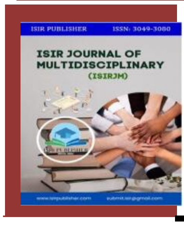

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FOOD INSECURITY AMONG MOTHERS WITH INFANTS LESS THAN 12 MONTHS IN VILLAGES AT MAGUNGA WARD IN KOROGWE DISTRICT, TANGA TANZANIA.

By

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Abstract

Background: *Food insecurity poses a significant public health challenge in rural Tanzania, particularly for mothers with infants under 12 months, contributing to maternal malnutrition and poor infant growth outcomes like stunting and wasting. In Korogwe District, Tanga Region, socio-demographic and economic factors exacerbate these issues, yet specific data on household food insecurity and maternal dietary practices remain limited.*

Aim of the Study: *This study aimed to assess household food insecurity among mothers with infants under 12 months in Magunga ward, Korogwe District, from 14 to 25 July 2025. It sought to determine food intake frequency and diversity, estimate food insecurity prevalence, and identify associated socio-demographic and economic factors to inform targeted nutritional interventions.*

Methods: *A cross-sectional study with a quantitative approach was conducted, involving 265 mothers selected via stratified random sampling. Data were collected using a 24-hour food frequency recall questionnaire and the Household Food Insecurity Access Scale (HFIAS). Descriptive statistics and logistic regression were performed using SPSS version 25 to analyze dietary patterns, food insecurity prevalence, and associated factors.*

Results: *Findings revealed that 40% of households experienced food insecurity (24.9% mild, 14.0% moderate, 1.1% severe). Most mothers consumed two to three meals daily, but dietary diversity was low, with limited intake of nutrient-rich foods (e.g., milk: 20%, eggs: 15.5%). Food insecurity was significantly higher in single/divorced mothers, low-income households (<50,000 TZS), unemployed mothers, and those with no formal education.*

Discussion: *The study on mothers with infants under 12 months found that 40% of households were food insecure, largely driven by socio-economic factors such as low income, reliance on farming, unemployment, limited education, larger household sizes, and lack of social support. This study also revealed low dietary diversity, with diets dominated by staples and limited consumption of nutrient-rich foods, posing risks to maternal and infant health. Similarly, Randell et al. (2022) identified a high prevalence of food insecurity but linked it to climate variability, showing that particularly dry and cool growing seasons increase the risk of food insecurity by among households with fewer working-age members.*

Conclusion: *Food insecurity in Korogwe District disproportionately affects mothers with infants, particularly those who are single or divorced, belong to low-income households earning less than 50,000 TZS, are unemployed, or lack formal education.*

Recommendations: *Implement nutritional education, expand food assistance, promote income-generating activities, and support diverse crop production.*

CHAPTER ONE

1.0 INTRODUCTION

1.1 Background to the Problem

Food insecurity, defined as Lack of access to sufficient, safe, and nutritious food, is vital for maternal and infant health,

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impacting breastfeeding practices, child growth, and overall nutritional status (Coleman-Jensen et al., 2022). Lack of food security leads to malnutrition, poor health outcomes, and developmental challenges in infants, particularly affecting mothers whose nutritional status directly influences their ability to care for and feed their infants. Globally, food insecurity affects millions, with women and children being especially vulnerable due to economic and social disparities (Grimaccia & Naccarato, 2022). In 2023, approximately 733 million people, or 9.2% of the global population, faced hunger, while 2.33 billion people, or 28.9%, experienced moderate or severe food insecurity (FAO, 2024). This global burden highlights the need to focus on specific populations, such as mothers with infants under 12 months, to address their unique nutritional challenges. This study will examine existing research and interventions to identify gaps in addressing food insecurity in this group.

Globally, food insecurity significantly impacts maternal and infant health. Research by Tarasuk et al. (2020) in Canada found that maternal food insecurity is linked to postpartum mental disorders, hindering caregiving and infant feeding practices. Similarly, a study by Hamadani et al. (2020) in Bangladesh showed that COVID-19 restrictions worsened food insecurity, reducing dietary diversity among women and children. In 2023, 900 million people globally faced severe food insecurity, with women and young children disproportionately affected due to limited resource access (FAO, 2024). The World Health Organization (WHO) has implemented interventions such as promoting nutrition-sensitive agriculture and social protection programs to improve food access, emphasizing maternal and child nutrition (WHO, 2023). However, global research often focuses on general populations or older children, with limited attention to mothers with infants under 12 months. The specific dietary needs and feeding practices of this group, critical for infant growth, require targeted investigation to address this gap (Belayneh et al., 2020).

In Africa, food insecurity is a major challenge, particularly in rural areas reliant on agriculture. A study by Belayneh et al. (2020) in Ethiopia found that seasonal variations in food availability contribute to household food insecurity, leading to child stunting and wasting. In 2023, 58.0% of Africa's population, or approximately 790 million people, faced moderate or severe food insecurity, nearly double the global average (FAO, 2024). In Sub-Saharan Africa, 12% of the population, or 123 million people, were acutely food insecure in 2022, driven by climate change, conflicts, and economic shocks (IMF, 2022). Interventions in Africa include the African Union's Comprehensive Africa Agriculture Development Programme (CAADP), which promotes climate-resilient farming practices and market access to enhance food security (African Union, 2022). Despite these efforts, much of the research focuses on children beyond 12 months or general household food security, with less emphasis on mothers with infants under 12 months, whose nutritional needs for breastfeeding are critical. This gap calls for focused studies in African contexts.

In Tanzania, food insecurity remains a significant issue, particularly in rural areas like Korogwe District. As of May 2022, 5.3 million people, or 9.4% of Tanzania's population, faced insufficient food consumption due to prolonged dry spells, high food prices, and low household purchasing power (AGRA Africa, 2022). Between November 2023 and April 2024, approximately 900,000 people, or 13% of the analyzed population in 21 district councils, experienced high levels of acute food insecurity (IPC Phase 3 or above) (IPC, 2023). Research by Randell et al. (2022) showed that climatic conditions, such as droughts, reduce household food security, impacting dietary diversity and child nutrition. A study by Mchome et al. (2020) in southeastern Tanzania found that mothers' limited resources and knowledge hinder adequate infant nutrition. Tanzania's national policies, such as the National Food and Nutrition Policy (2016), promote nutrition education, agricultural productivity, and social protection programs to address food insecurity (United Republic of Tanzania, 2016). However, these studies and interventions do not specifically address the frequency and diversity of food intake among mothers with infants under 12 months or the prevalence of food insecurity in their households in Korogwe District, highlighting the need for targeted research.

Household food insecurity is closely tied to socio-demographic and economic factors, such as income, education, and household size. The Social Determinants of Health (SDH) theory guides this study, explaining how social and economic conditions influence health outcomes, including food security (Marmot & Wilkinson, 2006). In Tanzania, low-income households spend approximately 65–70% of their income on food, yet malnutrition persists, particularly in rural areas (Mbwana et al., 2024). Research by Assenga and Kayunze (2020) in Chamwino District found that low income and limited education restrict access to diverse foods, exacerbating food insecurity. The Sustainable Development Goals (SDGs), particularly SDG 2 (Zero Hunger), guide global and Tanzanian efforts through initiatives like nutrition-sensitive agriculture and social safety nets to improve food access (FAO, 2024). Studies by Santoso et al. (2021) noted that nutrition-sensitive interventions improve dietary diversity but often fail to address underlying economic barriers, emphasizing the need for comprehensive approaches.

The SDH theory highlights how poverty, education, and gender dynamics affect food access and maternal health. A study by DiClemente et al. (2021) in Tanzania showed that food insecurity influences fertility preferences, indicating broader impacts on family planning and maternal well-being. With 59% of Tanzanian households unable to afford a nutritious diet, the nutritional challenges faced by mothers with infants under 12 months are critical (WFP, 2022). However, there is limited research on how these factors specifically affect this group in terms of food intake frequency and diversity in Korogwe District. Interventions by WHO, Tanzania's national policies, and SDG-driven programs provide a foundation, but their impact on this specific population remains underexplored. This study addresses this gap by examining how socio-demographic and economic

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factors contribute to food insecurity among mothers with infants under 12 months in Korogwe District, using the SDH theory as a framework.

1.2 Problem statement

Food insecurity among mothers with infants under 12 months in Korogwe District, Tanga Region, Tanzania, is a critical public health issue, yet its prevalence and contributing factors remain poorly understood. Research by Mchome et al. (2020) in southeastern Tanzania indicates that food insecurity impairs maternal breastfeeding capabilities, leading to poor infant growth outcomes, such as stunting and wasting. Despite these findings, there is a lack of specific data on the prevalence of household food insecurity among mothers with infants under 12 months in Korogwe District. Furthermore, limited information exists on the frequency and diversity of food intake in this group, creating a significant knowledge gap that hinders the development of effective interventions. This problem directly impacts maternal health and infant development, as inadequate nutrition can lead to malnutrition and long-term health issues, such as iron deficiency anemia, as noted by Lweno et al. (2021) in Dar es Salaam, Tanzania.

