DETERMINANTS OF NUTRITIONAL STATUS OF CHILDREN AGED 6-59 MONTHS IN KAJIADO CENTRAL SUB-COUNTY, KENYA

MERCY CHEPKORIR NGE'TICH

A Thesis Submitted to the Institute of Postgraduate Studies of Kabarak University in Partial Fulfillment of the Requirements for the Award of Master of Science in Human Nutrition and Dietetics Degree

KABARAK UNIVERSITY

NOVEMBER, 2025

DECLARATION

1. I do hereby declare that:
   i. This thesis is my work, and to the best of my knowledge, it has not been presented for the award of a degree in any university or college.
   ii. The work has not incorporated material from other works or a paraphrase of such material without due and appropriate acknowledgment.
   iii. The work has been subjected to processes of anti-plagiarism and has met Kabarak University's 15% similarity index threshold.
2. I do understand that issues of academic integrity are paramount, and therefore, I may be suspended or expelled from the University, or my degree may be recalled for academic dishonesty or any other related academic malpractices.

Signed:_____ Date:_____

Mercy Chepkorir Ng'etich

GMND/M/2167/12/22

RECOMMENDATION

To the Institute of Postgraduate Studies:

The thesis entitled "**Determinants of Nutritional Status of Children Aged 6-59 Months in Kajiado Central Sub-County, Kenya,"** written by **Mercy Chepkorir Ng'etich,** is presented to the Institute of Postgraduate Studies of Kabarak University. We have reviewed the research thesis and recommend that it be accepted in partial fulfillment of the requirements for the award of the degree of Master of Science in Human Nutrition and Dietetics.

Signed:_____ Date:_____

Dr. Miriam Muga

Department of Human Nutrition and Dietetics

Kabarak University

Signed:_____ Date:_____ __

Dr. Phyllis Waruguru

Department of Nutrition and Dietetics

Kabarak University

COPYRIGHT

ACKNOWLEDGMENT

I wish to express my deepest gratitude to my supervisors, Dr. Miriam Muga and Ms. Phyllis Waruguru of Kabarak University, for their unwavering support, insightful guidance, and wealth of knowledge throughout this journey. Their mentorship not only shaped my study ideas but also deepened my understanding of key concepts and strengthened the development of this thesis.

I am also sincerely grateful to the faculty members of the Department of Human Nutrition at Kabarak University for fostering an enabling academic environment. Their dedication to nurturing excellence and their constant encouragement greatly contributed to my growth as a scholar.

DEDICATION

To my parents, Stanley Kimutai Ng'etich and Emmy Chepngetich Ng'etich, for your endless love, support, and sacrifices. This achievement is as much yours as it is mine.

ABSTRACT

Optimal nutritional status in children aged 6–59 months remains a global challenge, with 149 million stunted, 45 million wasted, and 37 million overweight. In Kenya, 18% of under-fives are stunted, 5% wasted, 10% underweight, and 5% overweight, reflecting a double burden of malnutrition. Despite national programs, children in Kajiado Central continue to experience both under nutrition and overweight. This study examined determinants of nutritional status among children aged 6–59 months in the sub-county. An analytical cross-sectional study was conducted among 198 children from nine village units in both urban and rural settings, using a multistage random sampling approach. Data on socio-demographics, caregiver nutrition knowledge, dietary and hygiene practices were collected via semi-structured questionnaires, with anthropometric measurements analyzed using WHO Anthro software. SPSS v26 was used for descriptive, chi-square, Pearson correlation, and logistic regression analyses. Ethical clearance and permits were obtained from Kabarak University Scientific Research Ethics Committee and National Commission for Science, Technology and Innovation, as well as informed consent secured. Caregivers averaged 28.6 years; most were mothers (89.9%), married (78.3%), unemployed (61.1%), and 48% had at least secondary education. Nearly 81% had high nutrition knowledge, yet feeding practices were poor: only 17.7% of children 6–23 months met minimum meal frequency, 4.5% achieved minimum acceptable diet, and 19.4% attained dietary diversity. Continued breastfeeding declined from 86% at one year to 56% at two years. Diets were dominated by cereals (97%) and dairy (62%), while 38.4% of households did not treat drinking water. Prevalence of malnutrition was 21.3% stunting, 7.0% underweight, 5.5% wasting, 4.5% overweight, and 2.5% obesity. Urban residence reduced the risk of being underweight ($p=0.005$; AOR=0.03), while caregiver employment increased the risk of over nutrition (AOR=22.18, $p<0.05$). Meal frequency correlated positively with HAZ ($p=0.013$) and WAZ ($p=0.003$). Treated water reduced the odds of stunting by 69% (OR=0.31, $p=0.039$), with chlorine treatment reducing odds by 77% (OR=0.23, $p<0.001$). In conclusion, although caregiver nutrition knowledge was high, feeding practices remain poor. Children in Kajiado Central face a double burden of malnutrition. Key protective factors include urban residence and household water treatment, while caregiver employment increases the likelihood of child over nutrition. The study recommends expanding drinking water treatment, promoting dietary diversity through local foods, strengthening community feeding programs, and adopting multi-sectoral strategies addressing socio-economic and hygiene factors.

Keywords: *Children Aged 6–59 Months, Determinants, Kajiado Central Kenya, Nutritional Status*

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

LIST OF ABBREVIATIONS AND ACRONYMS

BFCI:	Baby Friendly Community Initiative
CHWs:	Community Health Workers
CI:	Confidence Interval
CM:	Centimeters
DBM:	Double Burden of Malnutrition
FFQ:	Food Frequency Questionnaire
HAZ:	Height or age Z score
HT:	Height
IYCF:	Infant and Young Child Feeding
KDHS:	Kenya Demographic and Health Survey
KNAP:	Kenya Nutrition Action Plan
KNDI:	Kenya Nutritionists and Dietitians Institute
KUSREC:	Kabarak University Scientific Research Ethics Committee
LMICs:	Low and middle-income countries
MAD:	Minimum Acceptable Diet
MDD:	Minimum Dietary Diversity
MDG:	Millennium Development Goals
MMF:	Minimum Meal Frequency
MUAC:	Middle Upper Arm Circumference
NACOSTI:	National Commission for Science, Technology, and Innovation
OR:	Odds Ratio
P:	P-value
PI:	Primary Investigator
R:	Correlation Coefficient

SD:	Standard Deviation
SDG:	Sustainable Development Goals
SDS:	Socio-Demographic Status
SES:	Socio-Economic Status
SPSS:	Statistical Package for Social Sciences
UNICEF:	United Nations Children's Fund
WASH:	Water, sanitation, and hygiene
WAZ:	Weight or age Z score
WHO:	World Health Organization
WHZ:	Weight for height Z score
WT:	Weight

CONCEPTIONAL OPERATIONAL DEFINITION OF TERMS

Children Aged 6-59 Months: Children between the ages of 6-59 months, who had lived in Kajiado Central for more than 6 months and whose caregivers consented voluntarily to participate in the study.

Determinants: Identified and measured factors that directly or indirectly influenced the nutritional status of children aged 6–59 months in Kajiado Central Sub-County e.g., socio-demographic and socio-economic characteristics, caregiver nutrition knowledge, dietary practices, and hygiene practices.

Nutritional Status: Nutritional health of children aged 6–59 months was assessed using Anthropometric measurements, i.e., MUAC, age, weight, and height/ length to calculate WHO standard z-scores for stunting (height-for-age), underweight/overweight (weight-for-age), and wasting (weight-for-height) using WHO Anthro software. Children with z-scores below -2 standard deviations (SD) were classified as undernourished, z-scores above +2 SD as over-nourished.

CHAPTER ONE

INTRODUCTION

1.1 Background of Study

The nutritional status of children reflects health as influenced by nutrient intake, absorption, and utilization (Fernández-Lázaro & Seco-Calvo, 2023). Among children aged 6–59 months, optimal nutrition is critical for physical growth, cognitive development, and immunity (WHO, 2022). Malnutrition manifests as under nutrition (stunting, wasting, underweight, and micronutrient deficiencies) or over nutrition (overweight and obesity), which could co-exist together, constituting the double burden of malnutrition. In 2022, 149 million children under five were stunted, 45 million wasted, and 37 million overweight globally, with malnutrition contributing to nearly 45% of under-five deaths (WHO, 2024; Chong et al., 2023). Sub-Saharan Africa has some of the world's highest stunting and wasting rates due to poverty, food insecurity, and poor WASH services (Hossain et al., 2020). In Kenya, 18% of children are stunted, 5% wasted, 10% underweight, and 3% overweight (KDHS, 2022). In Kajiado County, 14% are stunted, 1.3% severely wasted, and nearly 10% underweight (KDHS, 2022), reflecting the persistent nutrition challenges in Kajiado Central. Kajiado Central Sub-County is semi-arid, drought-prone, and highly food-insecure, with poor dietary diversity, inadequate sanitation, and unstable livelihoods (Kemboi et al., 2021).

Globally, caregiver education, age, employment, income, and household size shape food access, feeding practices, and care environments (Ekholuenetale et al., 2020; Banerjee et al., 2021). Children from poorer households face limited dietary diversity and higher malnutrition risks (Drewnowski et al., 2020). In Africa, poverty, rural residence, and large households are strongly associated with child under nutrition, while caregiver education improves feeding and hygiene practices (Amugsi et al., 2024; Florio et al.,

2023). In Kenya, socioeconomic inequalities cause poor nutritional status, particularly in pastoralist counties such as Samburu and Kajiado, where large families, low incomes, and food insecurity prevail (KDHS, 2022; Amugsi et al., 2024).

Globally, caregiver nutrition knowledge is vital for promoting exclusive breastfeeding, timely complementary feeding, and hygienic food preparation (Fadare et al., 2019). However, knowledge does not always translate into practice due to poverty, workload, and cultural beliefs (Motebejana et al., 2022). In Africa, low literacy and limited nutrition education hinder informed decision-making, while cultural norms often impede the adoption of recommended dietary practices (Fadare et al., 2019). In Kenya, nutrition knowledge gaps persist between rural and urban caregivers, with rural caregivers, including those in Kajiado, less exposed to nutrition education (Sanni et al., 2024).

Complementary feeding from six months, assessed through Minimum Meal Frequency (MMF), Minimum Dietary Diversity (MDD), and Minimum Acceptable Diet (MAD), is essential for healthy development (WHO, 2023). Globally, many children fail to meet these standards (UNICEF, 2021). In Africa, cereal-based diets, food insecurity, and cultural feeding practices limit dietary diversity (French et al., 2020). In Kenya, KDHS (2022) shows that while 68.8% of children meet MMF, MDD and MAD remain low, particularly in arid counties. In Kajiado, diets rely heavily on maize, milk, and tea, with drought and seasonal food shortages further reducing diversity (Marshak, 2021).

Globally, unsafe water, poor sanitation, and inadequate hygiene increase diarrheal diseases, reducing nutrient absorption and worsening malnutrition (Khan et al., 2021). In Africa, rural areas face chronic challenges in sanitation and water safety (Shrestha et al., 2020). In Kenya, access to improved water and sanitation is uneven, with semi-arid regions most affected (KDHS, 2022). In Kajiado, water scarcity, open defecation, and

limited access to handwashing facilities contribute to a high prevalence of diarrheal diseases (45.1%), which undermines child health and nutrition (Okumu et al., 2022).

These factors converge to threaten child health and nutrition, showing the need to examine the roles of sociodemographic and socioeconomic factors, caregiver knowledge, dietary practices, and hygiene in shaping nutrition outcomes among children aged 6–59 months.

1.2 Statement of the Problem

Nutritional status varies from optimal nutritional status to poor nutritional status. Poor nutritional status, presented as under nutrition or over nutrition, is a global problem (WHO, 2024). The consequences of poor nutritional status in children between 6-59 months are severe, including impaired cognitive development, increased susceptibility to infections, elevated child mortality rates, and an elevated risk of non-communicable diseases later in life (Fernández-Lázaro & Seco-Calvo, 2023). These also translate into broader social and economic costs, including lower human capital development and increased healthcare burdens (Imran & Imran, 2020). The ideal situation is not only the reduction but also the eradication of all forms of malnutrition among children.

In 2020, an estimated 19 million children under five were stunted, 45 million wasted, and 39 million overweight (WHO, 2024). In Kenya, 18% of children under five years are stunted, 10% are underweight, 3% are overweight, and 5% wasted (KDHS, 2022). In Kajiado County, 14% of children under five are stunted, 8% are wasted, 10% are underweight, and 3% are overweight, indicating the presence of the double burden of malnutrition (KDHS, 2022).

Poor nutritional status rises from multiple, interconnected factors, including socio-demographic and socioeconomic status, limited caregiver nutrition knowledge,

inadequate dietary practices, frequent illness, and poor hygiene practices (Amare et al., 2019; Moyo, 2018). Kajiado Central sub-county is classified as a resource-limited setting, characterized by frequent droughts, low agricultural productivity, inadequate access to health care, poor water and sanitation infrastructure, and limited caregiver education (Okumu et al., 2022). Despite several interventions, such as supplementary feeding programs and nutrition education initiatives, being implemented in Kajiado, malnutrition persists in this area, highlighting unaddressed factors contributing to malnutrition (KDHS, 2022). This study, therefore, examined the socio-demographic and socio-economic characteristics of caregivers, caregiver nutrition knowledge, dietary practices, and hygiene behaviors as potential determinants of the nutritional status of children aged 6–59 months in Kajiado Central Sub-County.

1.3 Objectives of the Study

1.3.1 General Objective

To establish the determinants of the nutritional status of children 6-59 months in Kajiado Central Sub-County, Kenya.

1.3.2 Specific Objectives

i. To assess the socio-demographic and socio-economic characteristics of caregivers of children aged 6-59 months in Kajiado Central Sub-County, Kenya.
ii. To assess the nutrition knowledge of the caregivers of children aged 6-59 months in Kajiado Central sub-county, Kenya.
iii. To assess the dietary and hygiene practices of children aged 6-59 months in Kajiado Central Sub-County, Kenya.
iv. To assess the nutritional status and its association with the socio-demographic and socio-economic characteristics, nutrition knowledge, dietary practices, hygiene

practices, and nutritional status of children aged 6-59 months in Kajiado Central Sub-County, Kenya

1.4 Research Questions

i. What is the socio-demographic and socio-economic status of caregivers of children aged 6-59 months in Kajiado Central Sub-County, Kenya?
ii. What is the nutritional knowledge of caregivers of children aged 6-59 months in Kajiado Central Sub-County, Kenya?
iii. What are the dietary and hygiene practices of children aged 6-59 months in Kajiado Central Sub-County, Kenya?
iv. What is the nutritional status and its association with socio-demographic and socio-economic characteristics, nutrition knowledge, dietary practices, and hygiene practices of children aged 6-59 months in Kajiado Central Sub-County, Kenya?

1.5 Justification of the Study

The age from 6 to 59 months is especially important because nutritional status during this time can have long-term effects on a child's health and development. Poor nutritional status results in wasting, stunting, underweight, overweight, obesity, and micronutrient deficiencies, also known as hidden hunger, and in severe cases, it results in protein-energy malnutrition and finally, child mortality if not well managed. This study addresses Sustainable Development Goal (SDG) 2 on zero hunger, particularly in eliminating child malnutrition, and SDG 3 on healthy lives and promoting well-being for all at all ages. The findings on determinants of nutritional status are useful to public health practitioners and academic scholars in informing future scientific research, especially in similar resource-limited settings, such as Kajiado Central. Therefore, making it worth undertaking this study, which sought to establish the determinants of the

nutritional status of children 6-59 months in Kajiado Central.

1.6 Significance of the Study

This study has important implications for Kenya, particularly in terms of achieving the country's health and nutrition goals established in Kenya Vision 2030. By identifying the specific determinants of nutritional status in Kajiado Central, the study lays the foundation for further research on child nutrition in similar resource-limited regions across Kenya. The findings also contribute to global efforts to reduce malnutrition and improve child health outcomes nationwide. This is crucial, as poor nutritional status remains one of the leading causes of child mortality globally (WHO, 2022). Identifying nutritional status determinants in Kajiado Central through this study benefits the local community of Kajiado Central. It advances Kenya's overall efforts to eradicate malnutrition and improve the well-being of future generations.

1.7 Scope of the Study

This study was conducted in Kajiado Central, Kenya, a region characterized by its semi-arid climate and reliance on pastoralism, which significantly impacts local food security and child health (Kemboi et al., 2021). The study only included children aged 6–59 months residing in Kajiado Central sub-county, Kenya, and their caregivers. It focused on assessing the nutritional status of these children and identifying the determinants and associated factors influencing their nutritional status. The study assessed various determinants, including socio-demographic factors, socio-economic factors, caregiver nutrition knowledge, dietary practices, hygiene practices, and their association with nutritional status. Importantly, nutritional status was assessed using only anthropometric measurements and did not include biochemical or clinical methods.

1.8 Limitations of the Study

The study's cross-sectional design did not provide information on causality and failed to capture changes or trends over time. However, the data was compared to long-term studies conducted in comparable settings to address this constraint. Data on Minimum Meal Frequency (MMF), Minimum Dietary Diversity (MDD), and Minimum Acceptable Diet (MAD) were applicable only for children aged 6–23 months, excluding those above 24 months. For children above 24 months, higher meal frequency and food group consumption were analyzed in relation to nutritional status.

This study relied on caregiver self-reports for dietary intake and child morbidity, which may be subject to self-reporting bias and recall bias. These were addressed by minimizing leading questions and feeding practices, and child care behaviors were collected based on caregivers' reports of activities in the preceding 24 hours. Additionally, the study did not capture cultural practices, which are known to influence child feeding, care giving, and health-seeking behaviors.

