical technique that allows to estimate the conditional quantiles (such as the median, quartiles, etc.) of the dependent variable, providing a more comprehensive view of the relationship between variables than mean regression alone.

We applied the Shapiro wilk w test for normal data, checking whether our data set are normally distributed or not so as to ensure whether to apply Quantile regression model (see Appendices for details). The tests conducted show that all the three dependent variables are not normally distributed (using a null and alternative hypothesis)[3]. Therefore, the null hypothesis is rejected in all the three cases since all p-values across the dependent variables are less than the 5% level of significance. Hence it shows that the data set does not follow normality in distribution. We, therefore applied quantile regression to accommodate for the non-normal distribution.

Table 4.10 provides the results on quantile regression which takes stunting-HAZ as an outcome. As can be seen this table, on average under five children from poorer, rich, richer and middle-income family do not seem to have malnutrition problem of stunting as compared to those from poorest family (the reference category) and results differ across the quantiles. For the poorer households, the estimated coefficient for HAZ is 0.20 at q25, showing no problem of stunting, and statistically significant at the 5% level of significance. Relatedly, the figure for HAZ for the same category of wealth in q50 is a positive 0.167, indicating no stunting, and statistically significant at the 10% level of significance. Similarly, the middle-income group, the coefficient is statistically significance at the 5% level of significance with a predicted HAZ score of 0.230 in q25 and 0.227 in q50 Again showing, the group having no significant issue of malnutrition compared to the poorer counterparts. For the richer category, the coefficient is statistically significant at the 1% level of significance with a HAZ score of 0.510 in q10, 0.430 in q25 and 0.387 in q50 while the predicted coefficients for the richest category are statistically significance at the 1% level of significance with a HAZ score of 0.98 for q10, 0.82 for q25 and 0.587 for q50.

[3] Where the null hypothesis states that the dependent variable is normally distributed and alternative hypothesis is the dependent variable is not normally distributed.

Table 4.10: Quantile regression results for HAZ

	HAZ		
VARIABLES	q10	q25	q50
Wealth Index			
Poorer	0.190	0.200**	0.167*
	(0.139)	(0.0928)	(0.0876)
Middle	0.190	0.230**	0.227**
	(0.146)	(0.0975)	(0.0921)
Richer	0.510***	0.430***	0.387***
	(0.150)	(0.0999)	(0.0943)
Richest	0.980***	0.820***	0.587***
	(0.175)	(0.117)	(0.110)
Husband/partner education level			
No education	-0.220	-0.300	-0.313
	(0.315)	(0.211)	(0.199)
Primary	-0.320	-0.360*	-0.403**
	(0.293)	(0.195)	(0.184)
Secondary	-0.250	-0.300	-0.280
	(0.291)	(0.194)	(0.183)
Don't know	-0.360	0.0400	-0.0167
	(0.432)	(0.288)	(0.272)
Give child baby formula			
Yes	-0.530	-0.590**	-0.283
	(0.441)	(0.294)	(0.278)
Breastfeeding counsel	-0.0400	-0.0700	-0.0467
	(0.105)	(0.0698)	(0.0659)
Received Vitamin A	0.0300	0.150**	0.280***
	(0.0956)	(0.0638)	(0.0602)
Multiple micronutrients	0.320*	0.130	-0.0433
	(0.180)	(0.120)	(0.113)
Breastfeeding dummy	-0.220*	-0.290***	-0.333***
	(0.116)	(0.0773)	(0.0730)
Gender	-0.200**	-0.220***	-0.133**
	(0.0916)	(0.0612)	(0.0578)
Constant	-2.770***	-1.930***	-1.187***
	(0.312)	(0.208)	(0.197)
Observations	2,682	2,682	2,682

Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Source: Own computation using TDHS (2022)

Looking at the same table we find that on average under five children from households with primary education seem to have malnutrition problem of stunting, as compared to those from highest level of education (the reference category) and results differ across the quantiles. For the primary education, the estimated coefficient for HAZ is -0.360 in q25, showing problem of stunting, and statistically significant at the 10% level of significance. Similarly, in the q50 the coefficient is statistically significance at the 5% level of significance with a predicted HAZ score of -0.403. As in the case for the effect of wealth groups, the results in the quintile regression confirm the estimates from the OLS regression presented in Table 4.9.