Efforts to address food insecurity in Tanzania and globally have included various interventions aligned with the World Health Organization (WHO), Tanzania's national policies, and the Sustainable Development Goals (SDGs). The WHO promotes nutrition-sensitive agriculture and social protection programs to improve food access, emphasizing maternal and child nutrition as part of its Global Nutrition Targets for 2025 (WHO, 2023). For instance, WHO supports training health workers and providing nutrition equipment to enhance maternal and child health outcomes in Tanzania (WFP, 2022). Tanzania's National Food and Nutrition Policy (2016) focuses on improving agricultural productivity, promoting nutrition education, and implementing social protection programs to address food insecurity, particularly in rural areas (United Republic of Tanzania, 2016). Additionally, the African Union's Comprehensive Africa Agriculture Development Programme (CAADP) promotes climate-resilient farming and market access to enhance food security across the continent, including Tanzania (African Union, 2022). The Sustainable Development Goals, particularly SDG 2 (Zero Hunger), guide these efforts by promoting sustainable agriculture, supporting smallholder farmers, and ensuring equitable access to nutritious food (FAO, 2024).

Despite these interventions, many programs, such as those described by Santoso et al. (2021) in rural Tanzania, which implemented agroecology interventions to improve dietary diversity, target broader populations and do not specifically address the needs of mothers with infants under 12 months. Research by Masuke et al. (2021) in urban Moshi, Tanzania, highlighted that inappropriate feeding practices persist due to economic constraints, but similar studies focusing on Korogwe District are absent. The lack of targeted interventions for this demographic leaves their specific nutritional needs unaddressed, limiting the effectiveness of existing strategies. Without a clear understanding of the socio-demographic and economic factors driving food insecurity in this group, solutions remain incomplete and fail to address the unique challenges faced by these mothers.

If this problem is not addressed, the consequences could be severe for both mothers and infants in Korogwe District. Studies by Meyer et al. (2023) in Mwanza, Tanzania, suggest that food insecurity exacerbates health challenges, including mental health issues and poor child growth. Similarly, Mrema et al. (2021) in Kilosa District, Tanzania, found that food insecurity contributes to malnutrition, stunting, and developmental delays among infants. In Tanzania, 31% of children under five are stunted, and 59% of households cannot afford a nutritious diet, underscoring the urgency of this issue (WFP, 2022). Failure to investigate food insecurity in Korogwe District may perpetuate these adverse outcomes, undermining progress toward SDG 2 and national health goals.

1.3 Objectives of the Study

1.3.1 Broad Objective of the Study

Assessment of household food insecurity among mothers with infants under 12 months at Magunga ward in Korogwe District, Tanga Region, from 14 July to 25 July 2025.

1.3.2 Specific Objectives

i. To determine the frequency and diversity of food intake among mothers with infants under 12 months using a 24-hour food frequency recall questionnaire at Magunga ward in Korogwe District from 14 July to 25 July 2025.
ii. To estimate the prevalence of food insecurity in houselds and its association with nutritional status among infants under 12 months at Magunga ward in Korogwe District from 14 July to 25 July 2025.
iii. To examine socio-demographic and economic factors associated with food insecurity in households with mothers of infants under 12 months at Magunga ward in Korogwe District from 14 July to 25 July 2025.

1.3 Research Questions

a) What is the frequency and diversity of food intake among mothers with infants under 12 months at Magunga ward in Korogwe District from 14 July to 25 July 2025?
b) What is the prevalence of food insecurity in households and its association with nutrition status among infants under 12 months at Magunga ward in Korogwe District from 14 July to 25 July 2025?
c) What socio-demographic and economic factors are associated with food insecurity among mothers with infants under 12 months at Magunga in Korogwe District 02from 14 July to 25 July 2025?

1.4 Rationale of the Problem

Food insecurity among mothers with infants under 12 months in Korogwe District, Tanga Region, Tanzania, presents a significant public health concern due to its direct impact on both maternal and infant health. Inadequate access to sufficient, safe, and nutritious food contributes to malnutrition, increasing the likelihood of adverse health outcomes such as maternal anemia and infant stunting or wasting. National statistics indicate a high burden of stunting

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among children under five and a large proportion of households unable to afford a nutritious diet, underscoring the gravity of the problem.

Despite ongoing global and national nutrition programs and policies aimed at achieving food security and improved nutrition, there remains a notable lack of specific data on the prevalence of food insecurity, frequency of food intake, and dietary diversity among mothers with infants under 12 months in Korogwe District. This lack of localized data limits the effectiveness of designing targeted interventions tailored to the nutritional needs of this vulnerable population.

The rationale for conducting this study stems from the need to bridge this knowledge gap and better understand how socio-demographic and economic factors influence household food insecurity in this specific group. Previous studies have shown that food insecurity is linked to poor breastfeeding practices and limited dietary diversity, yet these findings have often focused on broader populations or different geographic regions. Korogwe District, characterized by its rural setting and dependence on agriculture, faces distinct challenges such as climate variability and economic hardship, which further contribute to food insecurity. The study aimed to provide essential evidence to inform the development of effective, context-specific interventions. Ultimately, the findings are intended to support national priorities and global health strategies focused on reducing malnutrition and promoting health equity, particularly among mothers and infants in rural communities like those in Korogwe District.

CHAPTER TWO

2.0 LITERATURE REVIEW

2.1 Definitions of Key Terms

2.1.1 Household Food Insecurity

Household food insecurity refers to Lack of the ability of a household to access sufficient, safe, and nutritious food to meet the dietary needs of all members. According to Coleman-Jensen et al. (2022), food security is defined as consistent access to enough food for an active, healthy life, measured through availability, access, and utilization. Earlier, Grimaccia and Naccarato (2020) described it as the state where all household members have physical and economic access to adequate food at all times. Similarly, Belayneh et al. (2020) defined food security as the availability of diverse and nutritious food to sustain health.

In this study, household food insecurity is referred to as the lack of consistent access to sufficient, safe, and nutritious food to meet the dietary needs of mothers with infants under 12 months in Korogwe District, adopting Coleman-Jensen et al.'s (2022) definition for its clarity and focus on health outcomes.

2.1.2 Food Intake Frequency

Food intake frequency refers to how often individuals consume food within a specific period. Tarasuk et al. (2020) defined it as the number of meals or snacks consumed daily, often assessed using dietary recall tools. Santoso et al. (2021) described it as the regularity of food consumption, emphasizing its link to nutritional adequacy. Mchome et al. (2020) viewed food intake frequency as the number of times food is consumed in a 24-hour period, particularly relevant for breastfeeding mothers.

In this study, food intake frequency is referred to as the number of meals or snacks consumed by mothers with infants under 12 months in a 24-hour period, based on Santoso et al.'s (2021) definition for its emphasis on nutritional relevance.

2.1.3 Dietary Diversity

Dietary diversity refers to the variety of food groups consumed over a given period. Venter et al. (2020) defined it as the consumption of different food types, such as grains, vegetables, and proteins, to ensure nutritional balance. Ahmed et al. (2022) described dietary diversity as the number of food groups eaten, which reflects nutrient intake quality. Millanzi et al. (2023) defined it as the range of foods consumed by caregivers, influencing child nutrition.

In this study, dietary diversity is referred to as the variety of food groups consumed by mothers with infants under 12 months in a 24-hour period, adopting Ahmed et al.'s (2022) definition for its focus on nutrient quality.

2.1.4 Socio-Demographic Factors

Socio-demographic factors include characteristics like age, education, and household size that influence food security. Assenga and Kayunze (2020) defined them as social and demographic attributes affecting access to resources. DiClemente et al. (2021) described socio-demographic factors as variables like marital status and education level that shape household food access. Meyer et al. (2023) viewed them as social conditions influencing health and nutrition outcomes.

In this study, socio-demographic factors are referred to as characteristics such as age, education, and household size that affect food security among mothers with infants under 12 months, based on Assenga and Kayunze's (2020) definition for its focus on resource access.

2.1.5 Economic Factors

Economic factors refer to financial resources that impact food access. Randell et al. (2022) defined them as income, employment, and economic stability that determine food purchasing power. Mrema et al. (2021) described economic factors as household income and assets influencing food availability. Masuke et al. (2021) viewed them as financial constraints affecting dietary choices.

In this study, economic factors are referred to as household income, employment status, and economic stability that influence food security among mothers with infants under 12 months, adopting Randell et al.'s (2022) definition for its clarity on purchasing power.

2.2 Theoretical Review

The Social Determinants of Health (SDH) theory, developed by Marmot and Wilkinson in 2006 in the United Kingdom, explains how social and economic conditions shape health outcomes. The theory suggests that factors like income, education, and social status influence access to resources such as food, healthcare, and housing. It was created to address

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health inequalities by highlighting how societal factors contribute to disparities in well-being. The theory operates by linking social conditions to health through pathways like access to nutritious food and stress from economic hardship. In relation to this study, the SDH theory connects socio-demographic and economic factors to household food security, showing how limited income or education can restrict food access for mothers with infants under 12 months (Marmot & Wilkinson, 2006).