1.9 Assumptions of the Study

It was assumed that respondents were honest in sharing information about their socio-demographic and socioeconomic status, caregiver nutrition knowledge, dietary practices, and hygiene practices without deliberate distortion.

CHAPTER TWO

LITERATURE REVIEW

2.1 Introduction

This chapter presents a review of existing literature related to the determinants of child nutritional status, with a particular focus on children aged 6–59 months in resource-limited settings. Selecting determinants to include in this study was informed by evidence from similar resource-limited settings, which showed that these determinants influence child nutrition outcomes.

2.2 Socio-Demographic and Socioeconomic Determinants of Nutritional Status

The socio-demographic status (SDS) and socioeconomic status (SES) of households influence the dietary practices of children aged 6–59 months. Higher SES and SDS are associated with better access to nutritious foods, proper feeding practices, and, ultimately, improved nutrition outcomes. An Indian and Bangladeshi study highlighted the impact of household size and income on the nutritional status of children, finding that larger household sizes were associated with poor nutritional status in children (Banerjee et al., 2021). Larger households may face challenges in allocating resources, which can potentially affect the quantity and quality of food available to each child (Chegere & Stage, 2020).

Research indicates a positive correlation between household income and expenditure on diverse, high-quality meals, which in turn leads to improved child nutrition outcomes (Drewnowski et al., 2020; Ranjit et al., 2020). Households with higher income are more likely to allocate more resources towards acquiring diverse and nutritious foods. In contrast, lower-income households often acquire staple foods, which are generally cheaper, less varied, and lacking in essential nutrients, leading to poor dietary intake in children (Ekholuenetale et al., 2020). A study done in Samburu found that children in

larger households were at a greater risk of malnutrition, likely due to resource limitation, where limited food and care are spread too thinly among more family members (Amugsi et al., 2024). An Iranian study found that children born to older caregivers tend to have better nutritional status, as older caregivers could likely possess more knowledge and experience in childcare than their younger counterparts, which positively influences dietary practices and promotes more frequent clinic visits (Sanjari et al., 2023).

Studies conducted in sub-Saharan Africa have consistently shown that rural areas face challenges in accessing healthcare (Florio et al., 2023). Resource-limited areas may face unique challenges, including limited access to a variety of foods and healthcare services, which can adversely affect nutritional outcomes (Ameye & De Weerdt, 2020). Given that a large part of Kajiado County is rural, it was essential to understand how residing in urban or rural areas impacts the nutritional status of children aged 6-59 months. Higher levels of caregiver education are associated with better nutrition outcomes for children, as educated caregivers are more likely to be knowledgeable about proper hygiene, health care, and feeding practices (Amugsi et al., 2024). An Egyptian revealed that caregivers with higher education levels had children with better nutritional status (Rezaeizadeh et al., 2024).

Employment status encompasses both formal employment and self-employment that generates income. An Indonesian study showed that children of unemployed mothers had a better nutritional status than those of employed mothers (Kumar et al., 2021). This could mean that unemployed caregivers had sufficient time to care for their children. Also, primary caregivers who were employed tended to introduce children to solid food earlier, as they needed to go to work or stop breastfeeding earlier (Eshete et al., 2017). Although global and regional studies have established that socio-demographic and socioeconomic factors are important, there is limited localized evidence from pastoralist

and semi-arid settings, such as Kajiado Central. Moreover, conflicting findings exist regarding the relationship between socio-demographic and socio-economic status and child nutrition outcomes, with some studies showing protective effects of these factors, while others suggest negative impacts.

2.3 Nutrition Knowledge of Caregivers as a Determinant of Nutritional Status

Caregiver knowledge is assessed by their knowledge of breastfeeding practices, complementary feeding practices, hygiene practices, access to health care, responsive feeding, and understanding the causes and signs of malnutrition (Hammouh et al., 2023). Caregivers with high nutrition knowledge are also more likely to seek health care for their children when symptoms of infections arise and provide them with diverse and quality diets, thereby improving growth outcomes (Fadare et al., 2019; Hitchings et al., 2022; Nadimin et al., 2021). Poor nutrition knowledge can lead to inappropriate feeding practices, such as the delayed introduction of solid foods or poor food choices, which can contribute to malnutrition (Motebejana et al., 2022a). In Kenya, urban and economically privileged areas tend to have higher levels of caregiver nutrition knowledge due to better access to information, higher educational attainment, and increased exposure to nutrition-related services (Sanni et al., 2024).

This is in contrast to rural and resource-limited areas, which often have limited caregiver knowledge due to lower literacy rates, inadequate access to healthcare, and cultural practices that may influence nutrition choices (Fadare et al., 2019). Kajiado Central, as a resource-limited area, faces similar challenges. While the link between knowledge and nutrition outcomes is well established globally, it remains unclear to what extent high caregiver knowledge translates into improved dietary diversity and child growth outcomes in contexts where poverty and food insecurity persist as major barriers. This gap warrants research in Kajiado Central to examine how caregiver nutrition knowledge

influences the nutritional status of children aged 6–59 months.

2.4 Dietary and hygiene Practices as a Determinant of Nutritional status

2.4.1 Dietary Practices of Children 6-59 Months

The WHO highlights the importance of breastfeeding for children for at least two years, as it provides essential nutrients alongside a diverse diet, thereby promoting optimal growth (WHO, 2021). Kenya promotes breastfeeding for two years or longer, in line with international norms, through programs such as the Baby Friendly Community Initiative (BFCI). Continued breastfeeding rates are high in Kenya, with 81% of children aged 12-15 months and 54% of children aged 20-23 months still breastfeeding (Kamau, 2023). In semi-arid areas like Kajiado Central, where access to diverse and nutrient-rich complementary foods may be restricted and the health care infrastructure is often sub-optimal, understanding the role of continued breastfeeding becomes even more important.

WHO promotes adequate complementary feeding in addition to continued breastfeeding (WHO, 2023). Complementary feeding (CF) is the process of introducing foods and liquids to an infant's diet in addition to breast milk, beginning at around six months of age, to meet the child’s increasing nutritional needs and support their development (WHO, 2023). Key aspects of CF include the timely introduction of foods, consuming a variety of foods, prioritizing nutrient-dense foods, focusing on responsive feeding, and gradually increasing both the frequency and quantity of food (WHO, 2021). Optimal CF practices ensure that a child's nutrition needs are met, promoting growth and development and supporting long-term health and well-being (UNICEF, 2021). Feeding practices across Africa are influenced by regional and cultural diversity. Food availability and cultural customs impact eating patterns (French et al., 2020).

Minimum Meal Frequency (MMF) is an indicator used to assess whether children aged 6-23 months are fed frequently enough to meet their energy and nutrient needs. A Burkina Faso study found that dietary restrictions, cultural norms, and financial limitations are among the factors hindering the achievement of recommended MMF across Africa (Hien et al., 2023). Regional differences within Kenya also impact caregivers' ability to meet MMF requirements. In Kajiado County, the MMF for children aged 6-23 months is reported at 68.8% (KDHS, 2022). This indicates that a large proportion of children in this age group do not receive an adequate diet. Low MMF scores in children aged 6-23 months are associated with increased morbidity, and malnutrition accounts for up to 45% of mortality among children under five (WHO, 2022). Arid and semi-arid climate, cultural practices, and economic changes in the Kajiado Central region may influence the ability to meet MMF guidelines and, therefore, are worth studying.

Minimum Dietary Diversity (MDD) is a key indicator used to measure the proportion of children who receive food from at least five out of eight defined food groups within the previous 24 hours (UNICEF, 2021). Promoting a variety of food groups is important for reducing nutrition deficiencies, thereby promoting proper growth and development (Aboagye et al., 2021). To increase dietary diversity, interventions must consider various contextual factors, including climate, economic changes, household characteristics, caregivers' nutrition knowledge, and hygiene practices (Raru et al., 2023). A study in Baringo has shown that children in resource-constrained settings exhibit low dietary diversity, which is directly linked to poor nutritional outcomes (Rotich et al., 2023). Since Kajiado Central shares similar characteristics, being a resource-limited, semi-arid region with a predominantly pastoral lifestyle, it is crucial to identify the key determinants affecting dietary diversity in this setting.

The Minimum Acceptable Diet (MAD) is a composite indicator that combines the Minimum Dietary Diversity (MDD) and Minimum Meal Frequency (MMF) indices. To meet the MAD standard, a child must achieve both the minimum dietary diversity and the minimum meal frequency (UNICEF, 2021). Research by Hien et al. (2023) highlights the challenges in attaining MAD due to poor SES, limited access to health care, and cultural practices that influence dietary practices, which directly influence nutritional status. For instance, Kenya's MAD rate in Samburu is notably low, reflecting the broader challenges experienced in resource-limited settings (Marshak, 2021). Given that Kajiado Central similarly faces challenges such as poverty, inadequate health care, and cultural barriers to optimal feeding practices, it is critical to investigate whether children in this region meet the MAD. In summary, while breastfeeding practices in Kenya remain relatively high, complementary feeding practices are still poorer than international recommendations, particularly in Kajiado Central. The gap lies not only in food availability and economic constraints but also in cultural norms and household dynamics that restrict the introduction and use of nutrient-rich foods for young children.

2.4.2 Assessment of Dietary Intake of Children 6-59 Months

Dietary assessment involves the systematic collection, analysis, and interpretation of food and nutrient intake, and comparison against dietary recommendations or nutritional requirements, depending on the method used (Bailey, 2021). Assessment of dietary intake in children aged 6 to 59 months is an important component of monitoring complementary feeding practices in line with guidelines by the World Health Organization (WHO) (*WHO,* 2023). The assessment of dietary intake in this age group relies on a set of standardized indicators that have been jointly developed by the WHO and UNICEF to enable consistent tracking (UNICEF, 2021). The first key indicator is the Minimum Dietary Diversity (MDD), defined as the percentage of children aged 6–23

months who consumed foods and beverages from at least five of the following eight food groups during the previous day: breast milk; grains, roots or tubers and plantains; pulses, nuts and seeds; dairy products; flesh foods (meat, fish, poultry, organ meats); eggs; vitamin-A-rich fruits and vegetables; and other fruits and vegetables. The second indicator, Minimum Meal Frequency (MMF), refers to the number of meals, including snacks, given to children in a day based on their age and breastfeeding status. These two indicators combine to form the more comprehensive Minimum Acceptable Diet (MAD). For breastfed children, MAD is achieved when both MDD and MMF are met; for non-breastfed children, the criteria include MDD, MMF, and at least two milk feedings. Early initiation of complementary feeding, which involves the proportion of infants aged 6–8 months who receive solid, semi-solid, or soft foods in addition to breast milk, is another critical measure recommended by the WHO (UNICEF, 2021; WHO, 2023).

To collect data for these indicators, the 24-hour dietary recall method is frequently used. The 24-hour recall method involves listing all foods and beverages the child consumed in the previous 24 hours, including meals, snacks, and drinks. Then, including their times of consumption, portion sizes, and ingredients used, meal frequency, and preparation methods. The method utilizes food models, household utensils, or visual aids to help caregivers estimate portion sizes. A food frequency questionnaire (FFQ) helps capture intake over long periods, such as daily, weekly, biweekly, or monthly; however, they must be adapted and validated for the local context. It involves asking how often specific foods or food groups are consumed. It can include frequencies only or with portion sizes (Bailey, 2021).

By employing these assessment tools, especially the 24-hour recall and calculating the core WHO/UNICEF indicators (MDD, MMF, MAD, and early complementary feeding initiation), researchers and practitioners can monitor both the quality and quantity of

complementary feeding (UNICEF, 2021).

2.4.3 Hygiene Practices of Children 6-59 Months

Globally, adequate water and sanitation are important factors that determine the nutritional status of children (Khan et al., 2021). Unhygienic conditions and practices, such as not washing hands when preparing a child's meals, can cause foodborne diseases, among others. Nutritional status is impacted by diarrhea illnesses, which are often caused by poor water quality, improper food handling, and inadequate sanitation (Aldana-Parra et al., 2020; Trepanier et al., 2021). Proper hand washing and other hygienic practices, such as safe meal preparation, rely on access to clean water. Ensuring access to clean water and adequate sanitation remains a challenge across Africa. Children in resource-limited settings are more likely to be affected by waterborne diseases, with clear evidence linking water, sanitation, and child nutrition (Shrestha et al., 2020).

A study conducted in Kajiado County found that only 9% of latrines had a hand washing station, with 86% of these stations being functional with water. Over half (50.8%) of households practiced open defecation. A majority (61.4%) of households obtained water from improved sources. However, only 17.4% of households treated their water before drinking, primarily through boiling, and bacteriological analysis revealed widespread contamination (Okumu et al., 2022). The study also reported a 45.1% prevalence of diarrhea among children under the age of five. Factors contributing to an increased risk of diarrhea included the use of unimproved water sources and long distances to access water (Okumu et al., 2022). Given the water scarcity and inadequate sanitation infrastructure in Kajiado Central, assessing hygiene practices was crucial to understanding the nutritional implications in this setting.

2.5 Assessment of Nutritional Status of Children 6-59 Months

The nutritional status of children 6-59 months of age is an important indicator of their

general health and well-being. Z-scores for weight-for-age (WAZ), height-for-age (HAZ), and weight-for-height (WHZ) act as generally recognized markers of child nutritional status. To determine whether a child's measurements fall within the normal range for their age and sex, z-scores are computed using reference growth charts. The nutritional status of infants and children is categorized based on various indicators, and cut-off values classify child nutritional status according to the WHO growth standards. Categories include stunting, underweight, and wasting (*WHO*, 2021).

The nutritional status of children aged 6-59 months is a global concern due to its long-term effects on child development and health. The WHO and United Nations Children's Fund (UNICEF) estimated that there were 45.4 million wasted children and 149.2 million stunted children worldwide among the under-five population in 2020 (WHO, 2024). Approximately 3.1 million deaths per year, or 45% of all child deaths under the age of five, are attributed to undernutrition (Chong et al., 2023).

The double burden of malnutrition (DBM) illustrates how both overnutrition and undernutrition can coexist within the same populations (Hossain et al., 2020). The triple burden of malnutrition refers to the presence of three types of malnutrition in the same population, community, home, or individual, i.e., undernutrition, overnutrition, and micronutrient deficiencies (Sunuwar et al., 2020). Children may experience stunting and micronutrient deficiencies due to inadequate diets and limited access to health care. On the other hand, the prevalence of overweight and obesity is rising, particularly in urban areas, due to more sedentary lifestyles and the consumption of processed foods high in sugar and fat (KDHS, 2022).

In Kenya, among children aged 6-59 months, 5% are wasted, 18% are stunted, 3% are overweight, and 10% are underweight. In Kajiado County, 14% of children in this age range are stunted, 1.3% have severe wasting, 7.6% have mild wasting, 9.6% are moderately underweight, and 1.3% are severely underweight. (KDHS, 2022). The study aimed to assess the nutritional status of children aged 6-59 months in Kajiado Central Sub-County and its association with socio-demographic and socio-economic characteristics, caregiver nutrition knowledge, dietary practices, and hygiene practices.

2.6 Summary of Review Literature

Although global and regional literature highlights several determinants of child nutritional status, important gaps remain, particularly in resource-limited, semi-arid settings such as Kajiado Central. First, while socioeconomic and socio-demographic determinants, such as household size, income, education, and caregiver age, are well-established in other contexts, there is limited localized evidence from pastoralist communities. Furthermore, findings on SES and SDS remain contradictory, with some studies linking SES and SDS to better nutrition outcomes while others suggest the opposite, leaving uncertainty about their role in Kajiado Central. Similarly, although

rural-urban differences in access to food and health services are well recognized, how these dynamics specifically shape child nutrition outcomes in semi-arid pastoralist areas has not been adequately explored.

Second, while caregiver nutrition knowledge has been shown to influence feeding practices and health outcomes globally, it is unclear whether knowledge alone can translate into better nutrition outcomes in contexts where poverty, food insecurity, and cultural practices act as major barriers. The extent to which caregivers in Kajiado Central apply their knowledge in day-to-day feeding and health-seeking practices remains largely undocumented.

Thirdly, despite high national breastfeeding rates, evidence shows that complementary feeding practices fall short of recommended standards. However, there is insufficient data on dietary practices in Kajiado Central, particularly on whether children achieve minimum dietary diversity, meal frequency, and acceptable diets. Moreover, cultural practices such as food taboos, gendered food allocation, and restrictive child-feeding beliefs are rarely studied, yet they may play a critical role in shaping feeding patterns. Similarly, the influence of seasonality, drought, and household decision-making on dietary adequacy in this region remains poorly understood.

Fourthly, while poor sanitation and hygiene have been linked to diarrhea and malnutrition in broader studies, little is known about the specific hygiene practices within Kajiado Central households and how these behaviors beyond infrastructure availability directly affect child nutrition outcomes. Although water scarcity and sanitation challenges are documented, the consistency of water treatment and its association with diarrhea-related malnutrition remains underexplored.

Finally, though county-level data provide a general picture of malnutrition in Kajiado, there is limited sub-county-specific evidence on the prevalence and forms of malnutrition in Kajiado Central. Existing data mainly emphasize undernutrition, yet the emerging double and triple burden of malnutrition, including overweight and micronutrient deficiencies, remains insufficiently studied in pastoralist contexts. Moreover, few studies in this setting have integrated socioeconomic, dietary, caregiver knowledge, and hygiene determinants with actual anthropometric outcomes, leaving a critical gap in understanding how these factors interact to influence child nutrition.