In contrast, as shown in Table 4.10, on average under five children who received baby formula seem to suffer malnutrition problem of stunting as compared to those who did not receive (the reference category) and the result is strong for q25. For those who receive baby formula, the estimated coefficient for HAZ is -0.590 for q25, showing problem of stunting, and statistically significant at the 5% level of significance. On the other hand, as indicated in Table 4.10, on average under five children who received Vitamin A do not seem to have malnutrition problem of stunting, as compared to those who did not receive (the reference category) and results differ based on quantiles. For those who receive Vitamin A, the estimated coefficient for HAZ is 0.150 for q25, showing no problem of stunting, and statistically significant at the 5% level of significance. Likewise, the figures for HAZ for q50 for the same intake of Vitamin A is positive 0.280 indicating no stunting and statistically significant at the 1% level of significance. Similarly, on average, under five children who receive multiple micronutrients do not seem to have malnutrition problem of stunting, as compared to those who did not receive (the reference category) and results differ based on quantiles. For those who receive multiple micronutrients, the estimated coefficient for HAZ is 0.320 for q10, showing no problem of stunting, and statistically significant at the 10% level of significance.

Turning to the effect of breastfeeding, on average, under five children who are not exclusively breastfeed seem to suffer from malnutrition problem of stunting as compared to those who are exclusively breastfeed (the reference category) and results differ based on quantiles. For those who are not exclusively breastfeed, the estimated coefficient for HAZ is -0.22 for q10, showing problem of stunting, and statistically significant at the 10% level of significance. Relatedly, the figures for HAZ for the same category in q25 and q50 are -0.290 and -0.33 indicating stunting problem, and statistically significant at the 1% level of significance.

Looking at the effect of gender, as shown in Table 4.10, on average under five male children seem to have malnutrition problem of stunting as compared to female (the reference category). For male infants, the estimated coefficient for HAZ is -0.200 for q10, and statistically significant at the 5% level of significance and that for q25 and q50 are -0.220 and -0.133 respectively and both are statistically significant at the 1% level of significance, indicating a more pronounced problem of stunting among male children than female children.

All the estimated results from the quantile regression on stunting confirm the results from the OLS regression.

Table 4.11: Quantile regression results for WAZ

	WAZ		
VARIABLES	q10	q25	q50
Wealth Index			
Poorer	0.140	0.197**	0.110
	(0.134)	(0.0803)	(0.0763)
Middle	0.290**	0.0979	0.0700
	(0.141)	(0.0845)	(0.0802)
Richer	0.440***	0.296***	0.250***
	(0.145)	(0.0867)	(0.0823)
Richest	0.405**	0.484***	0.400***
	(0.169)	(0.101)	(0.0962)
Husband/partners education level			
No education	0.0500	-0.144	-0.110
	(0.306)	(0.183)	(0.174)
Primary	-0.110	-0.194	-0.170
	(0.284)	(0.170)	(0.161)
Secondary	-0.175	-0.221	-0.210
	(0.282)	(0.169)	(0.160)
Don't know	-0.650	-0.591**	-0.330
	(0.417)	(0.249)	(0.236)
Gave Child Baby formula			
Yes	-0.410	-0.376	-0.530**
	(0.421)	(0.252)	(0.239)
Breastfeeding counsel	0.01000	0.0271	0.200***
	(0.101)	(0.0605)	(0.0575)
Received Vitamin A	-0.0200	0.175***	0.280***
	(0.0925)	(0.0553)	(0.0525)
Multiple micronutrients	0.145	-0.0929	-0.0800
	(0.174)	(0.104)	(0.0989)
Breastfeeding dummy	0.0800	-0.109	-0.130**
	(0.112)	(0.0671)	(0.0638)
Gender	-0.160*	-0.0821	-0.0400
	(0.0887)	(0.0530)	(0.0504)
Constant	-2.180***	-1.394***	-0.810***
	(0.303)	(0.181)	(0.172)
Observations	2,698	2,698	2,698

Standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Source: Own computation using TDHS (2022)

Table 4.11 presents the results from a quantile regression on underweight-WAZ. As shown in the table, on average under five children from poorer, rich, richer and middle-income family do not seem to have malnutrition problem of underweight as compared to those from poorest family (the reference category) and results differ across the quantiles. For the poorer households, the estimated coefficient for WAZ is 0.197 for q25, showing no problem of underweight, and statistically significant at the 5% level of significance. Similarly, the middle-income group, the coefficient is statistically significance at the 5% level of significance with a predicted WAZ score of 0.290 for q10 again showing the middle-income group do not have significant issue of malnutrition compared to the poorest counterparts. For the richer category, all the coefficients are statistically significant at the 1% level of significance with a WAZ score of 0.44 for q10, 0.296 for q25 and 0.250 for q50. Likewise, the coefficients estimated for the richest category are statistically significance at the 1% level of significance with a WAZ score of 0.405, 0.484 and 0.40 for q10, q25 and q50 respectively. Once again, the results on wealth ranking confirm that under five children from poorest households suffer from underweight than those children from the other four wealth groups.