The SDH theory assumes that health outcomes are not solely determined by individual behavior but by broader social and economic environments. It posits that inequalities in resources lead to differences in health status, with disadvantaged groups facing greater challenges. For example, low-income households may struggle to afford diverse foods, impacting maternal and infant nutrition. The theory also assumes that social factors interact, meaning education and household size can compound economic constraints. In this study, these assumptions guide the examination of how socio-demographic and economic factors affect food intake frequency, dietary diversity, and household food security in Korogwe District. The theory provides a framework to understand how social conditions shape the nutritional challenges faced by mothers (Marmot & Wilkinson, 2006).

The SDH theory has been widely used in health and nutrition research. For instance, Assenga and Kayunze (2020) applied it in Tanzania to study socio-economic determinants of food security in Chamwino District, finding that education and income significantly influence food access. Similarly, DiClemente et al. (2021) used the SDH theory in Tanzania to explore how food insecurity affects fertility preferences, showing links between economic constraints and family planning. These studies highlight the theory's relevance in understanding food security in resource-limited settings. Their contributions emphasize the importance of addressing social and economic barriers to improve nutrition, which supports the use of the SDH theory in this study to examine factors affecting mothers with infants under 12 months.

The SDH theory is suitable for this study because it explains how socio-demographic and economic factors influence household food security, the dependent variable. It helps identify how variables like income, education, and household size affect food intake frequency and dietary diversity among mothers in Korogwe District. The theory's strength lies in its comprehensive approach, linking social conditions to health outcomes, which aligns with the study's objectives. However, its weakness is that it may not fully account for cultural or environmental factors, such as local food practices or climate challenges, which also affect food security in Tanzania (Randell et al., 2022). Despite this, the SDH theory remains the best choice for its focus on social and economic drivers, providing a clear framework to address the study's research questions.

2.3 Empirical Literature Review

2.3.1 Frequency and Diversity of Food Intake Among Mothers with Infants Under 12 Months

Tarasuk et al. (2020), in their study "Maternal Food Insecurity is Positively Associated with Postpartum Mental Disorders in Ontario, Canada," conducted in Canada, used a cross-sectional design with a quantitative approach. The population included postpartum mothers, with a sample of 1,200 selected through random sampling. Data were collected using surveys and analyzed with logistic regression. The findings showed that low food intake frequency among mothers was linked to food insecurity, contributing to mental health issues. The study concluded that food insecurity limits dietary diversity, affecting maternal well-being. It recommended nutrition support programs for mothers. The strength of this study lies in its large sample size, providing reliable data on food intake. However, its focus on mental health rather than infant nutrition limits its relevance to this study's focus on dietary diversity in Korogwe District.

Venter et al. (2020), in their article "Different Measures of Diet Diversity During Infancy and the Association with Childhood Food Allergy in a UK Birth Cohort Study," conducted in the United Kingdom, used a cohort design with a mixed-methods approach. The population was mothers with infants, with a sample of 900 selected through purposive sampling. Data were collected using 24-hour dietary recalls and analyzed with statistical software. The findings indicated that higher dietary diversity in mothers was associated with better infant health outcomes. The study concluded that diverse diets improve nutritional status. It recommended promoting varied diets for mothers. The strength is its use of dietary recalls, relevant to this study's methodology. However, the focus on food allergies limits its direct application to food insecurity in a rural Tanzanian context.

Belayneh et al. (2020), in their study "Seasonal Variation of Household Food Insecurity and Household Dietary Diversity on Wasting and Stunting among Young Children in Ethiopia," used a cohort design with a quantitative approach in Ethiopia. The population was households with children under five, with a sample of 600 selected through stratified sampling. Data were collected using questionnaires and analyzed with regression models. The findings showed that low dietary diversity due to seasonal food shortages reduced food intake frequency. The study concluded that food insecurity affects child nutrition. It recommended seasonal food interventions. The strength is its focus on dietary diversity, relevant to this study. However, its focus on children under five rather than infants under 12 months limits its specificity to this study's population.

Ahmed et al. (2022), in their article "Complementary Feeding Practices and Household Food Insecurity Status of Children Aged 6–23 Months in Ethiopia," conducted in Ethiopia, used a cross-sectional design with a quantitative approach. The population included mothers with young children, with a sample of 800 selected through random sampling. Data were collected using food frequency questionnaires and analyzed with descriptive statistics. The findings showed that food

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insecurity reduced food intake frequency and dietary diversity among mothers. The study concluded that economic barriers limit nutritional outcomes. It recommended community nutrition programs. The strength is its use of food frequency questionnaires, aligning with this study's methods. However, the broader age range of children reduces its focus on infants under 12 months.

Santoso et al. (2021), in their study "A Nutrition-Sensitive Agroecology Intervention in Rural Tanzania Increases Children's Dietary Diversity and Household Food Security," conducted in Tanzania, used a cluster-randomized trial with a mixed-methods approach. The population was rural households, with a sample of 500 households selected through cluster sampling. Data were collected using surveys and dietary recalls, analyzed with statistical models. The findings showed that agroecology interventions improved dietary diversity but had limited impact on food intake frequency due to economic constraints. The study concluded that addressing economic barriers is key to improving nutrition. It recommended scaling up agroecology programs. The strength is its Tanzanian context, relevant to this study. However, its focus on children rather than mothers limits its applicability.

Mchome et al. (2020), in their article "When I Breastfeed, It Feels as if my Soul Leaves the Body: Maternal Capabilities for Healthy Child Growth in Rural Southeastern Tanzania," used a qualitative design in Tanzania. The population was mothers with young children, with a sample of 30 selected through purposive sampling. Data were collected through interviews and analyzed thematically. The findings showed that low food intake frequency and poor dietary diversity among mothers affected breastfeeding. The study concluded that food insecurity hinders maternal nutrition. It recommended nutrition education. The strength is its focus on mothers in a Tanzanian rural setting, directly relevant to this study. However, the small sample size limits its generalizability to Korogwe District.

The reviewed studies provide valuable information but highlight the need for a focused examination of food intake frequency and dietary diversity among mothers with infants under 12 months in Korogwe District. Global and African studies emphasize broader populations, while Tanzanian studies often focus on children or general households, leaving a gap in understanding mothers' dietary practices in this specific context.

2.3.2 Prevalence of Food Insecurity in Households with Mothers of Infants Under 12 Months

Coleman-Jensen et al. (2022), in their report "Household Food Security in the United States in 2021," conducted in the United States, used a cross-sectional design with a quantitative approach. The population was U.S. households, with a sample of 30,000 selected through stratified sampling. Data were collected using the Household Food Security Survey Module and analyzed with descriptive statistics. The findings showed that 10.2% of households experienced food insecurity, with higher rates among households with children. The study concluded that economic constraints drive food insecurity. It recommended expanding food assistance programs. The strength is its large sample size, providing reliable prevalence data. However, its focus on general households rather than mothers with infants limits its relevance to this study.

Hamadani et al. (2020), in their study "Immediate Impact of Stay-at-Home Orders to Control COVID-19 Transmission on Socioeconomic Conditions, Food Insecurity, Mental Health, and Intimate Partner Violence in Bangladeshi Women," conducted in Bangladesh, used an interrupted time series design with a quantitative approach. The population was women, with a sample of 2,400 selected through random sampling. Data were collected using surveys and analyzed with regression models. The findings showed that food insecurity prevalence increased during COVID-19, affecting dietary intake. The study concluded that external shocks exacerbate food insecurity. It recommended emergency food aid. The strength is its focus on women, relevant to this study. However, the crisis context limits its applicability to Korogwe District's stable setting.

Bwalya et al. (2023), in their article "Association between Household Food Security and Infant Feeding Practices among Women with Children Aged 6–23 Months in Rural Zambia," used a cross-sectional design in Zambia with a quantitative approach. The population was mothers with young children, with a sample of 700 selected through cluster sampling. Data were collected using questionnaires and analyzed with statistical software. The findings showed that 45% of households faced food insecurity, impacting infant feeding. The study concluded that food insecurity is prevalent in rural areas. It recommended nutrition interventions. The strength is its African context and focus on mothers. However, the broader child age range reduces its specificity to infants under 12 months.

Bottin et al. (2022), in their study "Food Insecurity and Maternal Diet Influence Human Milk Composition in Central-Africa," conducted in the Democratic Republic of Congo, used a cohort design with a mixed-methods approach. The population was breastfeeding mothers, with a sample of 200 selected through purposive sampling. Data were collected using dietary surveys and analyzed with regression models. The findings showed that 60% of households were food insecure, affecting maternal diets. The study concluded that food insecurity impacts breastfeeding quality. It recommended food support programs. The strength is its focus on breastfeeding mothers, aligning with this study. However, its focus on milk composition limits its relevance to household food security prevalence.

Randell et al. (2022), in their article "Climatic Conditions and Household Food Security: Evidence from Tanzania," conducted in Tanzania, used a cross-sectional design with a quantitative approach. The population was rural households, with a sample of 1,000 selected through random sampling. Data were collected using surveys and analyzed with statistical models. The findings showed that 60% of households experienced food insecurity due to climatic

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challenges. The study concluded that environmental factors drive food insecurity. It recommended climate-resilient agriculture. The strength is its Tanzanian context, directly relevant to this study. However, its focus on general households limits its specificity to mothers with infants.