2.7 Conceptual Framework

The modified conceptual framework was adapted from the UNICEF (2020) Conceptual Framework on the Determinants of Maternal and Child Nutrition. Variables were organized into immediate, underlying, and outcome determinants of child nutrition. At the immediate level, child dietary practices and hygiene practices directly influence nutritional outcomes, as they determine nutrient intake, exposure to infections, and overall child health. At the underlying level, caregiver socio-demographic and socio-economic characteristics, as well as caregiver nutrition knowledge, reflect household capacity to provide adequate care, resources, and informed feeding practices. At the outcome level, the nutritional status of children aged 6–59 months was assessed solely through anthropometric measurements. This outcome reflects the combined effects of immediate and underlying determinants. The enabling determinants category of the UNICEF framework (e.g., governance, resources, and social norms) was not included in this study, as these factors were beyond the scope of the research (*UNICEF*, 2020).

CHAPTER THREE

RESEARCH DESIGN AND METHODOLOGY

3.1 Introduction

This section describes the research design, study location, study population, sample size, sampling procedure, data collection methods, ethical considerations, and data analysis methods are covered in this section.

3.2 Research Design

The study employed an analytical, community-based, cross-sectional study design. This design allows researchers to obtain a snapshot of the population's nutritional status at a specific point in time. Cross-sectional studies are also typically more efficient and cost-effective compared to longitudinal studies. They require fewer resources and can be completed in a shorter duration, making them suitable when timely data is needed (Wang & Cheng, 2020).

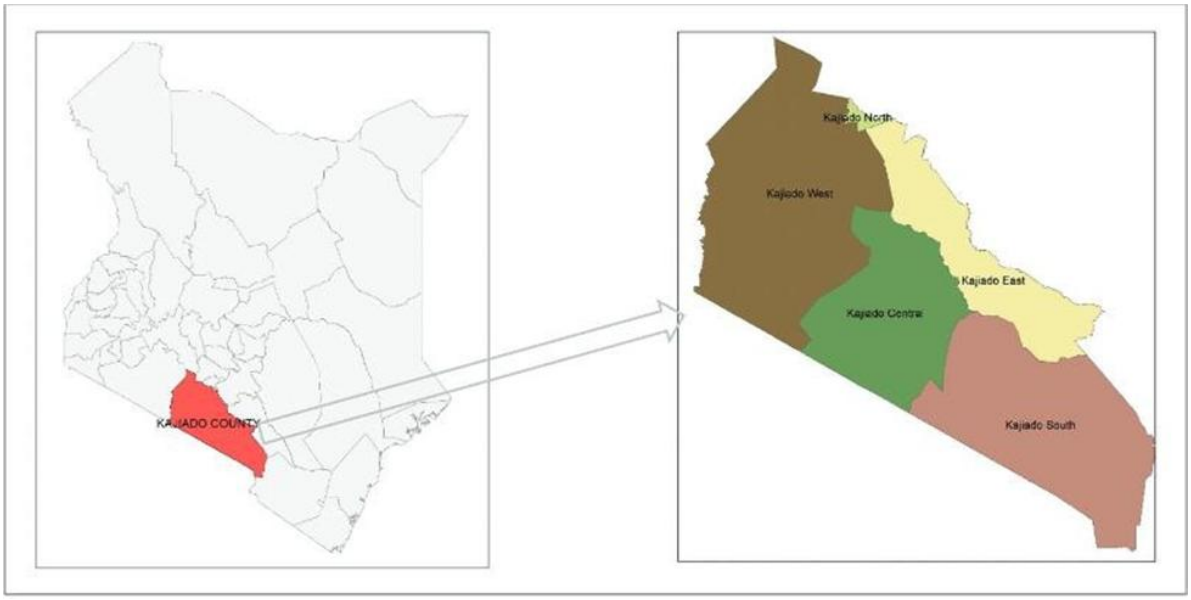
3.3 Location of Study

As shown in Figure 1, the study was carried out in Kajiado Central Sub-County in Kenya, which is part of Kajiado County. Kajiado Central is located in the southern region of the country, sharing borders with Kajiado North and Kajiado East, as well as Tanzania to the south. The climate of the area is arid and semi-arid, with unpredictable rainfall patterns and periodic droughts. The average annual temperature in Kajiado County is 18.9°C. The area receives about 500 mm of rainfall annually, most of it falling in April. In particular, the study was conducted in nine randomly selected village units, namely: Duka Moja, Kilorityi, Majengo A1, Majengo A2, Nalepo, Osimilai, Saina A, Saina B, and Sajiloni. Majengo A1 and A2, as well as Saina A and B, represent administrative sub-units of the larger Majengo and Saina villages. Kajiado Central was

chosen due to its unique socio-economic and environmental characteristics that impact child nutrition. The region's arid and semi-arid climate contributes to food insecurity, limiting access to diverse and nutrient-rich diets (Kemboi et al., 2021). Additionally, the pastoralist lifestyle of the area often leads to poor dietary diversity.

Figure 1

Map of Kajiado County



3.4 Participants of the Study

The study participants included children between 6 and 59 months of age and their caregivers. This age group is internationally recognized as among the most nutritionally vulnerable, as children undergo rapid physical growth and cognitive development that require optimal nutrition. Malnutrition during this period, particularly stunting, wasting, or micronutrient deficiencies, has both immediate and long-term health consequences, including impaired immunity, delayed development, and increased morbidity and mortality. Caregivers were included because they are directly responsible for feeding, hygiene, and health-seeking practices, making their socio-demographic characteristics, knowledge, and behaviors critical determinants of child nutritional status.

3.4.1 Inclusion Criteria

Only children aged 6–59 months residing in Kajiado Central Sub-County were included. The primary caregiver who was responsible for the child's daily feeding, hygiene, and care, and who gave informed consent, was included as the respondent. (Appendix II).

3.4.2 Exclusion Criteria

Children who were reported by caregivers to be sick with illnesses other than diarrhea and confirmed with hospital visit records were excluded. Children whose caregivers did not consent were excluded from the study. Children not regularly residing in the household (e.g., visiting relatives) were excluded to ensure that dietary practices and household determinants assessed reflected stable, long-term conditions.

3.5 Sampling Procedure and Sample Size

3.5.1 Sample Size Determination

To calculate the sample size, Fisher et al.'s formula was used (Jung, 2014):

$$N = (Z\ 2 \times p\ (1\text{-}p))/E$$

Where:

n = required sample size

Z = standard normal deviation (set at 1.96 for a 95% confidence level)

p = estimated proportion of the population with malnutrition= 0.14 (KDHS, 2022)

q = 1 - p

E = margin of error (at 0.05 for a 5% margin of error) n = $\frac{(1.96)2 * 0.14(1-014)}{(0.05)2}$

n≈ $\frac{3.8416 * 0.4(0.86)}{0.00250}$

n ≈ $\frac{0.162528640}{0.00250}$ n ≈ 185

The necessary sample size (n), taking into consideration a 10% attrition rate to account

for potential incomplete or damaged questionnaires, was approximately 204 children.

3.5.2 Sampling Procedure

Table 3 presents the distribution of sampled children per village unit. A multistage random sampling approach was used. First, a comprehensive list of all wards and rural units within the sub-county was obtained from local official sources. Based on this, nine rural units were selected for sampling. These units included Duka Moja, Kilorityi, Majengo A1, Majengo A2, Nalepo, Osimilai, Saina A, Saina B, and Sajiloni. These units represented both urban and rural settings to ensure geographic diversity. Secondly, simple random sampling was employed to recruit caregivers with children aged 6–59 months from various households in the selected village units.

To identify eligible households, Community Health Workers (CHWs) assisted in mapping out different household units. The sample distribution across villages is proportional to household counts to ensure representativeness. In cases where a household had multiple eligible children, each child was assigned a unique number, and a random number generator was used to select one child. This process ensured unbiased selection and maintained that the sample was representative of the population of Kajiado Central. This sampling approach ensured a proportional representation of children relative to the population size of each unit.

Table 1

Household Distribution by Village and Residence Proportional to Household Size

Village unit	Number of households	Residence
Duka Moja	14 (7.1%)	Rural
Kiloriti	24 (12.1%)	Rural
Sajiloni	22 (11.1%)	Rural
Nalepo	23 (11.6%)	Rural
Osimilai	15 (7.6%)	Rural
Saina A	24 (12.1%)	Urban
Saina B	32 (16.2%)	Urban
Majengo a1	20 (10.1%)	Urban
Majengo a2	24 (12.1%)	Urban

3.6 Instrumentation

A semi-structured questionnaire was used (Appendix III). The questions were adopted from an existing questionnaire used in a similar study conducted in Tharaka Nithi (Lukoye, 2019). These questions collected data on socio-demographic and socioeconomic characteristics, caregiver nutrition knowledge, dietary practices, and hygiene practices. The questionnaire was divided into five sections.

Section A focused on the social-demographic and socio-economic characteristics. Section B focused on caregiver nutrition knowledge using 20 questions and was scored in percentages. Section C focused on dietary factors, i.e., continued breastfeeding, duration of breastfeeding, complementary feeding, meal frequency, and food group consumption. Section D focused on hygiene practices, i.e., waste disposal, hand washing, toilet use, water treatment, and diarrhea status.Section E focused on the nutritional status of the children using anthropometric measurements, which involved taking measures of weight, height, or length (for weight-for-height/length, height-for-age, and weight -for-age assessments). The weight and height/length of children aged 6-59 months were

collected using a digital weighing scale and a measuring board, respectively. The weight was measured to the nearest 0.1 kg, while height/length was measured to the nearest 0.1 cm. The measurements were then input into the WHO Anthro software to generate z-scores accordingly.

3.6.1 Pilot study

The pilot study was done in the Isinya location because it closely resembles Kajiado Central Sub-County in terms of socio-demographic characteristics, economic activities, and environmental conditions. This similarity made Isinya a suitable setting for testing the research instruments without influencing or exhausting the main study population. The calculated sample size was 204 children. From this, 20 children (representing approximately 10% of the total sample) were randomly selected for the pilot study to mirror the target demographic closely. Selecting 10% of the population of the study aligns with common guidance for pilot work, providing sufficient cases to assess feasibility, refine tools, and train study staff.

This validated the applicability of the instruments for the final study. The data was used to refine instruments and study procedures. The questionnaire was administered to determine caregiver characteristics, caregiver nutrition knowledge, child feeding practices, hygiene practices, and to take anthropometric measurements of children aged 6-59 months. The questionnaire was analyzed as outlined in the data analysis (Table 4). To assess the quality of the responses given, descriptive analysis was undertaken. An interview was also conducted to get feedback from the caregivers, which helped improve data collection. The pilot study also helped determine the feasibility of the research, refine tools, train research assistants, and assess reliability.

3.6.2 Validity of the Instrument

Three child nutrition experts reviewed the questionnaire, selected purposively based on their advanced training in nutrition and dietetics, research experience in child growth and feeding practices, and familiarity with the local study context. We used three child nutrition specialists because this number is adequate for expert validation, allows for triangulation of perspectives, and ensures that consensus can be reached while remaining practical and feasible. The experts evaluated the questionnaire for relevance, clarity, and comprehensiveness in addressing the study objectives.

3.6.3 Reliability of the Instrument

To ensure reliability, the questionnaire was first administered twice to the same group of respondents using the test–retest method, which checks for consistency in responses across time. Responses were then compared to determine the stability of the instrument. Following this, internal consistency was assessed using Cronbach's alpha coefficient, which indicates how closely related a set of items is as a group. The analysis was carried out in SPSS, and Cronbach's alpha was calculated for each section of the questionnaire, including caregiver knowledge on child nutrition, feeding practices, and health-seeking behavior. A threshold of 0.70 or higher was considered acceptable for research purposes (Milosavljević et al., 2023). The overall Cronbach's alpha for the questionnaire was 0.83, suggesting good internal consistency.

3.7 Data Collection Procedure

Four research assistants with a diploma or higher-level degree in nutrition and with a license from the Kenyan Nutritionists and Dietitians Institute (KNDI) assisted the primary investigator (PI) in data collection. Research assistants received thorough training that covered several facets of data collecting, questionnaire administration, and data cleaning. Preference was given to applicants who were also familiar with Kajiado

Central Sub-County, had excellent communication skills, and were fluent in Swahili, English, and Maasai, the local dialect. Additionally, those who could commit to the entire time of data collection were chosen.

The first day of the training focused on introducing the study topic, providing a detailed examination of the study's overview, objectives, and methodology. There were practice sessions in which they created example scenarios to illustrate how they would interact with caregivers. Day two was on data collection to ensure they were proficient in using the tools and techniques required for the study. They were trained on how to maintain data quality and how to address issues that might arise, such as non-cooperative caregivers or incomplete responses. On the final day, a practical assessment was done to show their level of preparedness. Preparations on the schedules, distribution of fieldwork materials, equipment, and procedures for data submission and reporting were also done on the final day. The village units were accessed through planning, considering logistical challenges and local dynamics. The process prioritized participant safety and the privacy of their data. Research assistants fluent in Swahili, English, and the Maasai language ensured effective communication with caregivers.

Caregiver nutrition knowledge was assessed using a structured questionnaire adapted from the tool used in the study titled *"*Nutrition knowledge of caregivers and feeding practices of children 6–59 months in rural Kajiado Central, Kenya*"* (Waruguru, 2024). The questionnaire was aligned with the WHO Infant and Young Child Feeding (IYCF) guidelines and included items on breastfeeding, complementary feeding, signs and symptoms of malnutrition, and access to healthcare services. Caregiver nutrition knowledge was assessed using 20 questions covering essential areas such as breastfeeding, complementary feeding, dietary diversity, hygiene, and meal frequency. Each response was recorded as knows or doesn't know. Every correct response to a

question was awarded one point, and total scores were converted into percentages. Scores were then categorized into five levels: very low: 0–20%, low: 21–40%, moderate: 41–60%, high: 61–80% and very high: 81–100%. For hygiene practices, closed-ended questions were used to assess waste disposal methods and hand washing practices. A child was classified as having had diarrhea in the past 24 hours if they had passed three or more loose or watery stools within 24 hours. Nutritional status was assessed using anthropometric measurements.

Information on the dietary practices of children aged 6-23 months in Kajiado Central sub-county was collected using questions related to age-appropriate WHO Infant and Young Child Feeding (IYCF) indicators. For children 6–23 months, four core IYCF indicators were evaluated (continued breastfeeding, minimum meal frequency, minimum dietary diversity, and minimum acceptable diet). Frequency of meals was measured by questioning how many meals of solid, semisolid, or soft foods the child had eaten compared to the minimum required by specific ages of children in WHO (e.g., 2–3 meals for breastfed 6–8 months, and 4 meals for non-breastfed children 6–23 months). Dietary diversity was measured using an 8-food-group checklist validated by WHO, with a minimum of five food groups being consumed representing the minimum dietary diversity score for children 6-23 months and 4 food groups for children aged 24 -59 months.

The combination of minimum meal frequency and minimum dietary diversity formed the basis for determining whether a child met the criteria for a minimum acceptable diet. For children aged 24–59 months, information was collected on the number and timing of main meals (breakfast, lunch, dinner) and snacks consumed during the previous day. Additionally, dietary diversity was assessed by documenting food groups consumed, as assessed by the children aged 6-23 months. Importantly, dietary practices for school-

going children did not factor in school meal consumption since schools were closed for the holidays at the time of data collection.

The weight and height/length of children aged 6–59 months were measured according to the WHO Child Growth Assessment guidelines. Weight was measured using a Seca 847 digital weighing scale placed on a flat, stable surface. For children under 2 years, tared weighing was conducted by first weighing the mother alone and then weighing her together with the child; the child's weight was then displayed to the nearest 0.1 kg. Older children who could stand still were weighed directly on the scale with minimal clothing and no shoes. Length was measured for children below 2 years in a recumbent position using a length board placed on a flat surface. The child's head was positioned against the fixed headboard while the legs were gently straightened and the footboard pressed against the soles; measurements were read to the nearest 0.1 cm. For children aged 2 years and above, standing height was measured using a height board placed at a right angle to a flat surface. Children stood barefoot with heels, buttocks, shoulders, and head touching the board, and the headpiece was lowered to compress the hair before reading the measurement to the nearest 0.1 cm. Where necessary, 0.7 cm was added or subtracted to adjust for conversions between recumbent length and standing height (*WHO*, 2006).

3.8 Data Analysis

Table 1 shows data analysis, including statistical tests and presentation of variables per the objectives of the study. Data analysis was conducted using SPSS vs 26. Analysis of anthropometric data was conducted using the WHO Anthro software, which provided nutritional status results measured in Z-scores for underweight, stunting, and wasting. To assess the socio-demographic and socio-economic characteristics, descriptive and frequency statistics were utilized. Variables analyzed included: caregiver age, marital status, education level, employment status, household income, household size, residence

type (urban/rural), and monthly household income. Data was summarized as counts, percentages, means, standard deviation, modes, minimum, and maximum values. Results of statistical analysis were presented in summary tables and bar charts.

To assess caregiver nutrition knowledge scores, a total of 20 questions were used to assess caregivers' nutrition knowledge. After administering the questionnaire, individual scores were calculated based on the number of correct responses. The correct responses were converted to percentages, which were then categorized into five distinct levels of nutrition knowledge: very low 90-20), low (21-40), moderate (41-60), high (61-80), and very high (81-100). The number of caregivers falling into each category was counted. The proportion of caregivers I each category was computed. Findings were then presented in a summary table.