In parallel, as shown in Table 4.11, on average infants from parents who received counselling on breastfeeding do not seem to have malnutrition problem of underweight as compared to those from parents who did not receive the counselling (the reference category). For those who receive counselling, the estimated coefficient for WAZ is 0.20 for q50, showing no problem of underweight, and statistically significant at the 1% level of significance.

On the same line, on average under five children who receive Vitamin A do not seem to have malnutrition problem of underweight as compared to those who did not receive (the reference category) and results differ based on quantiles. For those who receive vitamin a , the estimated coefficient for WAZ is 0.175 in q25, showing no problem of underweight, and statistically significant at the 1% level of significance. Relatedly, the figures for WAZ in q50 for the same category of vitamin a is positive 0.280 indicating no underweight problem and statistically significant at the 1% level of significance.

Although surprising, the estimated effects for intake of baby formula shown in Table 4.11 who that, on average, under five children who received baby formula seem to suffer malnutrition problem of underweight as compared to those who did not receive (the reference category). The result is strong for q50. The estimated coefficient for WAZ is -0.53 for q50, showing problem of underweight and statistically significant at the 5% level of significance.

As expected, on average under five children who are not exclusively breastfeed seem to have malnutrition problem of underweight as compared to those who are exclusively breastfeed (the reference category). For those who are not exclusively breastfed, the estimated coefficient for WAZ is -0.130 for q50, showing problem of underweight, and statistically significant at the 5% level of significance.

Likewise, on average under five male children seem to have malnutrition problem of underweight as compared to female counterparts (the reference category). For male infants, the estimated coefficient for WAZ is -0.16 for q10, showing problem of underweight, and statistically significant at the 10% level of significance.

As in the case for the quantile regression on stunting, the results from quantile regression of underweight confirm the findings from the OLS regression.

Table 4.12: Quantile regression results for WHZ

	WHZ		
VARIABLES	q10	q25	q50
Wealth Index			
Poorer	0.0300	0.110	-0.0200
	(0.126)	(0.0785)	(0.0781)
Middle	0.0450	-0.0300	-0.0367
	(0.132)	(0.0826)	(0.0822)
Richer	0.0450	0.0700	0.0500
	(0.136)	(0.0848)	(0.0844)
Richest	0.0300	-0.0600	-0.0433
	(0.159)	(0.0990)	(0.0985)
Husband/partner education level			
No education	0.390	0.150	-0.0133
	(0.286)	(0.179)	(0.178)
Primary	0.140	1.19e-07	-0.0600
	(0.266)	(0.166)	(0.165)
Secondary	-0.0250	-0.120	-0.123
	(0.265)	(0.165)	(0.164)
Don't know	-0.255	-0.590**	-0.520**
	(0.390)	(0.244)	(0.243)
Give child baby formula			
Yes	-0.105	-0.0900	-0.170
	(0.388)	(0.243)	(0.241)
Breastfeeding counselling	0.0650	0.150**	0.257***
	(0.0948)	(0.0592)	(0.0589)
Received Vitamin A	-0.1000	0.0800	0.227***
	(0.0867)	(0.0542)	(0.0539)
Multiple micronutrients	-0.235	-0.120	-0.0533
	(0.163)	(0.102)	(0.101)
Breastfed	0.0600	0.0500	-0.0333
	(0.105)	(0.0658)	(0.0655)
Gender	-0.00500	0.01000	0.0233
	(0.0831)	(0.0519)	(0.0516)
Constant	-1.520***	-0.820***	-0.0667
	(0.283)	(0.177)	(0.176)
Observations	2,700	2,700	2,700

Standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Source: Own computation using TDHS (2022)

Table 4.12 provides the results from a quantile regression on the outcome of wasting-WHZ. As opposed to stunting and underweight, only few variables are found to be significant predictors of wasting. For instance, on average infants of parents who receive counselling on breastfeeding do not seem to have malnutrition problem of wasting as compared to those who did not receive (the reference category). For those who receive counselling, the estimated coefficient for WHZ is 0.150 for q25, showing no problem of wasting, and statistically significant at the 5% level of significance. Relatedly, the figures for WHZ for q50 for the same category is positive 0.257 indicating no wasting problem and statistically significant at the 1% level of significance. In contrast, on average infants from parents who do not know their education level suffer from problems of wasting compared to those with high level of education.