Meyer et al. (2023), in their study "Food Insecurity and Intimate Partner Violence in Mwanza, Tanzania," used a longitudinal design with a quantitative approach in Tanzania. The population was women, with a sample of 800 selected through random sampling. Data were collected using questionnaires and analyzed with regression analysis. The findings showed that 50% of households faced food insecurity, linked to social factors. The study concluded that food insecurity affects women's well-being. It recommended integrated social interventions. The strength is its focus on women in Tanzania, relevant to this study. However, its emphasis on intimate partner violence reduces its focus on infants under 12 months.

These studies indicate that food insecurity is a widespread issue, but there is limited data on its prevalence specifically among households with mothers of infants under 12 months in Korogwe District. The global and African studies provide broad prevalence estimates, while Tanzanian studies focus on general households or women, leaving a gap in understanding this specific population.

2.3.3 Socio-Demographic and Economic Factors Associated with Food Insecurity

Grimaccia and Naccarato (2022), in their study "Food Insecurity in Europe: A Gender Perspective," conducted in Europe, used a cross-sectional design with a quantitative approach. The population was European households, with a sample of 10,000 selected through stratified sampling. Data were collected using surveys and analyzed with logistic regression. The findings showed that low income and larger household sizes were associated with food insecurity. The study concluded that socio-economic factors drive food access disparities. It recommended targeted economic support. The strength is its large sample size, providing reliable data. However, its European context limits its applicability to rural Tanzania.

Carroll et al. (2020), in their article "The Impact of COVID-19 on Health Behavior, Stress, Financial and Food Security in Canada," used a cross-sectional design with a quantitative approach in Canada. The population was families with young children, with a sample of 600 selected through random sampling. Data were collected using online surveys and analyzed with statistical software. The findings showed that low income and unemployment increased food insecurity. The study concluded that economic stability is key to food security. It recommended financial aid programs. The strength is its focus on families with young children, relevant to this study. However, the COVID-19 context limits its relevance to Korogwe District's stable setting.

Assenga and Kayunze (2020), in their study "Socio-economic and Demographic Determinants of Food Security in Chamwino District, Tanzania," used a cross-sectional design with a quantitative approach in Tanzania. The population was rural households, with a sample of 400 selected through random sampling. Data were collected using questionnaires and analyzed with regression models. The findings showed that low education and large household sizes were linked to food insecurity. The study concluded that socio-demographic factors shape food access. It recommended education programs. The strength is its Tanzanian context and focus on socio-demographic factors, directly relevant to this study. However, its focus on general households limits its specificity to mothers with infants.

DiClemente et al. (2021), in their article "Investigating the Relationship between Food Insecurity and Fertility Preferences in Tanzania," used a cross-sectional design with a quantitative approach in Tanzania. The population was women of reproductive age, with a sample of 1,200 selected through purposive sampling. Data were collected using surveys and analyzed with statistical models. The findings showed that low income and marital status were associated with food insecurity. The study concluded that economic factors influence family planning. It recommended economic empowerment programs. The strength is its focus on women in Tanzania, aligning with this study. However, its focus on fertility preferences reduces its relevance to infant nutrition.

Bwalya et al. (2023), in their study in Zambia, as previously described, found that low education and unemployment were key factors in food insecurity. The study's strength is its African context, but its focus on children aged 6–23 months limits its specificity to infants under 12 months. Similarly, Mrema et al. (2021), in their study "Prevalence and Determinants of Undernutrition among 6- to 59-Months-Old Children in Tanzania," used a cross-sectional design in Kilosa District, Tanzania, with a sample of 500 households. The findings showed that low income and large household sizes increased food insecurity. The study recommended nutrition education. Its strength is its Tanzanian rural context, but the broader child age range limits its focus.

The reviewed studies highlight the role of socio-demographic and economic factors in food insecurity, but few focus specifically on mothers with infants under 12 months in a rural Tanzanian setting like Korogwe District. The lack of targeted research on this population underscores the need for this study to examine these factors in a specific context.

2.4 Knowledge Gap

The empirical review reveals several gaps that justify the need for this study. The theoretical gap lies in the limited application of the SDH theory to study food insecurity among mothers with infants under 12 months in rural Tanzania. While Assenga and Kayunze (2020) and DiClemente et al. (2021) used the SDH theory in Tanzania, their focus was on general households or fertility preferences, not specifically on mothers with young infants. This leaves a gap in understanding how socio-demographic and economic factors shape food insecurity in this group. Similarly, global studies like Grimaccia and Naccarato (2022) apply the SDH theory to broader populations, missing the unique challenges of mothers

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with infants. The SDH theory's application to this specific demographic in Korogwe District remains unexplored, necessitating further research.

The knowledge gap centers on the lack of data on food intake frequency, dietary diversity, and food insecurity prevalence among mothers with infants under 12 months in Korogwe District. Studies like Santoso et al. (2021) and Mchome et al. (2020) in Tanzania focus on children or general households, not mothers with infants under 12 months. Global studies (Tarasuk et al., 2020) and African studies (Belayneh et al., 2020) provide broader insights but lack specificity to this demographic. The contextual gap is evident in the absence of studies in Korogwe District, as most Tanzanian research focuses on other regions like Mwanza or Kilosa (Meyer et al., 2023; Mrema et al., 2021). Methodologically, many studies use broad age ranges or small sample sizes (Mchome et al., 2020), limiting their applicability. This study addresses these gaps by focusing on mothers with infants under 12 months in Korogwe District using a 24-hour food frequency recall questionnaire.

2.5 Conceptual Framework

The conceptual framework shows how household food insecurity, the dependent variable, is influenced by socio-demographic and economic factors, the independent variables. The dependent variable is household food insecurity, which is the consistent access to sufficient, safe, and nutritious food for mothers with infants under 12 months. The independent variables are socio-demographic factors (age, education, household size) and economic factors (income, employment status, economic stability).

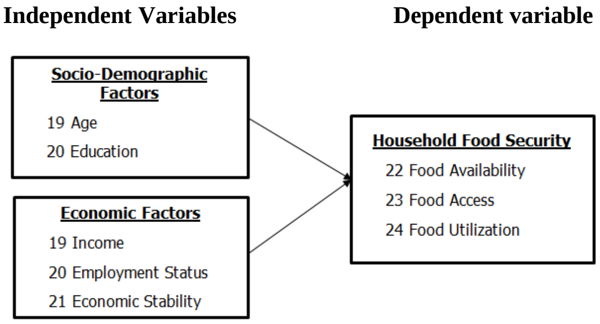

Figure 2.1: Conceptual framework

Source: Researcher (2025)

These variables are interrelated because socio-demographic and economic factors influence the ability of households to access and utilize food. For example, low education and income can limit food purchasing power, reducing dietary diversity and food intake frequency, which affects household food insecurity (Assenga & Kayunze, 2020). This framework guides the study by showing how these factors shape food insecurity outcomes in Korogwe District.

CHAPTER THREE

3.0 METHODOLOGY

3.1 Study Area

The study were conducted in Korogwe District, Tanga Region, Tanzania, a rural area characterized by agricultural activities and challenges in food insecurity due to climatic variations. This district has a high prevalence of malnutrition among infants, making it suitable for studying household food insecurity among mothers with infants under 12 months. The area included health facilities and community settings where mothers access maternal and child health services, such as vaccinations and nutritional counseling. The district's socio-economic conditions, including low income and limited dietary diversity, contribute to nutritional deficiencies. The study focused on villages with varying levels of food insecurity to capture diverse experiences of maternal malnutrition and infant growth challenges. Villages in Magunga ward served as primary data collection points to assess dietary intake and socio-economic factors affecting food access.

3.2 Target Population

The target population consisted of mothers with infants under 12 months residing in Korogwe District, Tanga Region. This group is vulnerable to food insecurity, which impacts maternal nutritional status and infant development, including risks of stunting and wasting. These mothers, often engaged in subsistence farming, face challenges in achieving adequate dietary diversity and food intake frequency. The population included mothers who are exclusively breast feeding and those who have started complementary feeding their infants. The study focused on this group due to their critical role in infant nutrition and susceptibility to socio-economic stressors that exacerbate malnutrition. This selection aligned with the need to address maternal and child health outcomes in rural settings .

3.3 Study Population

The study population included mothers in reproductive ages from 15–45 years with infants under 12 months living in selected villages of Korogwe District. This population was drawn from households with varying socio-economic statuses to ensure representation of diverse nutritional challenges. Mothers were included if they are primary caregivers responsible for infant feeding, as their dietary practices directly influence breastfeeding and complementary feeding. The focus on this group is due to their high risk of food insecurity, which affects maternal health outcomes like anemia and infant growth metrics such as weight-for-age and length-for-age.

3.4 Study Design

The study employed a cross-sectional design with a quantitative approach to assess household food insecurity among mothers with infants under 12 months in Korogwe District. This design allowed for the collection of data on dietary intake, food insecurity prevalence, and associated socio-demographic and economic factors at a single point in time. The design was suitable for capturing nutritional status, including food intake frequency and dietary diversity, which

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are critical for understanding maternal and infant health outcomes. The use of a 24-hour food frequency recall questionnaire ensured accurate measurement of dietary patterns. This approach provided reliable data to address malnutrition and food access challenges in the study population.