To assess the dietary practices of the children, IYCF indicators — specifically, continued breastfeeding, MMF, MDD, and MAD — were computed using the UNICEF definition for children aged 6-23 months (UNICEF, 2021). For children above 24 months, the number of food groups consumed as well as the number of meals was also analyzed. Descriptive statistics were applied to summarize the data, and the findings were presented in tables to facilitate comparison across variables.

To assess hygiene practices, variables such as hand-washing behavior, disposal of child waste, water treatment methods, and diarrhea status were evaluated. Descriptive statistics, including percentages, frequencies, and means, were applied and presented in summary tables.

To assess the nutritional status of the children 6-59 months, z scores were computed using Anthro software from height, weight, and age measures. MUAC measurements were also taken and displayed in a summary table.

To determine the association between socio-demographic, socio-economic, caregiver nutrition knowledge, dietary practices, hygiene practices, and nutritional status, multiple forms were utilized. Chi-square test was used to assess associations between categorical variables. Pearson was used to assess the correlation between continuous/ordinal variables and nutrition outcomes. Further, variables found to have significant associations were analyzed using binary/ multinomial regression modes as appropriate to control for potential intervening factors. Variables associated with WHZ, HAZ, and WAZ were analyzed to determine significant associations. For WHZ, the outcome was categorized into three groups i.e., wasted, normal, and overweight. This variable was coded accordingly in SPSS and analyzed using multinomial logistic regression due to the nature of its three outcome categories. For HAZ and WAZ, the outcomes were binary: stunted vs. not stunted for HAZ and underweight vs. normal for WAZ.

These were coded as binary variables and then analyzed using binary logistic regression. Both unadjusted and adjusted odds ratios (ORs) with corresponding 95% confidence intervals (CIs) were calculated to measure the strength of association between predictor variables and nutritional outcomes. Results were displayed in tables showing significance levels and odds ratios. Statistically significant was set at $p < 0.05$ with odds ratios (OR), 95% confidence intervals (CIs) presented for each model. Both unadjusted and adjusted models were presented, with odds ratios (ORs), 95% confidence intervals (CIs), and significance levels presented for each model.

Table 2

Data Analysis Table

Objective	Independent	Dependent Variables	Statistical Tests & Data Analysis	Data Presentation
1. To assess the socio-demographic and socio-economic characteristics of children 6-59 months.	Caregiver age, marital status, education level, employment status, household income, household size, and place of residence (urban/rural).	Not applicable – this objective was purely descriptive.	Descriptive statistics were computed, including frequencies, percentages, means, standard deviations, modes, and ranges (minimum and maximum values).	Findings were presented using summary tables and visual charts (e.g., bar graphs, pie charts) to illustrate distributions and patterns across households.
2. To assess the nutrition knowledge of caregivers of children 6-59 months.	Knowledge was measured through responses to questions on breastfeeding, complementary feeding, recognition of malnutrition signs and symptoms, and access to healthcare services.	Not applicable – this objective was purely descriptive.	Descriptive and frequency statistics were used to calculate overall knowledge scores. Scores were categorized into five levels: very low (0–20%), low (21–40%), moderate (41–60%), high (61–80%), and very high (81–100%).	Results were summarized in tables with frequency distributions, and knowledge categories were illustrated with charts for clarity.
3. To assess the dietary intake of children 6-59 months.	Dietary practices were assessed using indicators such as breastfeeding history, complementary feeding, meal frequency, and dietary diversity.	Not applicable – this objective was purely descriptive.	Descriptive and frequency statistics were applied, including means, percentages, and standard deviations.	Results were presented in tables and charts, showing levels of dietary adequacy and adherence to WHO standards (MMF, MDD, MAD).
4. To assess the hygiene practices of children 6-59 months.	Indicators include caregiver-reported child illness (especially diarrheal episodes), source of water, sanitation facilities, and hygiene practices such as hand washing.	Not applicable – this objective was purely descriptive.	Descriptive statistics (counts, percentages, means, standard deviations, and ranges) were used to summarize morbidity and hygiene conditions.	Summary tables and charts were used to illustrate the prevalence of child illness and the distribution of hygiene practices.

5. To assess the association between determinants and children 6-59 months.	Socio-demographic and socio-economic characteristics, caregiver nutrition knowledge, dietary practices, and hygiene practices.	Child nutritional status indicators: stunting, wasting, underweight, and overweight based on z-scores	Inferential analysis was applied: chi-square tests for associations, Pearson correlation tests for relationships, and binary & multinomial logistic regression to identify predictors of child nutrition outcomes.	Results were presented in tables showing statistical associations, supported by charts where appropriate for key findings.

Note. Abbreviations: SD Standard Deviations; IYCF Infant and Young Child Feeding; MMF = Minimum Meal Frequency; MDD = Minimum Dietary Diversity; MAD = Minimum Acceptable Diet; HAZ = height-for-age Z-score; WHZ = weight-for-height Z-score; WAZ = weight-for-age Z-score; MUAC = mid-upper arm circumference.

3.9 Ethical Considerations

Ethical clearance and research permit were obtained from KUREC (ref no: 11024) (appendix VI), NACOSTI (ref no: 964871) (appendix VII), and Kajiado County Health Office. These approvals ensured that the study adhered to national and institutional research ethics standards. Additionally, authorization was obtained from the local county government and area chiefs to collect data from the community. Respect for participants was ensured by obtaining informed consent (Appendix II) and guaranteeing the confidentiality and privacy of all data. Various measures were implemented to safeguard participant data and maintain confidentiality. First, identifiable information was not collected, but instead, unique codes were used for participants and questionnaires. Secondly, the secure storage of physical forms in locked cabinets and encrypted digital files was used to prevent unauthorized access and protect the data.

Thirdly, regular backups were performed to prevent data loss, and only authorized individuals could access or modify the data set. The PI monitored data collection daily to ensure compliance with procedures and address emerging issues. Criteria for review

included adherence to participant confidentiality, completeness of questionnaires, and accurate data entry. Data was securely stored on encrypted hard drives and cloud platforms with restricted access. Hard copies of questionnaires will be archived for five years in locked storage before being securely shredded. Digital files will be retained for two years and thereafter, securely deleted.

All study procedures were designed to ensure the protection of participants' rights, privacy, and well-being. The study also complies with all relevant professional, legal, and regulatory requirements, having secured all necessary permits and approvals. The study adhered to regulatory guidelines throughout, ensuring ethical conduct up to dissemination. There were no personal, familial, commercial, or social interests that could compromise the integrity of the study and or influence the outcomes.

The research team consisted of qualified and competent individuals who possess degrees or diplomas in Human Nutrition and Dietetics and are licensed by KNDI. The PI and research assistants were well-trained in ethical research practices and data collection methods. This ensured that the study was carried out with the highest standards of professionalism and care. The risk-benefit ratio for the study was thoroughly assessed and found to be favorable. The benefits of this study are both immediate and long-term. This includes the potential for improved child health outcomes through increased awareness of nutrition knowledge, practices, and the nutritional status of the children in the community.

The findings contribute to the advancement of knowledge in child nutrition and may inform future health interventions and policy recommendations in the region. Beneficence was evident in the study's aim to benefit the participants and the wider Kajiado Central community by advancing knowledge of nutritional status and its determinants, which may improve health outcomes. Non-maleficence was maintained

through the study's efforts to minimize any harm to participants, and justice was upheld by ensuring fair and equitable treatment of all participants. Research assistants were available to provide emotional support when needed, and referrals to relevant support services were offered for participants experiencing distress or requiring additional assistance. The study ensured that all participants' privacy was safeguarded by maintaining the anonymity of the data and securely storing it with encryption and access controls.

The security of data collection and storage was paramount, and all necessary steps were taken to prevent breaches or loss of data. The findings from this study were disseminated to study participants, health care providers, government officials, the academic community, and the public through various channels, including academic journals and community forums. The study findings focused on the key factors influencing child malnutrition, particularly among children aged 6-59 months, and provided recommendations for improving child nutrition in the community.

Ethical considerations were observed throughout the study. Permission to conduct research in Kajiado Central was obtained from local government offices and community leaders. Informed consent was sought from all caregivers, and the privacy and confidentiality of the data collected were strictly maintained.

CHAPTER FOUR

DATA ANALYSIS, PRESENTATION, AND DISCUSSION

4.1 Introduction

This chapter presents the findings of the study, organized according to the objectives of the study. A total of 204 children were initially targeted for the study, with this number factoring in expected attrition. However, 198 children were ultimately included in the final analysis, resulting in a response rate of 97.1%. The shortfall was due to factors such as incomplete questionnaires or missing anthropometric data. Reliability analysis of the questionnaire was conducted to determine the internal consistency of the items across different domains. As shown in Table 3, these results confirm that the questionnaire provided consistent and dependable measurements across the assessed domains.

Table 3

Reliability Analysis Results

Variable	No of items	Cronbach alpha
Socio-economic and socio-demographic factors	14	0.81
Caregiver nutrition knowledge	20	0.87
Dietary practices	5	0.82
Hygiene practices	5	0.82

4.2 Socio-Demographic and Socio-Economic Characteristics of Children 6-59 Months in Kajiado Central Sub-County, Kenya

Table 3 displays the distribution of various household characteristics. The largest number of households (38.4%) was made up of four to five household members. With a median of five household members, the average household size was six household members. Seven categories were used to classify caregiver ages, i.e., 15–19, 20–24, 25–29, 30–34, 35–39, 40–44, and above 45 years (KDHS 2022). The oldest caregiver was sixty-eight

years old, while the youngest was eighteen. Caregivers were 28.6 years old on average. The majority of caregivers (57.58%) were in the 20–29 age range.

There was an equal distribution of participants in rural and urban regions. Rural areas included Duka Moja, Kilorityi, Nalepo, Osimilai, and Sajiloni, which together had 98 (49.5%) participants. The urban areas included Majengo A1, Majengo A2, Saina A, and Saina B, which together had 100 (50.5%) participants, as presented in Education. This reflects the highest level of formal education completed at the time of the survey. The study found that 48% of caregivers had completed secondary education or higher, compared to approximately 12% who had no formal education. The largest number of caregivers were unemployed (61.1%), while 29.3% were self-employed (in informal or small-scale businesses), and only 9.6% were formally employed.

Household monthly income was categorized into Quintiles, with the average monthly household income being Kshs 13,833. Most households (29.3%) made ≤5,000 a month. Most children in the study (89.9%) were primarily cared for by their mothers, indicating that maternal care giving remains the dominant care giving arrangement. A small proportion of children were cared for by fathers (4.5%), grandparents (4.0%), or others (1.5%), reflecting the relatively low involvement of extended or alternative caregivers in child-rearing responsibilities within the study participants. Most caregivers were married (78.3%), suggesting that most children lived in two-parent households. Single caregivers and separated caregivers accounted for 19.25% and 2.5% respectively.

Table 4

Household Characteristics of Children 6-59 Months

Characteristic	Frequency (n)	%
Caregiver Education		
No formal education	23	12
Primary incomplete	8	4
Primary	71	36
Secondary	70	35
Post-secondary	26	13
Employment Status		
Employed	19	9.6
Self-employed	58	29.3
Unemployed	121	61.1
Monthly income		
Q1 (<5000)	58	29
Q2(5001-7000)	23	12
Q3(7001-12200)	38	19
Q4(12001-20000)	46	23
Q5 (>20001)	33	17
Household Size		
Less than 3	34	17.2
4–5	76	38.4
6–7	37	18.6
8–10	34	17.2
More than 11	17	8.6
Caregiver Age		
15–19	10	5.05
20–24	64	32.32
25–29	50	25.25
30–34	38	19.19
35–39	23	11.62
40–44	7	3.54
Above 45	6	3.03
Relationship with the child		
Mother	178	90
Father	9	5
Grandmother/Grandfather	8	4
Other (aunts, uncles, older siblings, step-parents, foster guardians, house helps, and family friends or neighbors	3	2
Marital status		
Single	38	19
Married	155	78
Separated	5	3

Note: N=198.

Table 5 shows the distribution of the children aged 6-59 months by age and sex. Male children made up 56.57% and female children 43.43% of the 198 children. The male-to-female sex ratio was 1.3. The average age, median age, and mode were 32.2 months, 32.5 months, and 48 months, respectively.

Table 5

Age Group Distribution of Children -59 Months

Age Group (Months)	Male	Female	Total
6–23	32	35	67 (33.8%)
24–35	29	15	44 (22.2%)
36–47	27	16	43 (21.7%)
48–59	24	20	44 (22.2)

Note: n=198

4.3 Nutrition Knowledge of Caregivers of Children 6-59 Months in Kajiado Central Sub-County

Table 6 shows the distribution of caregivers per nutrition knowledge classification. Caregiver nutrition knowledge was assessed using a structured questionnaire comprising 20 questions covering essential areas such as breastfeeding, complementary feeding, dietary diversity, hygiene, and meal frequency. Each correct response was awarded one point, and total scores were converted into percentages. Scores were then categorized into five levels: very low: 0–20%, low: 21–40%, moderate: 41–60%, high: 61–80% and very high: 81–100%. All caregivers scored within the high to very high categories, indicating relatively strong nutrition knowledge among respondents. From this distribution, 83.3% of caregivers fell into the "Very High" category (scores ≥81%), while 16.7% were categorized under the "High" range (61–80%).

Table 6

Classification of the caregiver Nutrition Knowledge

Classification	Frequency(n)	Percentage
High nutrition knowledge	33	16.7
Very high nutrition knowledge	165	83.3

Note: n=198

4.4 Dietary Practices among Children Aged 6–23 Months in Kajiado Central Sub-County

Table 7 shows the dietary practices of children 6-59 months. The results showed that 86% of infants at one year old and 56% of children at two years old were still breastfeeding. While the one-year breastfeeding rate is high, the continuation rate after two years is moderate. Only 17.7% of children (6-23 months) met the recommended Minimum Meal Frequency (MMF), which is far less than what the WHO recommends. Most children between 24 and 59 months old had consumed 3 meals in the previous 24 hours (56.5%). Most of the children (6-59 months) had a dietary diversity score of less than 5 (69.3). With them consuming mostly staple foods and a lack of variety in fruits, vegetables, and legumes, the primary food groups consumed were cereals (91%) and animal products (62%). Only 4.5% of children 6-23 months met the Minimum Acceptable Diet (MAD) criteria.

Table 7

Dietary Practices of Children 6-59 Months

Item	Frequency (n)	Percentage (%)
MMF Compliance (Children 6–23 months)		
Follows recommendation	41	61.2
Less than recommended	26	38.3
Meal Frequency (Children 24–59 months)		
2 meals	3	2.3
3 meals	74	56.5
4 meals	45	34.4
5 meals	9	6.9
Dietary Diversity (Children 24–59 months)		
2 food groups	22	16.8
3 food groups	43	32.8
4 food groups	35	26.7
5 food groups	22	16.8
6 food groups	7	5.3
7 food groups	2	1.5
Dietary Diversity Score (6–59 months)		
Score of 2	27	13.6
Score of 3	51	25.8
Score of 4	60	30.3
Score of 5	39	19.7
Score of 6	15	7.6
Score of 7	6	3.0
Dietary Diversity Status (6–23 months)		
Low dietary diversity (<5 food groups)	54	80.6
High dietary diversity (≥5 food groups)	13	19.4
Dietary Diversity Status (24–59 months)		
Low dietary diversity (<4 food groups)	84	64.1
High dietary diversity (≥4 food groups)	47	35.9
MAD (6–23 months)		
Met recommendations	9	4.5
Did not meet recommendations	58	95.5

Table 8 below shows the 8 food groups and their distribution by consumption in the previous 24 hours prior to the study.

Table 8

Food Group Consumption of Children 6-59 Months

Item	Frequency (n)	Percentage (%)
Group 1: Breast milk	68	34
Group 2: Grains, Roots, and Tubers	193	97
Porridge, bread, rice, noodles, or other grains	180	91
White potatoes, yams, cassava, etc.	89	45
Group 3: Legumes and Nuts	73	37
Group 4: Dairy Products	122	62
Infant formula	3	2
Milk (tinned, powdered, fresh)	105	53
Yogurt or drinking yogurt	10	5
Cheese or other dairy products	0	0
Group 5: Flesh Foods	59	30
Liver, kidney, heart, or other organs	16	8
Beef, pork, lamb, goat, chicken, or duck	36	18
Fish, shellfish, seafood (fresh/dried)	13	7
Grubs, snails, or insects	2	1
Group 6: Eggs	37	19
Group 7: Vitamin A Fruits & Vegetables	52	26
Pumpkin, carrots, sweet potatoes (orange)	37	19
Dark green leafy vegetables	98	49
Mangoes, papayas, musk melon	57	29
Group 8: Other Fruits & Vegetables –bananas, pears, grapes, oranges, cabbage, eggplant, bell peppers.	122	62

Note: n=198.

Figure 2 shows the proportion of the children who were reported to have had diarrhea within the 24 hours before the study. Out of the 198 children, 27 (14%) reported being sick in the last 24 hours before the survey. Of the 27 children with diarrhea, 13 (48%) were boys and 14 (52%) were girls.