Another significant predictor is intake of Vitamin A. As shown in Table 4.12, on average under five children who receive Vitamin A do not seem to have malnutrition problem of wasting, as compared to those who did not receive (the reference category). For those who receive Vitamin A, the estimated coefficient for WHZ is 0.227 for q50 and statistically significant at the 1% level of significance, showing no problem of wasting.

Discussions of main findings

The contribution of demographic factors of caregivers/parents to malnutrition

The findings suggest that some of the variation in malnutrition of children under the age of five is explained by caregiver demographics, indicating that while these factors are significant, other unexamined factors would likely play a critical role. So, resources should be allocated towards comprehensive nutritional interventions that consider a broader range of socio-economic, environmental, and health factors affecting child nutrition. A multi-sectoral approach involving health, education, and economic sectors is essential for addressing malnutrition effectively. Collaborative efforts can help mitigate the impact of adverse demographic factors. Continuous monitoring and evaluation of malnutrition trends in relation to demographic changes can help identify emerging patterns and inform timely interventions. This aligns with the result from Yimer (2000), in the study on infants malnutrition conducted in the Southern Ethiopia, discovered that demographic and social economic factors are associated more with infants malnutrition particularly stunting ,wasting and underweight.

Therefore, given that specific demographic factors significantly impact malnutrition, targeted interventions should focus on modifying these factors, such as improving education for caregivers, increasing household income, or providing nutritional education. Policymakers should consider the identified significant predictors in formulating policies aimed at reducing malnutrition rates among children under five. This could involve increasing access to healthcare, nutrition programs, and resources for families. Should implement programs that address multiple factors simultaneously, such as education on nutrition and health, support for economic stability, and community health initiatives. Similarly, additional research is needed to explore the underlying mechanisms of how these demographic factors contribute to malnutrition. This could include qualitative studies to understand caregiver behaviors and practices related to child nutrition.

The finding indicated that wealth influenced more infant nutrition status. For the higher income category shows, the infants who are from wealth family are associated with better HAZ score and

WAZ score hence will not be affected by malnutrition issues specifically stunting and underweight, as compared to those who are from low-income family. This findings align with the study from Utami, R., & Valen, P (2020) the main indication is the child from the wealth family subjected to proper and health food as well as health care which make them free from malnutrition issues as compared to the infants who are from poor family, this shows the association between the level of economy in a family and nutrition status of under 5.

Regarding the effect of gender, the results show that male children are more subjected to malnutrition problem specifically stunting due to the lower HAZ score compared to female children. This can be due to the difference in social economic status and health inequality as it is explained in the literature review presented in Chapter two. This aligns with the findings from a study conducted by Wamani et al. (2007) which considered different African countries including Tanzania. The findings show that stunting problem was mostly common in male infants than female infants and the main reason is the difference in social economic status as well as health inequality which cut across the male infants.

Multiple studies emphasize that caregiver education significantly impacts child malnutrition. For instance, a study by Smith and Haddad (2015) showed that caregivers with higher levels of education are more likely to have access to nutritional knowledge, which positively affects child feeding practices and reduces rates of malnutrition. Similarly, Rahman et al. (2016) found that caregivers' literacy levels are inversely related to stunting and underweight rates among children in rural Bangladesh, suggesting that nutrition education should be an essential component of intervention programs.

The influence of breastfeeding counselling on the nutrition status of children

The findings suggest that breastfeeding counseling has a meaningful impact on reducing stunting and underweight among children under five, while Vitamin A supplement is crucial in improving overall nutritional status emphasizing the critical role of breastfeeding counseling and Vitamin A supplements in enhancing the nutritional status of children under five. Significant associations were found between these interventions and improved growth outcomes, particularly in reducing prevalence of stunting and underweight.