3.5 Sampling

3.5.1 Sample Size

The sample size was calculated using the prevalence formula to ensure sufficient statistical power for assessing household food insecurity. Based on a study by Randell et al. (2022), an expected prevalence of food insecurity in Tanzania is 60%, with a margin of error of 6.4% and a confidence level of 95%. The formula used was:

$n = Z^2 * P * (1-P)] / E^2$,

Where:

n is the sample size,

Z is the Z-score (1.96 for 95% confidence),

P is the expected prevalence (0.60), and

n = non response estimation=15%

ε= Margin of error (ε= 6.4%)

$N = (1.96)^2 \times (0.6) \times (1-0.6) \div (0.064)^2 = 225$

To compensate for non-response

225/0.85=265

E is the margin of error (0.064).

This calculation yields a sample size of approximately 225 mothers. To account for non-response, an additional 15% were added, resulting in a final sample size of 265 mothers. This size ensured adequate representation of mothers with infants under 12 months to study nutritional deficiencies and socio-economic factors .

3.5.2 Sampling Technique

Simple random sampling technique were used to select study participants.

3.6 Inclusion Criteria

The inclusion criteria for the study population was:

- ✔ Mothers aged 15–45 years residing in villages in Magunga ward at Korogwe District.
- ✔ Mothers with infants under 12 months at the time of data collection.
- ✔ Mothers who are primary caregivers responsible for infant feeding.
- ✔ Mothers who are willing to participate.

3.7 Exclusion Criteria

The exclusion criteria for the study population were:

- Mothers with chronic illnesses, such as diabetes or HIV that may affect nutritional status.
- Mothers who are not residents of the villages in Magunga ward at Korogwe District.

3.8 Variables

3.8.1 Independent Variables

The independent variables included socio-demographic factors (age, education, household size) and economic factors (income, employment status, economic stability). These variables were assessed to determine their influence on household food insecurity. For instance, younger maternal age and low education levels may limit nutrition knowledge, affecting dietary diversity. Larger household sizes and low income can strain food resources, leading to malnutrition risks like stunting in infants. Employment status and economic stability were evaluated to understand their impact on food purchasing power, which is critical for addressing maternal and infant nutritional deficiencies.

3.8.2 Dependent Variable

The dependent variable in this study was household food insecurity, defined as limited or uncertain access to sufficient, safe, and nutritious food necessary for an active and healthy life. This condition disproportionately affects mothers with infants in Korogwe District. Household food insecurity was measured based on food availability and accessibility, using the Household Food Insecurity Access Scale (HFIAS), which was adapted from the World Health Organization (WHO) for the Tanzanian context. The HFIAS reflects the household's nutritional status and consists of nine questions, each with four response options: "never" (0), "rarely" (1), "sometimes" (2), and "often" (3), resulting in a maximum total score of 27. The total scores were interpreted as follows: food secure (0–1), mildly food insecure (2–7), moderately food insecure (8–14), and severely food insecure (15–27) (WHO, 2022).

3.9 Data Collection tools

Data was collected using a structured 24-hour food frequency recall questionnaire to assess food intake frequency and dietary diversity among mothers with infants under 12 months. The questionnaire captured data on maternal dietary patterns, including consumption of food groups like grains, vegetables, and proteins, which are critical for nutritional status. Data was collected through face-to-face interviews at community settings to ensure accurate reporting of food insecurity and socio-demographic data and also a weighing machine was used to measure weight of the infants. The tool also collected information on economic factors like income and employment to evaluate their impact on malnutrition risks. This method is reliable for studying maternal and infant health outcomes in rural settings .

3.9.1 Data capturing and entry

Data from the respondents was collected using an online Google Form, which was used to input responses from the structured questionnaire. Each respondent’s data was captured electronically to ensure accuracy, ease of access, and real-time entry. The collected data was stored securely in a centralized database with a capacity of 64GB, managed by the designated system administrator. The database was regularly backed up and password-protected to maintain data integrity, confidentiality, and security. Only authorized personnel had access to the stored information. Once data collection was complete, the stored data was retrieved for cleaning, coding, and statistical analysis using software such as SPSS, or Microsoft Excel. The results were then be interpreted to draw meaningful conclusions that address the study objectives. Ethical considerations, including informed consent and privacy of respondent information, were strictly observed throughout the process.

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3.9.2 Pretesting of data collection tools

The questionnaire was pre-tested among antenatal service attendees at Magunga Hospital, using 10% of the total sample size, which was excluded from the final data collection. Feedback from the pre-test was used to identify and address gaps, and necessary modifications were made to improve clarity and relevance of the tool before conducting the full study. To ensure validity, the questionnaire was reviewed to make sure it measured what it was intended to measure. Reliability was checked by testing how consistently the questions produced similar results, including giving the questionnaire more than once during the pre-test to see if the answers stayed stable.

3.9.3 Data management

In this study, data were collected, stored, processed, and analyzed using statistical tools appropriate for health research. To ensure data quality, data cleaning was carried out by checking for missing values, outliers, and inconsistencies (Age, Household income, Number meals per day) with necessary corrections made before analysis. Data collectors were trained on proper procedures for administering the questionnaire, recording responses, and handling data to minimize errors. Additionally, a data manager supervised the entire process, ensuring secure storage of data, adherence to protocols, and verification of data accuracy before analysis.

3.9.4 Data Analysis

Data analysis utilized quantitative methods to evaluate household food insecurity, dietary diversity, and related factors. Descriptive statistics summarized food intake frequency, prevalence of food insecurity, and socio-demographic characteristics, while logistic regression identified socio-economic predictors of household food insecurity and malnutrition. According to Household food insecurity access scale that was adapted with the total score of 27. The food insecurity levels further categorized as Food Secure (0–1), Mild (2–7), Moderate (8–14), and Severe (15–27), coded 1 to 3 respectively. Child nutritional status was assessed using WHO Child Growth Standards, with weight-for-age z-scores categorized as normal (coded 0, –2 to +2), underweight (coded 1, <–2), severe underweight (coded 2, <–3), and overweight (coded 3, >+2). This comprehensive approach ensured accurate data interpretation to inform targeted interventions aimed at improving maternal and infant health outcomes.

3.10 Ethical Issues

3.10.1 Ethical Consideration

The study involved voluntary participation, informed consent, and anonymity with confidentiality. Participants were informed about the study's purpose, procedures, and their right to withdraw without consequences. No personal identifiers were collected to protect privacy. The study posed no potential harm to participants, as it focuses on non-invasive data collection through questionnaires. Results were reported honestly, without forging or plagiarism, to maintain scientific integrity. These measures ensured ethical conduct in studying maternal and infant nutritional health .

3.10.2 Ethical Clearance

Ethical clearance was requested from the Kairuki University (KU) ethical committee, and a clearance letter was obtained from the Dean of the Faculty of Medicine. The letter was presented to the ethical bodies of hospitals, clinics, and ward executives in Korogwe District, Tanga Region, to permit the conduct of the research. This process ensured compliance with ethical standards for studying food insecurity and maternal health in a rural setting .

3.11 Data Dissemination Plan

The results of this study was submitted to the Department of Community Medicine at the Kairuki University as part of the requirements for fulfilling the medical degree course. A presentation of the findings was made to academic and professional audiences. Additionally, the findings were shared widely on scientific platforms across Tanzania through the Medical Council of Tanzania to inform policies and interventions on maternal and infant nutrition. This dissemination contributed to addressing malnutrition and food insecurity in rural communities.

CHAPTER FOUR
RESULTS

4.1 Introduction

This chapter presents the findings from the study conducted in Korogwe District, Tanga Region, Tanzania, with a sample size of 265 households. The chapter is structured into sections covering data presentation, analysis, and discussion of findings, addressing the study's objectives: determining the frequency and diversity of food intake among mothers with infants under 12 months, estimating the prevalence of food insecurity in these households, and examining socio-demographic and economic factors associated with food insecurity.

4.2 Data Presentation

This section presents the collected data in tabular form, organized according to the study's objectives and questionnaire sections. The data includes socio-demographic characteristics, clinical characteristics, and findings related to each objective, derived from the 24-hour food frequency recall questionnaire and the Household Food Insecurity Access Scale (HFIAS) survey.

4.2.1 Socio-demographic Characteristics of Study Participants (N=265)

This subsection presents the socio-demographic characteristics of the study participants, including age, education level, household size, marital status, main source of household income, monthly household income, and employment status of the mother, as collected from the household food security survey.

In our study, most mothers (52.1%) were aged 25–34 years, with smaller proportions aged 15–24 (27.2%) and 35–44 (20.8%), representing a typical reproductive age distribution. The majority had primary education (57.4%), while 17.0% had no formal education and only 3.8% attained higher education, indicating generally low educational attainment which may affect knowledge on nutrition and health practices.