Figure 2

Proportion of Children With and Without Diarrhea

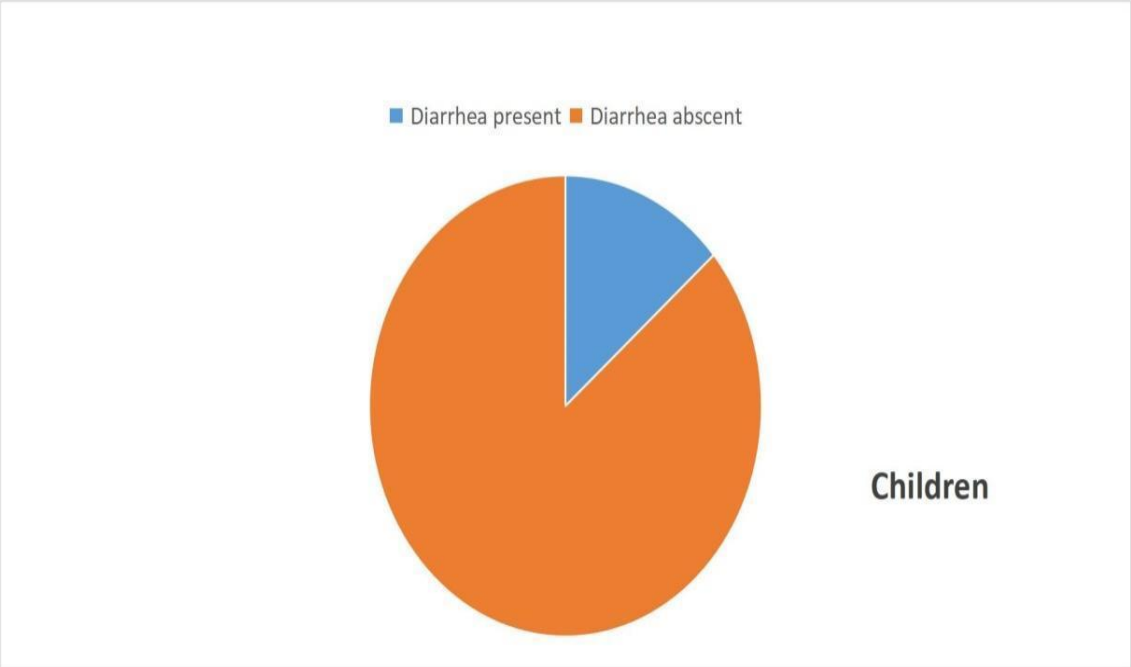


Table 9 below summarizes reported hygiene-related practices among caregivers of children aged 6–59 months in Kajiado Central. Most households (38%) said they never treat their drinking water. Most homes (74.2%) used pit latrines or other hygienic methods to dispose of child waste. Of the caregivers, 92.4 % (183) said they washed their hands with soap, whereas 7.6% (15) said they mostly used water alone. Data include water treatment methods, waste disposal strategies, and hand washing behavior across various critical moments. The caregivers based their responses on what they use most frequently for each variable.

Table 9

Hygiene Practices of Children 6-59 Months

Variable	Frequency (n)	Percentage (%)
When They Washed Their Hands		
Before preparing food	137	69.2
Before eating	176	88.9
Before feeding their children	93	47.0
After using the latrine	120	60.6
After coughing or sneezing	31	15.7
After handling pets or farm animals	33	16.7
After returning home from outside	44	22.2
What They Mostly Use to Wash Their Hands		
Water and soap	183	92.4
Water only	15	7.6
How They Dispose of Child Waste		
Regular household waste (not in a separate bag)	4	2.0
In a separate bag before disposal	16	8.1
Toilet	121	61.1
Main garbage bin	34	17.2
The main garbage bin on the farm	4	2.0
Burn	19	9.6
How they treat household drinking water		
Treated at the main source	17	8.6
Boiling	47	23.7
Water guard/chlorine	58	29.3
Never treated	76	38.4

Note. n=198

4.5 Nutritional Status of Children

Table 10 below summarizes the nutritional status of the children 6-59 months based on z-scores, MUAC measurements, and gender. Assessment of nutritional status using the Weight-for-Height Z-score (WHZ) revealed that 87.4% of the children fell within the normal range (>-2 to ≤+2 SD). A small proportion were classified as overweight (4.5%) and obese (2.5%), while 4.5% were moderately wasted (>-3 to <-2 SD) and 1.0% were severely wasted (<-3 SD). The prevalence was higher than that in Kenya (3%). Wasting

was also higher than the national prevalence (5%) but lower than that of Kajiado County (8.9%).

The Weight-for-Age Z-score (WAZ) results showed that most children (93.4%) were within the normal range (≥-2 to ≤+1 SD), while 6.6% were moderately underweight (≥-3 to <-2 SD). Notably, there were no cases of severe underweight recorded. This low prevalence suggests that under nutrition, in terms of body weight relative to age, is not a significant concern among the sampled children. Underweight prevalence was lower than that of Kenya (10%) as well as Kajiado county (10.9%)

When assessing Height-or-Age Z-score (HAZ), which reflects chronic malnutrition or stunting, 78.8% of children were found to have normal height-for-age values (> -2 SD). However, 15.2% were moderately stunted (<-2 to > -3 SD) and 6.1% were severely stunted (<-3 SD). Together, 21.3% of children were stunted, indicating a level of chronic malnutrition that still warrants public health attention. This is higher than the prevalence of stunting in Kajiado county (14%) but lower than national levels (18%).

Finally, most children (99.5%) had normal MUAC values (>12.5 cm). Only one child (0.5%) fell within the moderate acute malnutrition (MAM) range (11.5–12.5 cm), and no children were found to have severe acute malnutrition (SAM) based on MUAC. This further supports the finding that acute malnutrition is uncommon in this sample.

Table 10

Nutritional Status of Children 6-59 Months

Category	Frequency (n)	Girls (n = 86)	Boys (n = 112)
WHZ Classification			
> +3 (Obese)	5 (2.5%)	1	4
> +2 to ≤ +3 (Overweight)	9 (4.5%)	6	3
> –2 to ≤ +2 (Normal)	173 (87.3%)	75	98
> –3 to < –2 (Moderately wasted)	9 (4.5%)	3	6
< –3 (Severely wasted)	2 (1.0%)	1	1
WAZ Classification			
≥ –2 to ≤ +1 (Normal)	185 (93.0%)	79	106
≥ –3 to < –2 (Moderately underweight)	13 (7.0%)	7	5
HAZ Classification			
> –2 SD (Normal)	156 (78.8%)	69	88
≤ –2 to > –3 SD (Moderately stunted)	30 (15.2%)	12	17
≤ –3 SD (Severely stunted)	12 (6.1%)	5	7
MUAC Classification			
11.5–12.5 cm (MAM)	1 (0.5%)	0	1
> 12.5 cm (Normal)	197 (99.5%)	86	111

Note. Abbreviations: weight-for-height Z-score (WHZ), weight-for-age Z-score (WAZ), height-for-age Z-score (HAZ), and mid-upper arm circumference (MUAC).

4.6 Association of Determinants and Nutritional Status of Children of Children 6-59 Months in Kajiado Central Sub-County

Table 11 shows results from chi-square tests analyzing the association between socio-economic and socio-demographic characteristics and the nutritional status of children 6-59 months. No significant associations were found between WHZ score ($\chi^2 = 0.91$, p =.97), HAZ score ($\chi^2 = 0.40$, p = .818,) and WAZ score ($\chi^2 = 0.44$, p .510) and caregiver gender. There was no significant association between residence (urban/rural) and WHZ score ($\chi^2 = 3.72$, p = .590) as well as HAZ score ($\chi^2 = 1.63$, p = .443. The test showed a statistically significant association between residence and WAZ score ($\chi^2 = 8.05$, p = .005).

Chi-square results of the association between household size and nutrition indicators showed no significant relationship between WHZ score (χ^2 = 22.13, p = .333), HAZ score (χ^2= 10.19, p .252), and WAZ score (χ^2 = 8.96, p = .062). Chi-square test result on the association between employment status and nutrition indicators showed a statistically significant relationship with WHZ score (χ^2= 24.04, p = .008). No statistically significant relationship was found between employment status and HAZ score (χ^2 = 0.68, p = .954) and WAZ score (χ^2 = 4.71, p = .095). Spearman correlation was conducted to assess the correlation between employment status and nutrition indicators and found no statistically significant correlation with WHZ scores (ρ = .022, p = .756), HAZ scores (ρ = .017, p = .808), and WAZ scores (ρ = –.052, p = .466).

Chi-square test done to determine the relationship between caregiver education level and nutritional status showed no relationship with WHZ score (χ^2 = 7.84, p = .930) and HAZ score (χ^2= 6.81, p .339). There was also no statistically significant relationship with WAZ (χ^2= 7.34, p = .062). Chi-square test of association between household income Quintiles and nutritional status showed no statistically significant relationship with any of the nutrition indicators, i.e., WHZ score (χ^2= 0.91, p = .970), HAZ score (χ^2 = 7.04, p = .533), and WAZ score (χ^2= 2.54, p = .638).

There was no statistically significant association between caregiver age classification and WHZ score (χ^2 = 22.46, p = 0.609), HAZ score (χ^2 = 12.17, p = 0.274), or WAZ score (χ^2= 8.71, p = 0.559). Pearson correlation test revealed that the Caregiver's age showed a statistically significant but weak negative correlation with WHZ (r = -0.143, p = 0.045), indicating that as caregiver age increases, child weight-for-height tends to decrease slightly. No significant correlations were observed between caregiver age and HAZ or WAZ. Marital status of the caregivers was not significantly associated with WHZ (χ^2 = 10.78, p = 0.375), HAZ (χ^2= 3.13, p = 0.537), or WAZ (χ^2 = 5.68, p = 0.224). No

significant relationships were observed between knowledge classification and WHZ (χ^2 = 1.92, p = 0.861), HAZ (χ^2 = 3.06, p = 0.217), or WAZ (χ^2= 1.71, p = 0.426). Pearson correlation: Caregiver nutrition knowledge had no statistically significant correlations with WHZ, HAZ, or WAZ.

Table 11

Relationship between Socio-Demographic and Socio-Economic Characteristics and Nutritional Status of Children 6-59 Months

Variable	Category	Frequency n (%)	WHZ χ^2 (p)	HAZ χ^2 (p)	WAZ χ^2 (p)
				0.40	0.44
Gender	Male	6 (3.0%)	0.91 (.97)	(.818)	(.510)
	Female	192 (97.0%)			
			3.72	1.63	8.05
Location	Urban	100 (50.5%)	(.590)	(.443)	(.005)
	Rural	98 (49.5%)			
			22.13	10.19	8.96
Household size	<3	34 (17.2%)	(.333)	(.252)	(.062)
	4–5	76 (38.4%)			
	6–7	37 (18.6%)			
	8–10	34 (17.2%)			
	>11	17 (8.6%)			
			24.04	0.68	4.71
Employment	Employed	19 (9.6%)	(.008)	(.954)	(.095)
	Self-employed	58 (29.3%)			
	Unemployed	121 (61.1%)			
	No formal		7.84	6.81	7.34
Education level	education	23 (12.0%)	(.930)	(.339)	(.062)
	Primary incomplete	8 (4.0%)			
	Primary	71 (36.0%)			
	Secondary	70 (35.0%)			
	Post-secondary	26 (13.0%)			
			0.91	7.04	2.54
Income	Q1 (<5000)	58 (29.0%)	(.970)	(.533)	(.638)
	Q2 (5001–7000)	23 (12.0%)			
	Q3 (7001–12200)	38 (19.0%)			
	Q4 (12001–20000)	46 (23.0%)			
	Q5 (>20001)	33 (17.0%)			
			22.46	12.17	8.71
Caregiver age	15–19	10 (5.1%)	(.609)	(.274)	(.559)
	20–24	64 (32.3%)			
	25–29	50 (25.3%)			
	30–34	38 (19.2%)			

	35–39	23 (11.6%)			
	40–44	7 (3.5%)			
	≥45	6 (3.0%)			
			10.78	3.13	5.68
Marital status	Single	38 (19.0%)	(.375)	(.537)	(.224)
	Married	155 (78.0%)			
	Separated	5 (3.0%)			
Nutrition			1.92	3.06	1.71
knowledge	High	33 (16.7%)	(.861)	(.217)	(.426)
	Very high	165 (83.3%)			

Note: Abbreviations; X^2 = Chi-square; p =0.05; WHZ= Weight-for-Height Z-score (WHZ), HAZ= Height-for-Age Z-score (HAZ), and WAZ= Weight-for-Age Z-score (WAZ).

Table 11 shows the relationships between dietary practices and the nutritional status of children 6-59 months as analyzed by chi-square and Pearson correlation tests. Chi-square test was done to determine the relationship between continued breastfeeding of children 6-23 months and found a significant relationship with HAZ score ($\chi^2 = 7.97$, p = .019). However, the relationship was not significant with both WHZ score $\chi^2= 8.86$, p = .065 and WAZ score $\chi^2 = 0.32$, p = .573. Chi-square test showed no statistically significant relationship between achieving minimum dietary diversity for children 6-23 months and all nutritional status, i.e., WHZ score $\chi^2 = 3.63$, p = .163, HAZ score $\chi^2= 0.015$, p = .903, and WAZ score $\chi^2 = 1.33$, p = .249. For children above 24 months, the chi-square test showed no statistically significant association between dietary diversity and WHZ ($\chi^2 = 2.780$, p = 0.249), HAZ ($\chi^2 = 0.427$, p = 0.514), and WAZ ($\chi^2 = 1.466$, p = 0.226). The Pearson correlation analysis also found no significant relationship with all three nutrition indicators i.e., WHZ (r = 0.005, p = 0.954), HAZ (r = 0.053, p= 0.550), or WAZ (r = 0.044, p = 0.620), indicating no strong linear association between dietary diversity and the measured anthropometric indicators in this sample.

Chi-square test revealed a significant relationship between WHZ score and meeting MMF recommendation (for children 6-23 months) χ^2= 18.35, p = 019. However, there was no relationship between other nutrition indicators; HAZ score χ^2 = 4.45, p = .348, and WAZ score χ^2= 0.93, p = .629. Pearson correlation analysis was conducted to examine the relationships between meal frequency for children 24 to 59 months, and nutritional status indicators meal frequency showed significant positive correlations with HAZ (r = 0.216, p = 0.013) and WAZ (r = 0.254, p = 0.003), while the correlation with WHZ was not significant (r = 0.099, p = 0.260). Chi-square test showed a statistically significant relationship between WAZ score and achieving MAD (χ^2 = 6.54, p = .011). However, there was no significant relationship between WHZ score χ^2 = 6.54, p = .011, and HAZ score χ^2 = 1.03, p = .598.

Table 12

Relationship between Dietary Practices and Nutritional Status of Children 6-59 Months

Variable	Category	Frequency n (%)	WHZ χ^2 / r (p)	HAZ χ^2 / r (p)	WAZ χ^2 / r (p)
CBF (Continued Breastfeeding)	At 1 year	86 (—%)	8.9 (.065)	7.97 (.019)	0.32 (.573)
	At 2 years	56 (—%)			
MDD (6–23 months)	Low dietary diversity (<5 food groups)	54 (80.6%)	3.6 (.163)	0.015 (.903)	1.33 (.249)
	High dietary diversity (≥5 food groups)	13 (19.4%)			
DD (24–59 months)	Low dietary diversity (<4 food groups)	84 (64.1%)	2.8 (.249)	0.427 (.514)	1.466 (.226)
	High dietary diversity (≥4 food groups)	47 (35.9%)			
MMF (6–23 months)	Follows recommendation	41 (61.2%)	18. (.019)	4.45 (.348)	0.9 (.63)
	Less than recommended	26 (38.3%)			
MF (24–59 months)			r = 0. (.260)	r = 0.2 (.013)	r = 0. 3(.003)
	2 meals	3 (2.3%)			
	3 meals	74 (56.5%)			
	4 meals	45 (34.4%)			
	5 meals	9 (6.9%)			
MAD (6–23 months)	Met recommendations	9 (4.5%)	6.54 (.011)	1.03 (.598)	6.54 (.011)
	Did not meet recommendations	58 (95.5%)			

Note: Abbreviations; X^2 = Chi-square; p= 0.05; CBF= continued breastfeeding; MDD= Minimum Dietary Diversity; DD= Dietary Diversity; MMF= Minimum Meal Frequency MF=Meal Frequency; MAD= Minimum Acceptable Diet; WHZ= Weight-for-Height Z-score; HAZ= Height-for-Age Z-score; and WAZ= Weight-for-Age Z-score.

Table 13 below shows the relationship between diarrhea and hygiene practices and nutritional status using chi-square tests. No statistically significant associations were observed between having diarrhea in the past 24 hours and any of the nutritional

indicators: WHZ ($\chi^2 = 2.49$, p = .778), HAZ ($\chi^2 = 0.79$, p = .675), or WAZ ($\chi^2 = 0.42$, p = .518). In contrast, the water treatment method showed a statistically significant relationship with HAZ ($\chi^2 = 24.28$, p = 0.002), although no associations were found with WHZ ($\chi^2 = 22.47$, p = .316) or WAZ ($\chi^2 = 6.34$, p = .989). The type of handwashing materials used was not significantly associated with any of the three nutritional indicators: WHZ ($\chi^2 = 8.70$, p = .122), HAZ ($\chi^2 = 0.22$, p = .897), or WAZ ($\chi^2 = 1.39$, p = .500).