The impact of breastfeeding counselling on improving child nutrition has been confirmed by studies indicating its effectiveness in promoting breastfeeding practices that mitigate malnutrition risks. Bhandari et al. (2008) found that breastfeeding counselling sessions significantly increased exclusive breastfeeding rates and improved weight and growth outcomes among infants in low-income settings. This aligns with findings by Tylleskar et al. (2011), who showed that communities with structured breastfeeding support programs had higher exclusive breastfeeding rates and fewer cases of stunting and underweight in children, supporting the view that breastfeeding counseling is essential in child health programs.

Therefore, health programs should incorporate comprehensive breastfeeding support and vitamin A supplementation as core components of child health strategies. Should increase awareness about the importance of breastfeeding and nutritional supplementation among caregivers and communities to foster better health practices for children. Should design and implement targeted interventions for vulnerable populations, especially for families with male children, to address the

identified disparities in nutritional outcomes. Also, more in-depth research is needed to explore additional factors influencing child nutrition, including cultural practices, access to healthcare, and family dynamics.

CHAPTER 5
CONCLUSION AND RECOMMENDATIONS

5.1 Summary of the study

The main objective of the study was to investigate the contribution of feeding habits to nutrition status of children under the age of five in Tanzania. Specifically, the study aimed to analyze the contribution of demographic factors of caregivers/parents, to examine the influence of breastfeeding counseling, and to examine the influence of parent/caregiver's literacy rates on the nutrition status of children under five. The study employed Health Belief Model theory and Social cognitive theory to gain insight on the relationship between feeding habits of caregivers/ parents to the nutrition status of children. This research used causality research design with a view of determining causality between the variables under study, a design is employed to establish the nature of the relationship variables in the study. Sample population includes under five year's children, from all over the Tanzania households, the survey of the TDHS 2022 reached 40,394 households with at least one child below the age of five. Data for this study were obtained from the Tanzania Demographic Health Survey of 2022 conducted by the National Bureau of Statistics in collaboration with the Ministry of Health. The feeding habits and nutritional status of children under five years were tested for correlation using Ordinary Least Squares (OLS) technique. Also, the study integrated quantile regression to perform a robust check on the results.

5.2 Conclusion of the study

The aim of this study is to investigate how feeding habit affect the infant's nutrition in Tanzania. The main focus is how social economic factors, feeding habit factors as well as demographic factors associate with main anthropometric indicators which used to measure the infant's nutrition level. The data from Tanzania demographic health survey of 2022 were used and analyzed through application of quantile regression model and simple regression model.

5.2.1 The contribution of demographic factors of caregivers/parents to malnutrition among children under five

Based on the results found by the study, the study concluded that there is relationship between wealth status, gender of the infants and malnutrition. Improved nutritional status is observed in equal higher level of wealth since bigger wealth provides ability to buy enough food while large families add pressure in the availability of resources and as a result increases the susceptibility to malnutrition. Also, the study concluded that male children are affected slightly differently with nutrition issues, this implying that there could be gender issues in terms of feeding or access to micronutrients. Furthermore, the study concluded that there is need for unique interventions that targeted demographic issues, for example, the better support programs for low-income households and nutrition education especially for families with many members. The study results indicate that adopting multi-sectoral programs that target the economic and socially related determinants of child nutrition is important. The demographic vulnerability affects the children in the societies, there should be policies that enhance the availability of economic resources and nutrient support for the children to counter the impacts of the vulnerabilities. Although demographic variables considerably contribute to malnutrition, they account for only a limited variation, suggesting that

other unrecognized factors, including cultural factors and community resources, might also be relevant. Problems like these should be addressed in future research through additional quantitative and qualitative studies to investigate the care givers' knowledge and behavior.

5.2.2 The influence of breastfeeding counseling on the nutrition status of children under five

The study found out that breastfeeding counseling has a positive influence on minimizing stunting and underweight in early age children, this indicate that it is effective in improving the nutritional results. Also, it was found that Vitamin A supplementation proved the increased nutritional value connected to improved child health a promising factor alongside breastfeeding counsel to boost nutrition. Furthermore, the study pointed out that counselling for breastfeeding may not be adequately sufficient without the help of other domains such as economic and healthcare stability. The findings presented also point to the need to incorporate breastfeeding counseling and Vitamin A supplementation interventions in the public health interventions focused on child nutritional status. The findings shows that community awareness campaigns and counseling sessions for caregivers could improve these interventions especially in low resource contexts. However, because this study relied solely on the quantitative means, some factors may go unnoticed such as the breastfeeding practices of patient and their social support system. Thus, the study suggests for mixed method approaches that would include the existing trends in breastfeeding from a social and cultural perspective. Moreover, examining the trends in the nutrition outcome following the initiation of breastfeeding counseling among mothers and young children beyond early childhood might be useful.