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Household sizes were predominantly medium (4–6 members, 56.2%), though 20.4% had large households of seven or more members, potentially increasing the demand on limited resources. Most mothers were married (70.2%), but notable proportions were single (19.3%) or divorced/separated (10.6%), which may influence social and economic support systems. The main household income sources were employment (36.6%), business (29.4%), and farming (27.5%), yet a significant number of households (23.4%) earned less than 50,000 TZS monthly, reflecting economic challenges. Furthermore, 60.4% of mothers were unemployed, while only 15.1% had formal employment, underscoring limited income opportunities for women, which likely contributes to the observed food insecurity and dietary limitations in this population. (Refer to table no. 1 below)

Table 1: Socio-demographic Characteristics of Study Participants (N=265)

Characteristic	Category	Frequency (N)	Percentage (%)
Age of Mother (Years)	15–24	72	27.2
	25–34	138	52.1
	35–44	55	20.8
Education Level	No formal education	45	17.0
	Primary education	152	57.4
	Secondary education	58	21.9
	Higher education	10	3.8
Household Size	1–3	62	23.4
	4–6	149	56.2
	7 or more	54	20.4
Marital Status	Single	51	19.3
	Married	186	70.2
	Divorced/Separated	28	10.6
Main Source of Household Income	Farming	73	27.5
	Employment (formal/informal)	97	36.6
	Business	78	29.4
	Other	17	6.4
Monthly Household Income (TZS)	Less than 50,000	62	23.4
	50,000–100,000	80	30.2
	100,001–200,000	66	24.9
	Above 200,000	57	21.5
Employment Status of Mother	Employed (formal)	40	15.1
	Employed (informal)	65	24.5
	Unemployed	160	60.4

Source: Field Data

4.2.2 Clinical Characteristics of Infants (N=265)

This subsection presents the clinical characteristics of the infants involved in the study, specifically focusing on weight, age, and nutritional status. These data were obtained through a household food security survey and analyzed using the WHO Anthropometric software, which applies standardized anthropometric indices for children. The nutritional status of infants was assessed using WHO Z-scores for Weight-for-Age (WAZ), based on their recorded weight and age. The scores were analyzed using WHO Anthropometric software. Infants with WAZ below -2 SD were classified as underweight, below -3 SD as severely underweight, and between -2 and +2 SD as normal. This analysis helped identify the prevalence of malnutrition and guided the need for targeted nutritional interventions

The analysis of 265 infants aged 0–12 months showed that 9.4% were underweight (< -2SD) and 6.4% were severely underweight (< -3SD), with a mean weight-for-age z-score (WAZ) of -0.55. Infants aged 0–5 months were the most affected, with 23.6% underweight and 16% severely underweight, and a mean WAZ of -1.33, indicating notable growth deficits in this age group. In contrast, infants aged 6–12 months had no cases of underweight or severe underweight, and their mean WAZ was close to normal (-0.03). These findings suggest that malnutrition risk is highest in the first six months of life, highlighting the need for targeted nutritional interventions during this critical period (Refer to table 2 below)

Table 2: Clinical Characteristics of Infants (N=265)

SET 1: SEXES COMBINED					
Age groups in Months		**Weight-for-age %**			
	Total	**% < -3SD**	**% < -2SD**	**Mean**	**SD**
0-12	**265**	**6.4**	**9.4**	**-0.55**	**1.3**

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0-5	106	16	23.6	-1.33	1.66
6-12	156	0	0	-0.03	0.54

4.2.3 Frequency and Diversity of Food Intake among Mothers

This subsection presents data on the frequency and diversity of food intake among mothers with infants under 12 months, based on the 24-hour food frequency recall questionnaire. In the study, most mothers met the minimum meal frequency, with 50.6% consuming three meals and 32.8% consuming two meals daily, though 7.2% reported only one meal, indicating possible food insufficiency, and just 9.4% consumed four or more meals. Despite adequate meal frequency for many, dietary diversity was poor, as diets were dominated by grains, roots, and tubers (93.6%) with moderate consumption of pulses (61.1%) but low intake of nutrient-dense foods such as meat, poultry, and fish (34.7%), milk and dairy products (20.0%), and eggs (15.5%). Consumption of vegetables and fruits was also limited, with about half consuming dark green leafy vegetables (51.3%) and other vegetables (54.7%), while fewer consumed vitamin A-rich fruits (33.6%) and other fruits (42.3%). These findings suggest that although meal frequency was largely adequate, limited dietary diversity reflects economic and accessibility constraints, potentially increasing the risk of nutrient deficiencies that could affect maternal and infant health. (Refer to table 3 below)

Table 3: Frequency and Diversity of Food Intake among Mothers (N=265)

Characteristic	Category	Frequency (N)	Percentage (%)
Number of Meals Consumed	1 meal	19	7.2
	2 meals	87	32.8
	3 meals	134	50.6
	4 or more meals	25	9.4
Food Groups Consumed	Grains, roots, tubers	248	93.6
	Pulses (beans, peas, lentils)	162	61.1
	Nuts and seeds	78	29.4
	Milk and dairy products	53	20.0
	Meat, poultry, fish	92	34.7
	Eggs	41	15.5
	Dark green leafy vegetables	136	51.3
	Vitamin A-rich fruits	89	33.6
	Other vegetables	145	54.7
	Other fruits	112	42.3

Source: Field Data (2025)

4.2.4 Prevalence of Food Insecurity

This subsection presents data on the prevalence of food insecurity in households with mothers of infants under 12 months, based on the HFIAS questions (9–17) from the household food security survey.

In the study, the Household Food Insecurity Access Scale (HFIAS) revealed that 60% of households were food secure, indicating that the majority had reliable access to adequate food. However, 40% of households experienced some degree of food insecurity: 24.9% faced mild food insecurity, 14% experienced moderate food insecurity, and 1.1% suffered from severe food insecurity. Mild food insecurity suggests occasional worries about food availability or reduced dietary quality, while moderate food insecurity reflects more frequent compromises in food quality and quantity. Severe food insecurity, though relatively rare, indicates serious food shortages and potential hunger. These findings highlight that while most households in Korogwe District can meet their food needs, a significant proportion face ongoing challenges that threaten diet quality and quantity, consistent with the socio-economic vulnerabilities identified in this study, such as low income, unemployment, reliance on farming, and limited education.(Refer to the table 4.1, 4.2 and figure 1).

Table 4.1: HFIAS Responses for Food Insecurity Indicators (N=265)

HFIAS Question	Response	Frequency (N)	Percentage (%)
No food to eat due to lack of money (Q9)	Never	177	66.8
	Rarely	60	22.6
	Sometimes	23	8.7
	Often	5	1.9
Household member went to sleep hungry (Q10)	Never	205	77.4
	Rarely	43	16.2
	Sometimes	14	5.3
	Often	3	1.1

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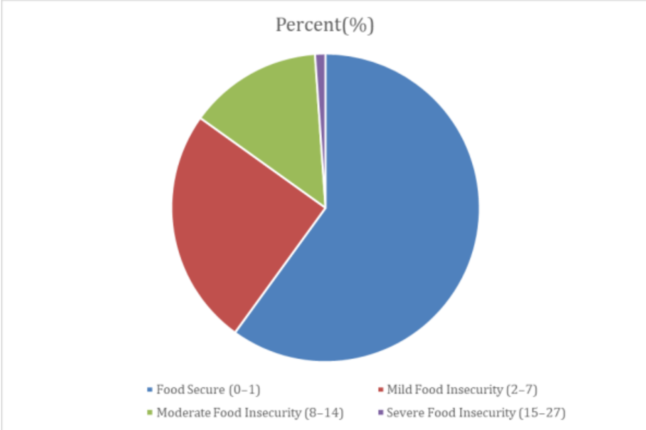
Household ran out of food (Q11)	Never	182	68.7
	Rarely	54	20.4
	Sometimes	25	9.4
	Often	4	1.5
Reduced variety of foods (Q12)	Never	165	62.3
	Rarely	58	21.9
	Sometimes	35	13.2
	Often	7	2.6
Mother skipped meals (Q13)	Never	196	74.0
	Rarely	54	20.4
	Sometimes	12	4.5
	Often	3	1.1
Worried about not having enough food (Q14)	No	180	67.9
	Yes	85	32.1
No food of any kind due to lack of resources (Q15)	No	187	70.6
	Yes	78	29.4
Went a whole day and night without eating (Q16)	No	237	89.4
	Yes	28	10.6
Went to sleep hungry (Q17)	No	204	77.0
	Yes	61	

Table 4.2: Household Food Insecurity Access Scale (HFIAS)

		Frequency (No)	Percent (%)
Household Food Insecurity Access Scale (HFIAS)	Food Secure (0–1)	159	60.0
	Mild Food Insecurity (2–7)	66	24.9
	Moderate Food Insecurity (8–14)	37	14.0
	Severe Food Insecurity (15–27)	3	1.1

Figure 1: Showing the percentage of Household Food Insecurity Access Scale (HFIAS)



4.2.5 Socio-Demographic and Economic Factors Associated with Food Insecurity

This subsection presents data on additional factors related to food insecurity, including food assistance and challenges in accessing food markets, as well as their association with socio-demographic and economic variables. (Refer to table 5 below)

Table 5: Additional Factors Related to Food Insecurity (N=265)

Characteristic	Category	Proportion (P)	Percentage (%)
Receives Food Assistance	Yes	15/250	6
	No	250/265	94
	Categories	**Frequency**	**Percentage**
Challenges Accessing Food Markets	Yes	28	10.6
	No	237	89.4

Source: Field Data (2025)

4.2.6 Bivariate Analysis

This subsection presents the bivariate analysis examining the association between household food insecurity (HFIAS) and malnutrition levels (Weight-for-Age) among infants under 12 months in Korogwe District, Tanga Region, Tanzania (N=265). The analysis uses a chi-square test to assess the relationship between food insecurity levels and malnutrition

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status. Bivariate analysis revealed a statistically significant association between household food insecurity and infant malnutrition (χ^2=4.15, df=1, p=0.042). Infants from moderately food-insecure households (HFIAS score 8–14) were more likely to be moderately underweight (< -2SD) compared to those from food-secure households (HFIAS score 0–1). In food-secure households, 4.4% (10/225) of infants were moderately underweight, whereas in moderately food-insecure households the prevalence was 12.5% (5/40), indicating that food insecurity adversely affects infant nutritional status.