Table 13

Relationship between Hygiene Practices and Nutritional Status of Children 6-59 Months

Variable	Category	Frequency n (%)	WHZ χ^2 (p)	HAZ χ^2 (p)	WAZ χ^2 (p)
		171	2.49	0.79	0.42
Diarrhea	No diarrhea	(86.0%)	(.778)	(.675)	(.518)
	With diarrhea	27 (14.0%)			
Water			22.47	24.28	6.34
treatment	Treated at the main source	17 (8.6%)	(.316)	(.002)	(.989)
	Boiling	47 (23.7%)			
	Water guard/chlorine	58 (29.3%)			
	Never treated	76 (38.4%)			
Hand		183	8.70	0.22	1.39
washing	Water and soap	(92.4%)	(.122)	(.897)	(.500)
	Water only	15 (7.6%)			
Waste	Regular household waste (not in		3.72	1.63	0.93
disposal	a separate bag)	4 (2.0%)	(.590)	(.443)	(.629)
	In a separate bag before disposal	16 (8.1%)			
	Toilet	121 (61.1%)			
	Main garbage bin	34 (17.2%)			
	Main garbage bin on the farm	4 (2.0%)			
	Burn	19 (9.6%)			

Note: Abbreviations; X^2 = Chi-square; p= 0.05; WHZ= Weight-for-Height Z-score (WHZ), HAZ= Height-for-Age Z-score (HAZ), and WAZ= Weight-for-Age Z-score (WAZ).

Table 14 shows the association between significant variables and nutritional status indicators, done by regression analysis. Logistic regression analyses were conducted to examine associations between significantly associated variables and nutritional status indicators. WHZ was analyzed using multinomial logistic regression, while HAZ and WAZ were assessed using binary logistic regression. Both unadjusted and adjusted odds ratios (ORs) were presented in Table 13, as well as reference categories. Unadjusted ORs represent the association between each variable and the nutrition indicators without accounting for other influencing variables. Adjusted ORs represent control for potential confounding variables, including child characteristics such as age, sex, birth order, and morbidity; caregiver factors such as age, education level, and employment status; household characteristics including income, household size, and place of residence; as well as environmental factors such as access to clean water, sanitation, and overall food security.

In the multinomial model for WHZ, employment status was significantly associated with child nutritional status. Children whose caregivers were employed had significantly higher odds of being over-nourished compared to those whose caregivers were unemployed (Adjusted OR = 22.18; 95% CI: 3.68–33.75, $p < 0.05$). Neither MMF nor MAD showed statistically significant associations with WHZ in either unadjusted or adjusted models (Adjusted OR for MMF = 1.12; 95% CI: 0.55–2.28; MAD = 0.87; 95% CI: 0.40–1.88).

Bivariate logistic regression revealed no significant associations between meal frequency and HAZ. When compared to children who consumed five meals per day, those consuming fewer meals had no statistically significant odds of stunting across all categories (e.g., 1 meal: AOR = 0.91; 95% CI: 0.21–3.89; 4 meals: AOR = 1.06; 95% CI: 0.42–2.68). Household water treatment methods showed significant associations with

HAZ score. Children from households that used treated water from the source had significantly lower odds of stunting (AOR = 0.31; 95% CI: 0.10–0.94, $p < 0.05$). Similarly, use of Water Guard or chlorine was associated with significantly reduced odds of stunting (AOR = 0.23; 95% CI: 0.12–0.45, $p < 0.05$).

A statistically significant association was found between living in urban Kajiado Central and WAZ score. Children living in urban areas had significantly lower odds of being underweight compared to children living in rural areas (AOR = 0.03; 95% CI: 0.002–0.41, $p < 0.05$). Additionally, higher maternal education (tertiary education vs. lower levels) was associated with a reduced likelihood of underweight status (AOR = 0.54; 95% CI: 0.15–1.98, $p < 0.05$). Neither MMF nor MAD showed significant associations with WAZ (Adjusted OR for MMF = 0.91; 95% CI: 0.44–1.87; MAD = 1.04; 95% CI: 0.49–2.20).

Table 14

Association between Determinants and Nutritional Status

Outcome	Predictor	Categories (Reference in parentheses)	Unadjusted OR (95% CI)	Adjusted OR (95% CI)
WHZ	Occupation	Employed (vs. Unemployed)	22.18 (3.68 – 133.75) *	22.18 (3.68 – 33.75) *
	MMF	Met (vs. Not met)	1.14 (0.50 – 2.60)	1.12 (0.55 – 2.28)
	MAD	Met (vs. Not met)	0.95 (0.39 – 2.29)	0.87 (0.40 – 1.88)
HAZ	Meal Frequency	1 (vs. 5 meals/day)	1.12 (0.28 – 4.49)	0.91 (0.21 – 3.89)
		2 (vs. 5 meals/day)	1.03 (0.30 – 3.49)	1.10 (0.33 – 3.63)
		3 (vs. 5 meals/day)	0.95 (0.38 – 2.35)	0.98 (0.39 – 2.48)
		4 (vs. 5 meals/day)	1.09 (0.45 – 2.64)	1.06 (0.42 – 2.68)
	Water is treated at the main source	Treated (vs. Untreated)	0.33 (0.12 – 0.92)	0.31 (0.10 – 0.94) *
	Water Guard/Chlorine	Yes (vs. No)	0.24 (0.13 – 0.45)	0.23 (0.12 – 0.45) *
WAZ	Location	Urban (vs. Rural)	0.03 (0.002 – 0.41) *	0.03 (0.002 – 0.41) *
	Education	Tertiary (vs. Other)	0.54 (0.15 – 1.98)	0.54 (0.15 – 1.98) *
	MMF	Met (vs. Not met)	0.97 (0.47 – 2.00)	0.91 (0.44 – 1.87)
	MAD	Met (vs. Not met)	1.02 (0.48 – 2.16)	1.04 (0.49 – 2.20)

*Note: Abbreviations: CI= confidence interval, OR= odds ratio; WHZ= Weight-for-Height Z-score (WHZ), HAZ= Height-for-Age Z-score (HAZ), and WAZ= Weight-for-Age Z-score (WAZ). P=0.05. Significant associations (*p < 0.05*) are marked with an asterisk (*****). Variables adjusted for included location, education level, occupation, household, income, household size, marital status, MMF, MAD, caregiver gender, diarrhea, and caregiver nutrition knowledge.*

4.7 Discussion

4.7.1 Socio-Demographic and Socio-Economic Characteristics of Children 6-59 Months in Kajiado Central Sub-County

The average household size of six people is higher than the national level of 3.7 members (KDHS, 2022). The majority of caregivers were between the ages of 20 and 29, which is consistent with Kenya's statistics as well as an Indonesian study that showed most caregivers fall within this age group (Haryanti et al., 2024; KDHS, 2022). The largest number of households earn less than Kshs. 5,000 per month, which is similar to the national level (KDHS, 2022). The number of caregivers who had completed secondary or higher education is higher than the national numbers for rural areas, according to KDHS (2022). This could indicate some advancement in access to education. However, 12% of women had no formal education, which is higher than the national level, indicating that access to school remains a challenge in Kajiado Central (KDHS, 2022). However, the higher educational attainment among caregivers in this study contrasts with findings from Narok County (Wakhungu et al., 2025, Nkoitoi et al., 2024), where fewer women had reached secondary education, possibly reflecting localized progress in education access in Kajiado.

Most of the caregivers were unemployed. Most caregivers were female, which shows similar patterns of high female caregiver involvement and the predominance of biological mothers, also seen in rural Ethiopia (Shibeshi et al., 2023), suggesting cultural consistency across East Africa. A significant proportion of caregivers were married. Compared to KDHS 2022, the proportion of unemployed caregivers in this study is significantly higher, which may reflect the limited formal employment opportunities in semi-arid rural counties like Kajiado (KDHS, 2022).

4.7.2 Nutrition Knowledge of Caregivers of Children 6-59 Months of Age in Kajiado Central Sub-County

All caregivers scored within the high to very high categories, indicating relatively strong nutrition knowledge among respondents. From this distribution, 83.3% of caregivers fell into the "Very High" category (scores ≥81%), while 16.7% were categorized under the "High" range (61–80%). This indicates that all caregivers possess high nutritional knowledge. This is in contrast to a Narok County study that found lower levels of nutritional status (Nkoitoi et al., 2024). This, however, does not translate to practice, as seen with poor complementary feeding practices and poor nutritional status of some children. This finding contrasts with several studies in sub-Saharan Africa, where caregiver nutrition knowledge was generally low to moderate (Forh et al., 2022; Motebejana et al., 2022b). The unexpectedly high knowledge levels in Kajiado may be attributed to better educational access, NGO activity, or health campaigns. However, the persistent gap between knowledge and practice mirrors findings in Nigeria and Ethiopia, where high awareness did not necessarily lead to improved feeding behaviors (Christian & Dake, 2022). This suggests that structural barriers, such as poverty, food insecurity, and cultural feeding practices, may outweigh knowledge in influencing outcomes.

4.7.3 Dietary and Hygiene Practices of Children 6-59 Months of Age in Kajiado Central Sub-County

The results showed that breastfeeding rates reduced at 2 years, similar to the country's findings (KDHS, 2022). The breastfeeding continuation rates are higher than national averages, where only about 70% of children are breastfed at one year (KDHS, 2022), suggesting a positive cultural norm in Kajiado. Only 4.5% of children met the MAD, which is extremely low compared to the KDHS findings of 31% (KDHS, 2022). This low compliance is a concern, as children who do not meet MAD are at a greater risk of

malnutrition, stunting, and micronutrient deficiencies. Some households never treated their drinking water, washed their hands with mostly water only, and disposed of their child's waste unhygienically. Similar findings were found by Okumu et al (2022) in Kajiado County. Hygiene practices, while better than those in earlier studies in Kajiado and Narok, still lag behind global standards. The high proportion of untreated drinking water remains a critical concern, comparable to rural Ethiopia, where untreated water was strongly associated with child stunting (Gizaw et al., 2022).

4.7.4 Nutritional status of Children 6-59 Months of Age in Kajiado Central Sub-County

In the study, 78.8% of children were classified as not stunted, with 21.3% stunted (15.2% moderately and 6.1% severely). In comparison, KDHS 2022 reports that 18% of children under five are stunted in Kenya, while global data from the World Health Organization (WHO) shows that 22% of children worldwide are stunted. This suggests that the study sample has a relatively lower prevalence of stunting compared to the national and global averages. Compared to studies in Narok County and Kitui, where stunting rates exceeded 30%, Kajiado Central shows better outcomes, possibly due to stronger breastfeeding practices (Chui et al., 2024; Kotonto, 2024). The study found that only 2% of children were severely wasted, which is notably lower than the 4.2% prevalence of wasting reported in the KDHS (2022).

For children under five. On the global scale, WHO data reports a prevalence of 7.3% for severe wasting. This indicates that the study Kajiado Central is doing better than both national and global averages in terms of acute malnutrition. However, the study also highlighted that 13.1% of children were at risk of being overweight, an emerging issue that aligns with global trends of rising obesity and overweight in children and the double burden of malnutrition. Similar to trends in urban Nairobi and middle-income countries,

where rising overweight coexists with under nutrition (KDHS, 2022). The study observed that 6% of children were moderately underweight. This figure is slightly lower than the 7.1% of children under five who are underweight according to KDHS (2022). Globally, the WHO reports a 5.7% prevalence of underweight in children under five.

Thus, the study's prevalence of underweight is similar to the national and global figures, but still represents an area of concern. The MUAC results were good in the study, with only one child falling into the borderline category. This is significantly better than global data, which indicates a prevalence of severe acute malnutrition (SAM) of around 2.4%, according to UNICEF. This suggests that acute nutrition deficiencies are rare in Kajiado Central sub-county, which is a positive outcome and reflects good overall nutrition health among the children. The MUAC results strongly contrast with those in Ethiopia, positioning Kajiado as relatively better off in terms of acute malnutrition outcomes (Abitew et al., 2021).

4.7.5 Association between the Socio-Demographic and Socio-Economic Characteristics, Nutrition Knowledge, Dietary Practices, Hygiene Practice, and Nutritional status of Children Aged 6-59 Months in Kajiado Central Sub-County, Kenya

No statistically significant association was found between caregiver gender and child nutritional status (WHZ: $\chi^2 = 0.91$, $p = .97$; HAZ: $\chi^2 = 0.40$, $p = .818$; WAZ: $\chi^2 = 0.44$, $p = .510$). This finding suggests that, in Kajiado Central Sub-County, whether the primary caregiver is male or female does not significantly influence the nutrition outcomes of children aged 6–59 months. This may be because 97% of the caregivers were female. This finding is similar to studies that have shown that caregiver roles are predominantly performed by women (Nyagweta, 2024). Other studies in sub-Saharan Africa have had mixed results. Studies with similar representation of both genders could better analyze the association between gender and nutritional status.

Residence, rural or urban, was significantly associated with WAZ score, with children in rural areas having significantly lower odds of being underweight. This finding is similar to an Indonesian study, which found that children living in rural areas had better nutrition outcomes (Mauludyani et al., 2025). Other studies report that children living in urban areas have better nutritional outcomes than those living in rural areas, which is associated with better access to services and linked to a lower risk (Sanni et al., 2024). No statistically significant associations were found between household size and any nutrition indicator. This suggests that family size in Kajiado Central may not strongly influence child nutritional status. Some studies suggest that larger households face an increasing risk of malnutrition (Christian & Dake, 2022).

Employment status had a significant association with WHZ. Some studies report improved outcomes with employment due to increased income, while others find negative impacts due to reduced care giving time (Ketema et al., 2022). Tertiary education reduced the odds of child under nutrition in this study. Higher education likely equips caregivers with better knowledge of health and nutrition, resource utilization, and decision-making, thereby improving child nutrition.

No significant association was found between income and any of the nutrition indicators. This is in contrast with studies in high-density low-income contexts where larger household sizes were associated with malnutrition (Wainaina, 2019). The study found that the older the caregiver, the more likely there may be a slight decline in the nutritional status of their children, as measured by weight-for-height.

No significant association was found between marital status and any of the nutrition indicators. This suggests that marital status alone may not influence child nutrition in this setting. This is similar to a study done in Kitui, where marital status was not associated with the nutritional status of children (Mbijiwe et al., 2022). No association was found

between caregiver nutrition knowledge classification and nutritional status indicators. While one might expect better nutrition knowledge to translate into improved child nutrition outcomes, these findings suggest that knowledge alone is insufficient to influence nutritional status in Kajiado Central. It is similar to other studies where nutrition knowledge was not significantly associated with child nutritional status (Utami et al., 2022).

A significant association was found between continued breastfeeding and HAZ. Findings reinforce global recommendations by the WHO for breastfeeding up to 2 years or beyond. Literature consistently shows its role in promoting nutritional status in children (Hong et al., 2023). For both age groups (6–23 months and over 24 months), no statistically significant association was found between dietary diversity and any nutrition indicators.

A significant relationship was found between meeting MMF recommendations and WHZ. Significant positive correlations were found between feeding frequency for children 24-59 months and HAZ and WAZ. Frequent meals continue to support growth, especially in weight-for-age and height-for-age, underlining the importance of age-appropriate feeding even into the preschool years. This supports prior findings that energy requirements remain high in toddlers and that continued attention to feeding frequency is important beyond the critical first 1,000 days, a significant association between MAD and WAZ. Meeting MAD correlates with reduced underweight, supporting its use as a composite indicator for IYCF monitoring.

No significant association between having diarrhea in the past 24 hours and any of the nutrition indicators. This contrasts with many studies linking repeated diarrhea to stunting and wasting (Soboksa et al., 2021). Significant association with water treatment

methods and HAZ, and logistic regression confirmed association with normal nutritional status rather than stunting. Specifically, water treated at source and the use of chlorine/Water guard were protective against stunting. No significant association was observed between the type of hand washing and any nutritional outcome. Some studies show strong links between hand washing and nutrition (Kuddus et al., 2022).

CHAPTER FIVE

SUMMARY, CONCLUSION, AND RECOMMENDATIONS

5.1 Summary of the Findings

This study examined the association between socio-demographic and socio-economic characteristics, caregiver nutrition knowledge, dietary practice, hygiene practices, and the nutritional status of children aged 6–59 months in Kajiado Central Sub-County.

The socio-demographic and socio-economic profile of households showed that most households had four to six members, with a median of five. Caregivers were primarily young, with a mean age of 28.6 years, and the majority (57.6%) were aged 20–29. Nearly half (48%) of caregivers had at least a secondary education, yet unemployment was high (61.1%). Most households earned ≤Ksh 5,000 monthly, reflecting low-income levels. Mothers were the main caregivers (89.9%). Most caregivers (78.3%) were married and already had previous children (77.8%), suggesting high levels of caregiving experience. Most children were male (56.6%) with a mean age of 32.2 months. Regarding nutrition knowledge, caregivers demonstrated strong nutrition knowledge, with 100% scoring in the high (16.7%) or very high (83.3%) categories.

Dietary and hygiene practices revealed that 86% of infants at one year old and 56% of children at two years old were still breastfeeding. While the one-year breastfeeding rate is high, the continuation rate after two years is moderate. Only 17.7% of children (6-23 months) met the recommended Minimum Meal Frequency (MMF), which is far less than what the WHO recommends. Most children between 24 and 59 months old had consumed 3 meals in the previous 24 hours (56.5%). Most of the children (6-59 months) had a dietary diversity score of less than 5 (69.3). With a focus on staple foods and a lack of variety in fruits, vegetables, and legumes, the primary food groups consumed were cereals (91%) and animal products (62%). Only 4.5% of children 6-23 months met the

Minimum Acceptable Diet (MAD). Although 92.4% of caregivers reported washing hands with soap, 14% of children had been ill in the 24 hours preceding the survey. Nearly 38% of households did not treat their drinking water, and while most households (74.2%) used appropriate child waste disposal methods.