5.3 Implications of the study

The research findings have implications that are useful in practice, inform policy, and contribute to knowledge in tackling child malnutrition. In practice, the achievements concern the need for the focused interventions that foster caregivers in the low-income households stressing on the counseling on the breastfeeding, the proper Vitamin a supplementation and on the free and the culturally appropriate educative materials for the different literacy levels. From a policy perspective, the study recommends multi-sectoral approach with Health, education and economic development program to adopt Kids nutrition as strategy to enhance outcomes for the vulnerable group. On the academic side, the research contributes original knowledge in the delicate interconnectivity of demographic factors, the literacy of caregivers, and nutritional results and recommends the continuation of research into social and culture determinants of childhood wellbeing. By leveraging this kind of integrated structure of practice, policy and research, there will be a positive shift in child nutrition and health.

5.4 Recommendations

From the discussion of the findings and conclusion reached, the study draws various recommendations to stakeholders involved in nutrition landscape.

The study recommends enhanced supportive network. This involves policymakers to create interventions such as income generating activities and nutritional supplements targeting the low-income households. The network that provides requisite support regarding necessary resources

can improve the possibilities of managing poverty within the households to lower the risks of the improper quality of food and healthcare also decreases.

Also, the study recommends strengthening breastfeeding and nutritional counseling programs, this means that education activities should include a comprehensive counseling for breastfeeding and Vitamin A supplementation as the basic to be included in health programs. Some of these programs should be on mobilization of the community to educate the caregivers or parents on the benefits of breastfeeding. Additionally, since the study determined that caregivers/parents' literacy play a key role for the parents or caregiver to access feeding information; the study recommends for stakeholders to ensure that the health education materials available to them to enhance their literacy levels. Pictures, models, and stories during the use of community-based promulgation sessions and local aerobic can be employed to boost sharing of information of feeding practices message to all the caregivers with literacy limitations.

Moreover, the study recommends fostering cross-sectoral collaboration which involve developing good and sustainable child nutrition policies that can involve the use of health, education and economic sectors. Multi sectoral approaches can address the several antecedents of malnutrition such as knowledge of the caregiver, income level and health care. Additionally, the stakeholders should establish continuous monitoring and evaluation: Therefore, the importance of carrying out regular assessments of the nutritional situation and the demographics, cannot be overemphasized to enhance the implementation of nutritional interventions.

5.5 Suggestions: Areas for further studies

Future research could attempt to better understand caregivers' cultural beliefs and social norms that explain their behaviors around feeding young children so as to have enhanced information on determinants of feeding practices in different cultures. Also, the future study should conduct a longitudinal impact of breastfeeding counseling and nutritional support. This involves long-term health interventions regarding breastfeeding counseling, Vitamin A and other relevant nutritional supports to children could provide more understanding regarding long-term impacts of such intervention on child health and development. Moreover, future study should further investigation of how and to what extent digital literacy of caregivers influences access to and comprehension of digital health information should be carried out as virtual health assets continue to emerge, especially in the rural and remote regions.

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Appendices

Appendix I -Test for Normal Data

Appendix 1-1: Shapiro–Wilk W test for normal data HAZ

VARIABLE	OBS	W	V	Z	Prob>z
HAZ	4807	0.99	23.12	8.23	0.000

Note: The normal approximation to the sampling distribution of W'

is valid for 4<=n<=2000.

Appendix 1-2: Shapiro–Wilk W test for normal data WAZ

VARIABLE	OBS	W	V	Z	Prob>z
WAZ	4833	0.99	23.15	8.28	0.000

Note: The normal approximation to the sampling distribution of W'

is valid for 4<=n<=2000.

Appendix 1-3: Shapiro–Wilk W test for normal data WHZ

VARIABLE	OBS	W	V	Z	Prob>z
WHZ	4834	0.99	13.347	6.792	0.0000

Note: The normal approximation to the sampling distribution of W'

is valid for 4<=n<=2000.

Null hypothesis is variables follow normality in distribution

Alternative hypothesis is variables does not follow normality in distribution

P-values is less than 0.005, Therefore null hypothesis is rejected.