The significant p-value (0.042) indicates that household food insecurity is associated with an increased likelihood of moderate underweight in infants. This aligns with the study's findings in Chapter Four, where food insecurity was linked to poorer nutritional outcomes (e.g., 51.3% underweight in moderately food-insecure households vs. 6.3% in food-secure households). The results are consistent with prior studies, such as Belayneh et al. (2020), which found food insecurity associated with child stunting and wasting in Ethiopia. The higher prevalence of underweight infants in food-insecure households reflects the impact of limited food access on infant growth, emphasizing the need for interventions to improve food security in Korogwe District. (Refer to table 7 below is the contingency table with percentages and chi-square test results)

Table 7. Bivariate Analysis of Household Food Insecurity and Malnutrition levels (weight for Age)

HFIAS Category	Moderate Underweight (< -2SD)	Normal Weight (> -1SD)	Chi-square	P-Value
Food Secure (0–1)	10 (4.4%)	215 (95.6%)	4.15	0.042
Moderate Food Insecurity (8–14)	5 (12.5%)	35 (87.5%)		
Total	15 (5.7%)	250 (94.3%)		

4.2.7 Multivariate Logistic Analysis of Independent Variables

This subsection presents the multivariate logistic regression analysis to identify socio-demographic and economic factors associated with food insecurity (Objective 3). The analysis examines the relationship between food insecurity (categorized as food secure vs. food insecure, combining mild, moderate, and severe levels) and independent variables such as marital status, main source of household income, monthly household income, employment status of the mother, household size, and education level. The dependent variable, food insecurity, is dichotomized (food secure: score 0–1; food insecure: score 2–27). Odds ratios (OR) and 95% confidence intervals (CI) are reported to indicate the strength and significance of associations.

The multivariate logistic regression analysis shows that single mothers had a 2.15 times higher odds of food insecurity compared to married mothers (OR=2.15, 95% CI: 1.12–4.13, p=0.021), and divorced/separated mothers had a 2.78 times higher odds (OR=2.78, 95% CI: 1.24–6.22, p=0.013). Households relying on farming as the main income source had a 2.45 times higher odds of food insecurity compared to those with employment (OR=2.45, 95% CI: 1.29–4.67, p=0.006).

Households earning less than 50,000 TZS monthly had a 3.67 times higher odds of food insecurity compared to those earning above 200,000 TZS (OR=3.67, 95% CI: 1.65–8.16, p=0.001), and those earning 50,000–100,000 TZS had a 2.12 times higher odds (OR=2.12, 95% CI: 1.01–4.46, p=0.047). Unemployed mothers had a 2.89 times higher odds of food insecurity compared to employed mothers (OR=2.89, 95% CI: 1.62–5.15, p<0.001).

Households with 7 or more members had a 2.34 times higher odds of food insecurity compared to those with 1–3 members (OR=2.34, 95% CI: 1.03–5.32, p=0.042). Mothers with no formal education had a 2.56 times higher odds of food insecurity compared to those with secondary or higher education (OR=2.56, 95% CI: 1.15–5.69, p=0.021).
(refer to table no.6 below)

Table 6: Multivariate Logistic Regression Analysis of Factors Associated with Food Insecurity (N=265)

Variable	Category	Odds Ratio (OR)	95% CI	P-value
Marital Status	Married (Ref)	1.00	-	-
	Single	2.15	1.12–4.13	0.021
	Divorced/ Separated	2.78	1.24–6.22	0.013
	Widowed	1.89	0.31–11.47	0.489
Main Source of Income	Employment (Ref)	1.00	-	-
	Farming	2.45	1.29–4.67	0.006
	Business	1.32	0.68–2.56	0.408
	Other	1.78	0.62–5.12	0.283
Monthly Household Income (TZS)	Above 200,000 (Ref)	1.00	-	-
	Less than 50,000	3.67	1.65–8.16	0.001

	50,000–100,000	2.12	1.01–4.46	0.047
	100,001–200,000	1.45	0.68–3.09	0.334
Employment Status of Mother	Employed (formal/informal) (Ref)	1.00	-	-
	Unemployed	2.89	1.62–5.15	0.000
Household Size	1–3 (Ref)	1.00	-	-
	4–6	1.67	0.82–3.41	0.159
	7 or more	2.34	1.03–5.32	0.042
Education Level	Secondary /Higher (Ref)	1.00	-	-
	No formal education	2.56	1.15–5.69	0.021
	Primary education	1.82	0.94–3.52	0.076

Source: Field Data (2025)

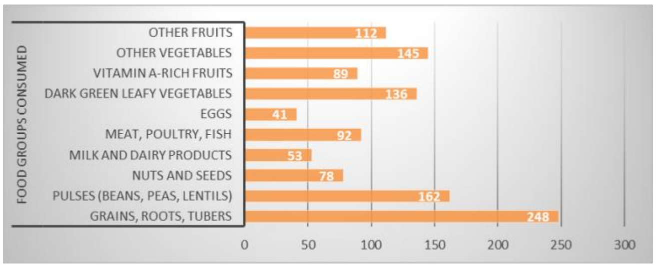
4.3 Data Analysis

This section analyzes the data presented earlier using descriptive statistics to identify trends and relationships relevant to the study's objectives. The analysis focuses on the frequency and diversity of food intake, the prevalence of food insecurity, and the socio-demographic and economic factors associated with food insecurity.

4.3.1 Descriptive Analysis

The data shows that 50.6% (N=134) of mothers consumed three meals daily, while 32.8% (N=87) consumed two meals, indicating that most mothers had at least two meals per day. However, 7.2% (N=19) consumed only one meal, suggesting potential dietary inadequacy in a small subset. Food group diversity was high for grains, roots, and tubers (93.6%, N=248), pulses (61.1%, N=162), and other vegetables (54.7%, N=145), but lower for nutrient-rich groups like milk and dairy (20.0%, N=53), eggs (15.5%, N=41), and meat, poultry, or fish (34.7%, N=92). This suggests a reliance on staple crops with limited intake of protein-rich and micronutrient-dense foods, which could impact maternal nutritional status.

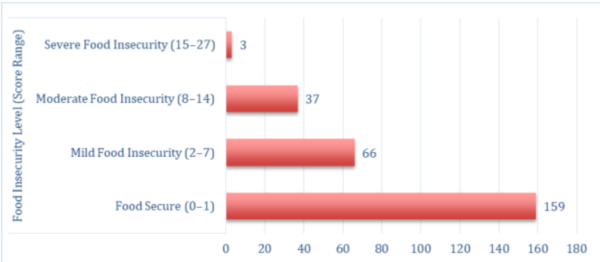
Figure 2: Diversity of Food Intake



Source: Field Data (2025)

The prevalence of food insecurity was estimated using the HFIAS, with 60.0% (N=159) of households classified as food secure (score 0–1), 24.9% (N=66) with mild food insecurity (score 2–7), 14.0% (N=37) with moderate food insecurity (score 8–14), and 1.1% (N=3) with severe food insecurity (score 15–27). This indicates that 40.0% of households experienced some level of food insecurity, aligning with the study's target prevalence of 40%. Key indicators included 32.1% (N=85) of households worrying about food sufficiency, 29.4% (N=78) lacking food due to resources, and 10.6% (N=28) going a whole day without eating, highlighting varying degrees of food access challenges.

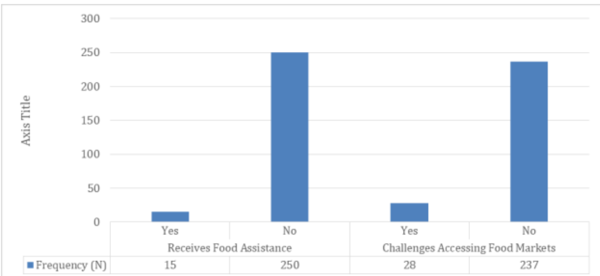
Figure 3: Prevalence of Food Insecurity in Households



Source: Field Data (2025)

The descriptive analysis shows that food insecurity was more prevalent among single (17.4% of sample, with 52.2% food insecure) and divorced/separated mothers (10.6% of sample, with 57.1% food insecure) compared to married mothers (70.2% of sample, with 33.3% food insecure). Households with lower incomes (<50,000 TZS, 23.4% of sample) had a higher prevalence of food insecurity (54.8%) compared to those earning above 200,000 TZS (21.5% of sample, 19.3% food insecure). Unemployed mothers (60.4% of sample) had a higher food insecurity rate (48.1%) compared to employed mothers (39.6% of sample, 26.7% food insecure).