The nutritional status assessment showed that acute malnutrition was low: 87.4% of children had normal Weight-for-Height Z-scores (WHZ), with only 5.5% wasted and a small proportion overweight or obese. Underweight prevalence (based on WAZ) was also low at 6.6%, with no severe cases. However, 21.3% of children were stunted (based on HAZ), indicating a significant burden of chronic malnutrition. MUAC results were mostly normal, further confirming low acute malnutrition levels. Caregiver genders, household size, age, marital status, income, and nutrition knowledge showed no significant associations with child nutrition outcomes (WHZ, HAZ, and WAZ). However, rural residence was significantly protective against underweight status (WAZ), as well as tertiary level education. Continued breastfeeding was significantly associated with better HAZ scores. Meeting MMF standards was significantly associated with WHZ, indicating the importance of adequate feeding frequency. However, MDD and overall dietary diversity showed no significant correlation with nutrition outcomes for children 6-59 months. Employment status showed a significant association with WHZ.

5.2 Conclusion

We therefore conclude that caregivers of children aged 6–59 months in Kajiado Central are predominantly young, female, married, and unemployed, with low household income and varying education levels, and these socio-demographic and socio-economic characteristics significantly influence child nutritional status. Caregivers generally possess high levels of nutrition knowledge, yet this knowledge does not consistently translate into appropriate dietary practices. Dietary adequacy among children is poor,

with very few meeting minimum meal frequency, dietary diversity, and minimum acceptable diet requirements. Hygiene practices are common, particularly hand washing, but gaps remain in safe water treatment, which is strongly associated with child nutrition outcomes. Overall, the nutritional status of children reflects suboptimal conditions, with notable prevalence of stunting, underweight, wasting, overweight, and obesity.

In conclusion, child nutrition in Kajiado Central is shaped by an interplay of caregiver, household, and environmental factors, underscoring that nutrition outcomes are not the result of feeding practices alone but are influenced by broader socio-economic and hygiene-related determinants.

5.3 Recommendations

5.3.1 Recommendations for Practice

The county government of Kajiado should expand access to safe water and/or the use of water guard. This study found that 38% of households did not treat their drinking water, and untreated water was significantly associated with poorer child nutrition outcomes (HAZ). Improving water safety can reduce infection-related under nutrition.

Programs should enhance access to locally available diverse foods to increase meal frequency and diet diversity. Results showed that 69.3% of children had a dietary diversity score of less than 5, with diets dominated by cereals and limited intake of fruits, vegetables, and legumes. Only 17.7% of children met the Minimum Meal Frequency (MMF), and 4.5% met the Minimum Acceptable Diet (MAD). Interventions should therefore emphasize the utilization of affordable, locally available foods to meet WHO standard. A multi-sectoral approach is required to address the root causes of malnutrition. Although acute malnutrition was low (5.5% wasted), stunting affected 21.3% of children, highlighting chronic causes linked to poverty, education, and

caregiving practices. Addressing this issue requires collaboration among the health, education, agriculture, and social protection sectors.

5.3.2 Recommendations for Further Research

Given that caregiver education, employment, urban residence, and water treatment significantly influence child nutrition outcomes, it is recommended that longitudinal studies be conducted to track these associations and establish trends over time.

In this study, caregiver education, employment status, rural residence, and water treatment practices were significantly associated with nutritional status indicators (e.g., WHZ, HAZ, WAZ). Longitudinal studies are necessary to confirm these relationships over time and to explore the causal pathways.

REFERENCES

Abitew, D. B., Yalew, A. W., Bezabih, A. M., & Bazzano, A. N. (2021). Comparison of mid-upper-arm circumference and weight-for-height Z-score in identifying severe acute malnutrition among children aged 6–59 months in South Gondar Zone, Ethiopia. *Journal of Nutrition and Metabolism, 2021*(8830494). https://doi.org/10.1155/2021/8830494

Aboagye, R. G., Seidu, A.-A., Ahinkorah, B. O., Arthur-Holmes, F., Cadri, A., Dadzie, L. K., Hagan, J. E., Eyawo, O., & Yaya, S. (2021). Dietary diversity and undernutrition in children aged 6–23 months in Sub-Saharan Africa. *Nutrients, 13*(10), 3431. https://doi.org/10.3390/nu13103431

Aldana-Parra, F., Vega, G. O., & Fewtrell, M. (2020). Associations between maternal BMI, breastfeeding practices and infant anthropometric status in Colombia: Secondary analysis of ENSIN 2010. *BMC Public Health, 20*(1), 232. https://doi.org/10.1186/s12889-020-8310-z

Amare, Z. Y., Ahmed, M. E., & Mehari, A. B. (2019). Determinants of nutritional status among children under age 5 in Ethiopia: Further analysis of the 2016 Ethiopia Demographic and Health Survey. *Globalization and Health, 15*(1), 62. https://doi.org/10.1186/s12992-019-0505-7

Ameye, H., & De Weerdt, J. (2020). Child health across the rural–urban spectrum. *World Development, 130,* 104950. https://doi.org/10.1016/j.worlddev.2020.104950

Amugsi, D. A., Sidze, E., Thuita, F., Flax, V. L., Wilunda, C., Adair, L., Mwangi, B., Anono, E., Odhiambo, H., Ekiru, S., Chepkwony, G., Albert, W., Ng'ang'a, M., Miller, J. D., Sagara, B., Kimani-Murage, E., & Lutter, C. (2024). Determinants of acute malnutrition among children under five in arid regions, Kenya. *medRxiv.* https://doi.org/10.1101/2024.10.01.24314690

Arsenault, J. E., Yakes, E. A., Islam, M. M., Hossain, M. B., Ahmed, T., Hotz, C., Lewis, B., Rahman, A. S., Jamil, K. M., Brown, K. H., & Dewey, K. G. (2013). Very low adequacy of micronutrient intakes by young children and women in rural Bangladesh is primarily explained by low food intake and limited diversity. *Journal of Nutrition, 143*(2), 197–203. https://doi.org/10.3945/jn.112.169524

Bandoh, D. A., & Kenu, E. (2017). Dietary practices and nutritional status of children under five in the Techiman Municipality of Ghana. *Food Science and Nutrition, 5*(3), 555–562. https://doi.org/10.1002/fsn3.429

Beal, T., Tumilowicz, A., Sutrisna, A., Izwardy, D., & Neufeld, L. M. (2018). A review of child stunting determinants in Indonesia. *Maternal & Child Nutrition, 14*(4), e12617. https://doi.org/10.1111/mcn.12617

Bhutta, Z. A., Berkley, J. A., Bandsma, R. H. J., Kerac, M., Trehan, I., & Briend, A. (2017). Severe childhood malnutrition. *Nature Reviews Disease Primers, 3,* 17067. https://doi.org/10.1038/nrdp.2017.67

Black, R. E., Victora, C. G., Walker, S. P., Bhutta, Z. A., Christian, P., de Onis, M., Ezzati, M., Grantham-McGregor, S., Katz, J., Martorell, R., & Uauy, R. (2013). Maternal and child undernutrition and overweight in low-income and middle-income countries. *The Lancet, 382*(9890), 427–451. https://doi.o rg/10.10 16/S 0140-6736(13)60937-X

Blössner, M., Siyam, A., Borghi, E., Onyango, A., de Onis, M., & WHO Working Group on Infant Growth. (2009). *WHO Anthro for personal computers, version 3: Software for assessing growth and development of the world's children.* WHO. https://www.who.int/tools/child-growth-standards/software

Borkotoky, K., & Unisa, S. (2015). Indicators to examine quality of diets of children under five years: An application to Indian data. *Public Health Nutrition, 19*(16), 2867–2879. https://doi.org/10.1017/S1368980015000302

Bourke, C. D., Berkley, J. A., & Prendergast, A. J. (2016). Immune dysfunction as a cause and consequence of malnutrition. *Trends in Immunology, 37*(6), 386–398. https://doi.org/10.1016/j.it.2016.04.003

Brhane, G., & Regassa, N. (2014). Nutritional status of children under five years of age in Shire Indaselassie, Northern Ethiopia: Examining the prevalence and risk factors. *Kontakt, 16*(3), e161–e170. https://doi.org/10.1016/j.kontakt.2014.06.003

Chakona, G., & Shackleton, C. M. (2017). Minimum dietary diversity scores for women indicate micronutrient adequacy and food insecurity status in South African households. *Nutrients, 9*(8), 812. https://doi.org/10.3390/nu9080812

Chesire, E. J., Orago, A. S., Oteba, L. P., & Echoka, E. (2008). Determinants of under nutrition among school-age children in a Nairobi peri-urban slum. *East African Medical Journal, 85*(10), 471–479. https://doi.org/10.4314/eamj.v85i10.9662

Christian, P., Lee, S. E., Donahue Angel, M., Adair, L. S., Arifeen, S. E., Ashorn, P., Barros, F. C., Fall, C. H. D., Fawzi, W. W., Hao, W., Hu, G., Humphrey, J. H., Huybregts, L., Joglekar, C. V., Kariuki, S. K., Kolsteren, P., Krishnaveni, G. V., Liu, E., Martorell, R., … Black, R. E. (2013). Risk of childhood undernutrition related to small-for-gestational age and preterm birth: A pooled analysis of 19 birth cohorts from low- and middle-income countries. *PLoS Medicine, 10*(5), e1001472. https://doi.org/10.1371/journal.pmed.1001472

Croft, T. N., Marshall, A. M. J., Allen, C. K., Arnold, F., Assaf, S., Balian, S., … Rutstein, S. O. (2018). *Guide to DHS statistics.* ICF. https://dhsprogra m.com/ pubs/ pdf/DHSG1/Guide_to_DHS_Statistics_DHS-7.pdf

Cunningham, K., Ruel, M., Ferguson, E., & Uauy, R. (2015). Women's empowerment and child nutritional status in South Asia: A synthesis of the literature. *Maternal & Child Nutrition, 11*(1), 1–19. https://doi.org/10.1111/mcn.12125

Darapheak, C., Takano, T., Kizuki, M., Nakamura, K., & Seino, K. (2013). Consumption of animal source foods and dietary diversity reduce stunting in children in Cambodia. *International Archives of Medicine, 6*(1), 29. https://doi.org /10.1186/ 1755-7682-6-29

De Onis, M., Borghi, E., Arimond, M., Webb, P., Croft, T., Saha, K., De-Regil, L. M., Thuita, F., Heidkamp, R., Krasevec, J., Hayashi, C., & Flores-Ayala, R. (2019). Prevalence thresholds for wasting, overweight and stunting in children under 5 years. *Public Health Nutrition, 22*(1), 175–179. https://doi.or g/10.101 7/S 1368980018002434

De Onis, M., Onyango, A. W., Borghi, E., Siyam, A., Nishida, C., & Siekmann, J. (2007). Development of a WHO growth reference for school-aged children and adolescents. *Bulletin of the World Health Organization, 85*(9), 660–667. https://doi.org/10.2471/BLT.07.043497

De Onis, M., & Branca, F. (2016). Childhood stunting: A global perspective. *Maternal & Child Nutrition, 12*(Suppl. 1), 12–26. https://doi.org/10.1111/mcn.12231

Demissie, S., & Worku, A. (2013). Magnitude and factors associated with malnutrition in children 6–59 months of age in pastoral community of Dollo Ado district, Somali region, Ethiopia. *Science Journal of Public Health, 1*(4), 175–183. https://doi.org/10.11648/j.sjph.20130104.12

Derso, T., Tariku, A., Biks, G. A., & Wassie, M. M. (2017). Stunting, wasting and associated factors among children aged 6–24 months in Dabat health and demographic surveillance system site: A community-based cross-sectional study in Ethiopia. *BMC Pediatrics, 17*(1), 96. https://doi.org/10.1186/s12887-017-0848-2

Desyibelew, H. D., & Dadi, A. F. (2019). Burden and determinants of malnutrition among pregnant women in Africa: A systematic review and meta-analysis. *PLOS ONE, 14*(9), e0221712. https://doi.org/10.1371/journal.pone.0221712

Development Initiatives. (2020). *2020 Global nutrition report: Action on equity to end malnutrition.* Development Initiatives. https://globalnutri tionreport .org/ reports /2020-global-nutrition-report

Dewey, K. G., & Brown, K. H. (2003). Update on technical issues concerning complementary feeding of young children in developing countries and implications for intervention programs. *Food and Nutrition Bulletin, 24*(1), 5–28. https://doi.org/10.1177/156482650302400102

Dewey, K. G., & Vitta, B. S. (2013). *Strategies for ensuring adequate nutrient intake for infants and young children during the period of complementary feeding.* Alive & Thrive.https://www.aliveandthrive.org/en/resources/strategies-for-ensuring-ad equa te-nu trient-intake-for-infants-and-young-children-during-the-period-of-complementary-feeding

Ekholuenetale, M., Tudeme, G., Onikan, A., & Ekholuenetale, C. E. (2020). Socioeconomic inequalities in hidden hunger, undernutrition, and overweight among under-five children in 35 sub-Saharan Africa countries. *Journal of the Egyptian Public Health Association, 95*(1), 9. https://doi.org/10.1186/s42506-019-0034-5

Endris, N., Asefa, H., & Dube, L. (2017). Prevalence of malnutrition and associated factors among children in rural Ethiopia. *BioMed Research International, 2017,* 6587853. https://doi.org/10.1155/2017/6587853

Engle, P. L., Menon, P., & Haddad, L. (1999). Care and nutrition: Concepts and measurement. *World Development, 27*(8), 1309–1337. https://doi.org/10.1 016/S0305-750X(99)00059-5

Ettyang, G. A., & van Marken Lichtenbelt, W. D. (2005). Nutritional status of Maasai pastoralists in Kajiado District, Kenya. *East African Medical Journal, 82*(10), 507–511. https://doi.org/10.4314/eamj.v82i10.9351

Faber, M., & Wenhold, F. A. M. (2007). Nutrition in contemporary South Africa. *Water SA, 33*(3), 393–400. https://doi.org/10.4314/wsa.v33i3.49130

FANTA. (2006). *Working group on infant and young child feeding indicators: Developing and validating simple indicators of dietary quality and energy intake of infants and young children in developing countries.* Food and Nutrition Technical Assistance (FANTA). https://www.fantaproje ct.org/sites/defaul t/files/resources/IYCF_Dietary_Quality.pdf

FAO, IFAD, UNICEF, WFP, & WHO. (2020). *The state of food security and nutrition in the world 2020: Transforming food systems for affordable healthy diets.* FAO. https://doi.org/10.4060/ca9692en

FAO. (2011). *Guidelines for measuring household and individual dietary diversity.* Food and Agriculture Organization of the United Nations. https://www.fa o.org/3 /i1983e/i1983e.pdf

Fekadu, Y., Mesfin, A., Haile, D., & Stoecker, B. J. (2015). Factors associated with nutritional status of infants and young children in Somali Region, Ethiopia: A cross-sectional study. *BMC Public Health, 15,* 846. https://doi.or g/10.1 186/s 12889-015-2190-7

Fischer Walker, C. L., & Black, R. E. (2004). Zinc and the risk for infectious disease. *Annual Review of Nutrition, 24*(1), 255–275. https://doi.o rg/10.1146/ annurev.nutr.24.012003.132249

Fiorentino, M., Bastard, G., Sembène, M., Fortin, S., & Perignon, M. (2016). Anthropometric and micronutrient status of schoolchildren in Dakar, Senegal. *Nutrients, 8*(12), 770. https://doi.org/10.3390/nu8120770

Geberselassie, S. B., Abebe, S. M., Melsew, Y. A., Mutuku, S. M., & Wassie, M. M. (2018). Prevalence of stunting and its associated factors among children 6–59 months in Northern Ethiopia: A cross-sectional study. *Journal of Nutrition and Metabolism, 2018,* 1078363. https://doi.org/10.1155/2018/1078363

Gebru, K. F., Haileselassie, W. M., Temesgen, A. H., Seid, O., & Mulugeta, B. (2019). Determinants of stunting among under-five children in Ethiopia: A multilevel analysis using 2016 EDHS data. *BMC Pediatrics*, *19*(1), 176. https://doi.org/ 10.1186/s 12887-019-1546-9

Gebru, N. W., Mekonnen, T. H., & Edris, M. (2020). Prevalence and factors associated with stunting among children aged 6–59 months in Ethiopia: A cross-sectional study from the 2016 Ethiopian Demographic and Health Survey. *BMC Nutrition, 6*(1), 19. https://doi.org/10.1186/s40795-020-00347-6

Gitau, G. N., Makasa, M., Kinyao, P., Mwangi, A., & Mutie, D. M. (2016). Feeding practices and nutritional status of children under five in Kajiado County, Kenya. *East African Medical Journal, 93*(11), 533–542. https://doi.o rg/10.43 14/ea mj.v93i11.6

Global Panel on Agriculture and Food Systems for Nutrition. (2016). *Food systems and diets: Facing the challenges of the 21st century.* Global Panel. https://www.glopan.org/reports/foresight

Government of Kenya. (2012). *National nutrition action plan 2012–2017.* Ministry of Public Health and Sanitation. https://scalingupnutrition.org/resource-library

Habte, T. Y., & Krawinkel, M. (2016). Dietary diversity score: A measure of nutritional adequacy or an indicator of healthy diet? *Journal of Nutrition and Health Sciences, 3*(3), 303. https://doi.org/10.15744/2393-9060.3.303

Hagos, S., Haile, D., Wolde, H., & Sisay, M. (2017). Magnitude of stunting and its determinants among children aged 6–59 months in rural Ethiopia: A community-based cross-sectional study. *BMC Research Notes, 10*(1), 517. https://doi.org/10.1186/ s13104-017-2836-8

Kandala, N. B., Madungu, T. P., Emina, J. B., Nzita, K. P., & Cappuccio, F. P. (2011). Malnutrition among children under the age of five in the Democratic Republic of Congo (DRC): Does geographic location matter? *BMC Public Health, 11*(1), 261. https://doi.org/10.1186/1471-2458-11-261

Kenya National Bureau of Statistics (KNBS), Ministry of Health (MOH), National AIDS Control Council (NACC), Kenya Medical Research Institute (KEMRI), & National Council for Population and Development (NCPD). (2015). *Kenya demographic and health survey 2014.* KNBS and ICF International. https://dhsprogram.com/publications/publication-fr308-dhs-final-reports.cfm

Kenya National Bureau of Statistics (KNBS). (2018). *Basic report on well-being in Kenya: Based on the 2015/16 Kenya integrated household budget survey (KIHBS).* KNBS. https://www.knbs.or.ke

Kenya National Bureau of Statistics (KNBS). (2022). *Kenya demographic and health survey 2022: Key indicators report.* KNBS and ICF International. https://dhsprogram.com/publications/publication-pr144-preliminary-reports-key-indicators-reports.cfm

Kenya National Bureau of Statistics (KNBS). (2023). *Economic survey 2023.* KNBS. https://www.knbs.or.ke

Kimani-Murage, E. W., Muthuri, S. K., Oti, S. O., Mutua, M. K., van de Vijver, S., Kyobutungi, C., & Ezeh, A. C. (2015). Evidence of a double burden of malnutrition in urban poor settings in Nairobi, Kenya. *PLoS ONE, 10*(3), e0129943. https://doi.org/10.1371/journal.pone.0129943

Kimani-Murage, E. W., Schofield, L., Wekesah, F., Mohamed, S., Mberu, B., Ezeh, A., & Izugbara, C. (2014). Vulnerability to food insecurity in urban slums: Experiences from Nairobi, Kenya. *Journal of Urban Health, 91*(6), 1098–1113. https://doi.org/10.1007/s11524-014-9894-3

KNBS & UNICEF. (2017). *Kenya multiple indicator cluster survey 2014: Final report.* KNBS and UNICEF. https://mics.unicef.org/surveys

KNBS, UNICEF, & Ministry of Health (MOH). (2022). *Kenya multiple indicator cluster survey 2021: Final report.* KNBS and UNICEF. https://mics.unicef.org/surveys

Kothari, C. R. (2004). *Research methodology: Methods and techniques* (2nd ed.). New Age International.