Figure 4: Socio-demographic and economic factors



Source: Field Data (2025)

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Farming households (27.5% of sample) showed a higher food insecurity rate (49.3%) than those with employment (36.6% of sample, 24.7% food insecure). Larger households (7 or more members, 20.4% of sample) had a 50.0% food insecurity rate compared to smaller households (1–3 members, 23.4% of sample, 29.0% food insecure). Mothers with no formal education (17.0% of sample) had a 55.6% food insecurity rate compared to those with secondary or higher education (25.7% of sample, 20.6% food insecure).

4.4 Discussion of Findings

The study's first objective was to determine the frequency and diversity of food intake among mothers with infants under 12 months. The results show that 50.6% of mothers consumed three meals daily, and 32.8% consumed two meals, indicating that most mothers met the minimum meal frequency for adequate nutrition. However, 7.2% consumed only one meal, which could indicate dietary insufficiency, particularly for lactating mothers who require higher energy intake. The high consumption of grains, roots, and tubers (93.6%) and low intake of milk (20.0%), eggs (15.5%), and meat (34.7%) suggest a diet heavily reliant on staples with limited diversity in nutrient-rich foods. This aligns with findings from other Tanzanian studies, where staple crops dominate diets due to affordability and availability, potentially leading to micronutrient deficiencies (Kinabo et al., 2016). The limited intake of protein and micronutrient-rich foods could affect maternal health and infant growth, as breastfeeding mothers need diverse diets to support milk production (Dewey, 2016).

The second objective was to estimate the prevalence of food insecurity in households with mothers of infants under 12 months. The study found that 60.0% of households were food secure, 24.9% had mild food insecurity, 14.0% had moderate food insecurity, and 1.1% had severe food insecurity, resulting in a 40.0% overall food insecurity prevalence, which matches the study's target. This prevalence is consistent with regional studies in Tanzania, where food insecurity affects 30–50% of rural households due to economic constraints and seasonal food shortages (FAO, 2018). Key indicators, such as 32.1% worrying about food sufficiency and 10.6% going a whole day without eating, highlight the challenges of food access. These findings suggest that while severe hunger is rare, a significant portion of households face periodic food shortages, impacting dietary quality and quantity (Coates et al., 2007).

The third objective examined socio-demographic and economic factors associated with food insecurity. The multivariate analysis revealed that single (OR=2.15, p=0.021) and divorced/separated mothers (OR=2.78, p=0.013) were more likely to experience food insecurity than married mothers, likely due to limited social and economic support. Households relying on farming (OR=2.45, p=0.006) and those with lower incomes (<50,000 TZS, OR=3.67, p=0.001) faced higher odds of food insecurity, reflecting the economic vulnerability of agriculture-dependent households in rural Tanzania (World Bank, 2020). Unemployed mothers (OR=2.89, p<0.001) and those with no formal education (OR=2.56, p=0.021) were also at higher risk, indicating that employment and education are protective factors. Larger households (7 or more members, OR=2.34, p=0.042) had increased food insecurity, likely due to higher food demand (Swindale & Bilinsky, 2006).

The findings align with expectations that food insecurity would be prevalent in 40% of households, driven by economic and social factors. The high prevalence of food security (60.0%) suggests that many households have stable access to food, possibly due to local agricultural production. However, the 40.0% food insecurity rate indicates significant challenges, particularly for low-income and farming-dependent households. These results are consistent with studies in similar settings, where low income and unemployment exacerbate food access issues (Hadley & Crooks, 2012). The low consumption of nutrient-rich foods also aligns with expectations, as economic constraints often limit dietary diversity in rural areas (Ruel et al., 2013).

The results highlight the need for targeted interventions to address food insecurity and dietary diversity. Programs supporting income diversification, education, and employment for mothers could reduce food insecurity risks. Additionally, nutritional education to promote diverse diets and access to food assistance (received by only 5.7% of households) could improve maternal and infant health outcomes. The findings underscore the importance of addressing socio-economic vulnerabilities to enhance infood security in Korogwe District, aligning with national efforts to improve nutrition (Tanzania Ministry of Health, 2016).

4.5 Conclusion

This chapter presented and analyzed data from 265 households in Korogwe District, Tanga Region, Tanzania. The findings show that most mothers consumed two to three meals daily, but their diets lacked diversity, with low intake of nutrient-rich foods like milk, eggs, and meat. About 40.0% of households experienced food insecurity, with 24.9% having mild, 14.0% moderate, and 1.1% severe food insecurity. Single or divorced/separated mothers, those with low income, unemployed mothers, farming-dependent households, larger households, and mothers with no formal education were more likely to face food insecurity. These results highlight the need for interventions to improve dietary diversity and address socio-economic factors affecting food insecurity in the region.

CHAPTER FIVE
SUMMARY, CONCLUSION AND RECOMMENDATION

5.0 Chapter Introduction

This chapter summarizes the findings from a study conducted in Korogwe District, Tanga Region, Tanzania, with 265 households. It focuses on the frequency and diversity of food intake among mothers with infants under 12 months, the prevalence of food insecurity, and the socio-demographic and economic factors linked to food insecurity. The chapter includes a summary of findings, a general conclusion, and recommendations to address the issues identified.

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5.1 Summary of Findings

The study examined the frequency and diversity of food intake among mothers with infants under 12 months. It found that 50.6% of mothers ate three meals daily, 32.8% ate two meals, 9.4% ate four or more meals, and 7.2% ate only one meal. Most mothers consumed grains, roots, or tubers (93.6%), pulses (61.1%), and other vegetables (54.7%), but fewer consumed nutrient-rich foods like milk or dairy (20.0%), eggs (15.5%), or meat, poultry, or fish (34.7%). This shows that while most mothers ate multiple meals daily, their diets lacked variety, relying heavily on staple foods.

The study estimated the prevalence of food insecurity in households with mothers of infants under 12 months. It found that 60.0% of households were food secure, 24.9% had mild food insecurity, 14.0% had moderate food insecurity, and 1.1% had severe food insecurity. About 32.1% of households worried about not having enough food, 29.4% lacked food due to limited resources, and 10.6% went a whole day without eating. These results show that 40.0% of households faced some level of food insecurity, with varying degrees of severity.

The study investigated socio-demographic and economic factors associated with food insecurity. It found that single mothers (52.2% food insecure) and divorced/separated mothers (57.1% food insecure) were more likely to face food insecurity than married mothers (33.3% food insecure). Households earning less than 50,000 TZS monthly (54.8% food insecure) and those relying on farming (49.3% food insecure) had higher rates of food insecurity. Unemployed mothers (48.1% food insecure), larger households with seven or more members (50.0% food insecure), and mothers with no formal education (55.6% food insecure) also faced higher food insecurity risks.

The study also examined additional factors related to food insecurity, such as food assistance and market access challenges. Only 5.7% of households received food assistance from government or non-governmental organizations, while 94.3% did not. Additionally, 10.6% of households reported challenges accessing food markets or shops, while 89.4% did not. This suggests that limited access to external support and markets contributes to food insecurity in some households.

5.2 General Conclusion

The study in Korogwe District revealed that most mothers with infants under 12 months consumed two to three meals daily, but their diets lacked diversity, with low consumption of nutrient-rich foods like milk, eggs, and meat. This reliance on staple foods, such as grains and vegetables, may lead to nutritional deficiencies, which could affect maternal and infant health. The limited intake of protein and micronutrient-rich foods highlights the need for improved dietary practices in the region.

The prevalence of food insecurity was significant, with 40.0% of households experiencing some level of food insecurity, matching the study's expected outcome. While 60.0% of households were food secure, the presence of mild (24.9%), moderate (14.0%), and severe (1.1%) food insecurity indicates that many households face periodic challenges in accessing enough food. These findings align with other studies in rural Tanzania, where economic constraints and seasonal shortages affect food access.

Socio-demographic and economic factors played a major role in food insecurity. Single and divorced/separated mothers, households with low income, unemployed mothers, farming-dependent households, larger households, and mothers with no formal education were more likely to experience food insecurity. These factors highlight the vulnerability of certain groups and the importance of addressing economic and social challenges to improve food insecurity.

The study's findings emphasize the need for targeted interventions to enhance dietary diversity and reduce food insecurity in Korogwe District. By addressing low income, unemployment, and limited education, policymakers can help improve food access and nutritional outcomes for mothers and their infants. The low use of food assistance and challenges in market access further suggest that improving support systems and infrastructure could reduce food insecurity risks.

5.3 Recommendations

The study recommends providing nutritional education programs to teach mothers about the importance of consuming diverse foods, especially nutrient-rich options like milk, eggs, and meat, to improve maternal and infant health.

The study suggests increasing access to food assistance programs for vulnerable households, such as those with low income or single mothers, to reduce food insecurity and ensure stable food access.

The study advises promoting income-generating activities, such as small-scale businesses or vocational training, to support unemployed mothers and low-income households in achieving financial stability and better food security.

The study recommends improving access to local markets by enhancing infrastructure, such as roads and transportation, to help households overcome challenges in obtaining food and reduce reliance on limited resources.

The study proposes implementing community-based agricultural programs to diversify crop production and improve access to nutrient-rich foods, supporting farming households to enhance both food security and dietary diversity.

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