Leroy, J. L., Ruel, M., Frongillo, E. A., Harris, J., & Ballard, T. J. (2015). Measuring the food access dimension of food security: A critical review and mapping of indicators. *Food and Nutrition Bulletin, 36*(2), 167–195. https://doi.org/ 10.1177 /0379572115587274

Masibo, P. K., & Makoka, D. (2012). Trends and determinants of undernutrition among young Kenyan children: Kenya Demographic and Health Survey 1993, 1998, 2003 and 2008–2009. *Public Health Nutrition, 15*(9), 1715–1727. https://doi.org/10.1017/S1368980012002856

Mekonnen, Y., & Worku, A. (2011). Determinants of low birth weight in Ethiopia: Analysis of the 2011 EDHS data. *Ethiopian Journal of Health Development, 27*(1), 14–20. https://www.ajol.info/index.php/ejhd/article/view/88371

Ministry of Health (MOH). (2012). *National micronutrient survey report, Kenya 2011.* Government of Kenya. https://sunbusinessnetwork.org/resource-library

Ministry of Health (MOH). (2017). *Kenya national strategy for the prevention and control of non-communicable diseases 2015–2020.* Government of Kenya. https://www.health.go.ke

Mkhize, M., & Sibanda, M. (2020). A review of selected studies on the factors associated with the nutrition status of children under the age of five years in South Africa. *International Journal of Environmental Research and Public Health, 17*(21), 7973. https://doi.org/10.3390/ijerph17217973

Mosha, I. H., & Philemon, N. (2010). Factors influencing pregnancy outcomes in Morogoro Municipality, Tanzania. *Tanzania Journal of Health Research, 12*(4), 242–251. https://doi.org/10.4314/thrb.v12i4.54709

Mosha, T. C. E., & Philemon, N. (2013). Nutritional status of under-five children and associated factors in Morogoro Municipality, Tanzania. *Tanzania Journal of Health Research, 15*(4), 1–10. https://doi.org/10.4314/thrb.v15i4.6

Müller, O., & Krawinkel, M. (2005). Malnutrition and health in developing countries. *CMAJ, 173*(3), 279–286. https://doi.org/10.1503/cmaj.050342

Ndukwu, C. I., & Egbuonu, I. (2011). Assessment of growth and nutritional status of children aged 0–5 years in a rural community in Southeast Nigeria. *Annals of Medical and Health Sciences Research, 1*(1), 37–44. https://doi.org/10.4103/2141-9248.96937

Shinsugi, C., Matsumura, M., Karama, M., Tanaka, J., Changoma, M., & Kaneko, S. (2015). Factors associated with stunting among children according to the level of food insecurity in the household: A cross-sectional study in a rural community of southeastern Kenya. *BMC Public Health, 15*(1), 441. https://doi.org/10.1186/s12889-015-1802-6

Shrimpton, R., Victora, C. G., de Onis, M., Lima, R. C., Blössner, M., & Clugston, G. (2001). Worldwide timing of growth faltering: Implications for nutritional interventions. *Pediatrics, 107*(5), e75. https://doi.org/10.1542/peds.107.5.e75

Sileshi, Z., & Tefera, B. (2013). Prevalence of stunting and associated factors among preschool children in Ethiopia. *Journal of Nutrition and Health Sciences, 1*(1), 1–6.

Tabacchi, G., Giammanco, S., La Guardia, M., & Giammanco, M. (2007). A review of the literature and a new classification of the early determinants of childhood obesity: From pregnancy to the first years of life. *Nutrition Research, 27*(10), 587–604. https://doi.org/10.1016/j.nutres.2007.08.013

Tette, E. M. A., Sifah, E. K., & Nartey, E. T. (2015). Factors affecting malnutrition in children and the uptake of interventions to prevent the condition. *BMC Pediatrics, 15*(1), 189. https://doi.org/10.1186/s12887-015-0496-3

UNICEF. (2019). *The state of the world's children 2019: Children, food and nutrition.* UNICEF. https://www.unicef.org/reports/state-of-worlds-children-2019

UNICEF, WHO, & World Bank Group. (2021). *Levels and trends in child malnutrition: Key findings of the 2021 edition of the joint child malnutrition estimates.* UNICEF, WHO, & World Bank. https://www.who.int/publ ications/i /item/9 789240025257

UNICEF, WHO, & World Bank Group. (2023). *Levels and trends in child malnutrition: Key findings of the 2023 edition of the joint child malnutrition estimates.* UNICEF, WHO, & World Bank. https://www. who.i nt/pu blicatio ns/i/item /9789240073661

United Nations. (2015). *Transforming our world: The 2030 Agenda for Sustainable Development.* UN. https://sdgs.un.org/2030agenda

United Nations. (2021). *The sustainable development goals report 2021*. UN. https://unstats.un.org/sdgs/report/2021

Victora, C. G., Adair, L., Fall, C., Hallal, P. C., Martorell, R., Richter, L., & Sachdev, H. S. (2008). Maternal and child undernutrition: Consequences for adult health and human capital. *The Lancet, 371*(9609), 340–357. https://doi.org/10.1016/S0140-6736(07)61692-4

Victora, C. G., de Onis, M., Hallal, P. C., Blössner, M., & Shrimpton, R. (2010). Worldwide timing of growth faltering: Revisiting implications for interventions. *Pediatrics, 125*(3), e473–e480. https://doi.org/10.1542/peds.2009-1519

WHO. (2010). *Indicators for assessing infant and young child feeding practices: Part 2—Measurement.* World Health Organization. https://www.who.i nt/publicatio ns/i/item/9789241599290

WHO. (2018). *Guidelines on counselling of women to improve breastfeeding practices.* World Health Organization. https://www. who.int/publicat ions/i/item/97 892415 50468

WHO. (2020). *Infant and young child feeding: Model chapter for textbooks for medical students and allied health professionals.* World Health Organization. https://www.who.int/publications/i/item/9789241597494

WHO. (2021). *Guideline on the prevention and management of wasting and nutritional oedema (marasmus, kwashiorkor and marasmic-kwashiorkor).* World Health Organization. https://www.who.int/publications/i/item/9789240037267

WHO. (2022). *World health statistics 2022: Monitoring health for the SDGs.* World Health Organization. https://www.who.int/publications/i/item/9789240051157

WHO & UNICEF. (2008). *Indicators for assessing infant and young child feeding practices: Part 1—Definitions.* World Health Organization. https://apps.w ho.int/iris/ha ndle/10665/43895

WHO & UNICEF. (2017). *Guidance on ending the inappropriate promotion of foods for infants and young children: Implementation manual.* World Health Organization. https://www.who.int/publications/i/item/9789241513470

World Bank. (2020). *World development indicators 2020.* The World Bank. https://databank.worldbank.org/source/world-development-indicators

APPENDICES

Appendix I: Letter of Introduction

Mercy Chepkorir Ng'etich
P.O. Box 268- 20200
Kericho
0721210143
mngtich@kaarak.co.ke

Dear Sir/Madam,

I am a master's student at Kabarak University in the Department of Nutrition and Dietetics, which is under the School of Medicine and Health Sciences. I am undertaking a master's degree in Human Nutrition and Dietetics, and my registration number is GMND/M/2167/12/22. I am undertaking this study in partial fulfillment of my degree. My research focuses on the Determinants of Nutritional status in children aged 6-59 Months in Kajiado Central sub-county, Kenya.

I am writing this letter to sincerely request your assistance and cooperation, which would be necessary as I collect data for this research. All information provided by the research participants was handled ethically and kept confidential. The participants remained anonymous throughout the study and even after data collection.
I can be reached at any time via email or phone. Thank you.
Sincerely,

Mercy Chepkorir Ng'etich

Appendix II: Consent Form

KABARAK UNIVERSITY RESEARCH ETHICS COMMITTEE ADULT INFORMED CONSENT FORM

STUDY: DETERMINANTS OF NUTRITION STATUS OF CHILDREN AGED 6-59 MONTHS IN KAJIADO CENTRAL SUB-COUNTY, KENYA

Primary investigator: Mercy Chepkorir Ng'etich, **Affiliated Institution** Kabarak University

Introduction

You are invited to participate in this research study being undertaken by the above-listed Investigator. This will help you gather information about the study so that you can voluntarily decide whether you want to participate or not. You are encouraged to ask any questions regarding the research process, as well as any benefits or risks that you may incur by participating. After you have been adequately informed about the study, you will be requested to either agree or decline to participate. Upon agreeing to participate in the study, you will be further requested to affirm that by appending your signature/thumbprint on this form. Accepting or declining to participate in this study does not in any way waive the following rights, to which you are entitled:

a. Voluntary participation in the study;
b. Withdrawing from the study at any time without the obligation of having to give an Explanation and;
c. Access to services to which you are entitled

A copy of this form will be provided to you for your records should I continue:
YES NO?

This study has been reviewed and approved by **Kabarak University Scientific Research Ethics Committee (KUREC)**

The main reason(s) for conducting this study are to answer the following questions:

i. What are the key socioeconomic and socio-demographic factors associated with households that have children aged 6-59 months in Kajiado Central?

ii. How do dietary practices vary among households with children aged 6-59 months in Kajiado Central, and what types of foods are commonly consumed by these children?

iii. What is the current nutritional status of children aged 6-59 months in Kajiado Central, Kenya, in terms of stunting, wasting, and underweight?

iv. How is the nutritional status of children aged 6-59 months associated with socioeconomic and socio-demographic factors and dietary factors in Kajiado Central?

To answer these research questions, you are requested to voluntarily answer questions and/or accept some procedures performed on you.

To participate in the study, you must meet the following inclusion and exclusion criteria:

i. Participants must be residents of Kajiado Central Sub-County, Kenya, as this is the primary study location.

ii. The study will include children and their caregivers, where the child is 6-59 months of age.

iii. Children 6 months to 59 months who are ill will be excluded.

The study aims to include 204 eligible participants who meet the inclusion criteria. This sample size has been determined based on considerations of feasibility, the available resources, and statistical power requirements for the proposed analyses. It aims to provide a representative sample that adequately captures the nutrition knowledge of caregivers and the nutritional status of the children.

Your participation in his research involves a month-long data collection process. The initial data collection interview will require approximately 15 minutes of your time.

A skilled and well-trained interviewer will engage you in a private setting where you can comfortably respond to the questions. Please be aware that you are under no obligation to answer any question that makes you uncomfortable. The interview will cover the following areas:

1. Socioeconomic and Socio-demographic Characteristics
2. Nutrition Knowledge
3. Dietary factors

4. Hygiene practices
5. Anthropometric Measurements of the child will be taken.

Your participation in his study is greatly valued, and your comfort, privacy, and confidentiality are of utmost importance to us. If you have any concerns or queries at any point, please feel free to reach out to us. Your contribution will play a pivotal role in advancing our understanding of the relationship between caregiver nutrition knowledge and the nutritional status of the child.

We value your well-being and safety as a participant in our study. While every effort has been made to minimize risks, it is important to acknowledge the potential risks that may arise from your participation:

i. Discussing personal health and dietary information may raise privacy concerns. Rest assured that your participation will remain strictly confidential. Identifying information will be anonymized, and only authorized researchers will have access to your data.
ii. If anthropometric measurements are taken, there may be slight physical discomfort during the process. Trained personnel will ensure that measurements are conducted in a non-invasive and sensitive manner to minimize any discomfort.

iii. Mitigation Strategies: You will be fully informed about the study's purpose, procedures, and potential risks before giving your consent to participate. Your voluntary participation will ensure that you are comfortable with the study's expectations.

    a. Trained interviewers will create a safe and supportive environment during the interview, encouraging open communication and understanding.
    b. Your personal information and responses will be handled with the utmost confidentiality, ensuring that your identity remains protected.
    c. Stringent data security measures will be employed to prevent unauthorized access or data breaches.
    d. You have the right to withdraw from the study at any time without consequence or explanation if you feel uncomfortable.
    e. Your safety and well-being are paramount to us. Should you have any concerns or questions about the study or its potential risks, please do not hesitate to contact us.

Your willingness to contribute to advancing our understanding of feeding practices and nutritional status among dialysis patients is greatly appreciated.

Privacy & Confidentiality

Privacy refers to your right to have control over how your personal information is collected, used, and shared. Confidentiality, on the other hand, is our responsibility to safeguard your information and ensure that it remains undisclosed to the extent feasible.

i. During the interview, only necessary information will be collected, focusing solely on the study's objectives. Your identifiers will be minimized to ensure anonymity.

ii. All collected data will be stored in secure, password-protected electronic systems with restricted access. Physical records will be stored in locked cabinets accessible only to authorized personnel.

iii. Your identity will be protected throughout the study. All personal identifiers will be removed, ensuring that your responses are anonymous.

iv. If any quotations or examples are used in the study, pseudonyms will be employed to protect your identity further.

v. Only authorized researchers will have access to the data. Data will be shared internally within the research team for analysis purposes only.

vi. Your data will be handled with meticulous care. The data will be used solely for the study and will not be shared for any other purpose.

Data Retention and Disposal:

- Your data will be retained for 5 years from the completion of the study.
- After the retention period, your data will be securely deleted from electronic systems, and any physical records will be shredded to ensure complete erasure.

Extra Precautions for Safety and Anonymity:

1. For participants' identification, unique codes will be assigned, which will be stored separately from the collected data to ensure anonymity.
2. Any communication between you and the research team will be conducted

through secure channels to prevent unintended disclosure.

3. Any personal information shared during the interview will be de-identified during transcription to maintain confidentiality.

Your participation is essential to the success of this study, and we are committed to ensuring your privacy and protecting your personal information. If you have any concerns or questions regarding privacy, confidentiality, or data handling, please do not hesitate to reach out. Your trust is of utmost importance to us, and we appreciate your contribution to advancing our knowledge of feeding practices and nutritional status among dialysis patients. In case you are not comfortable answering any of the questions during the interview because of feeling embarrassed or uncomfortable, it will be within your rights to decline. Otherwise, every measure has been taken to ensure that the interview is conducted in a private area with minimal to no interference so that you feel comfortable. If at all, you suffer any injury, illness, or complication(s) by participating in this study, kindly contact us immediately using the contact details provided at the bottom of this form. The study clinician will attend to you, and if there is a need for further assessment or treatment, you will be referred accordingly.

Your participation in his study holds the potential to yield several benefits, ranging from personal to community and societal levels. These benefits are not entitlements but actual outcomes that may result from your valuable contribution:

1. Participating in this study will offer you a deeper understanding of the intricate relationship between caregiver nutrition knowledge and nutritional status, specifically in the context of children 6-59 months. By sharing your experiences and insights, you will gain a heightened awareness of how caregiver nutrition knowledge affects the nutritional status of children, potentially empowering you to make more informed choices.
2. Your participation will contribute to the advancement of medical knowledge in the management of malnutrition. By sharing your experiences, you are playing a crucial role in enriching our
3. Understanding of caregiver nutrition knowledge on nutritional status in children 6-59 months. This knowledge has the potential to shape future healthcare approaches for malnourished children.
4. Through your input, this study aims to identify patterns and correlations between

feeding practices and caregiver nutrition knowledge and the nutritional status of children 6-59 months. These findings could lead to the development of tailored nutrition interventions for malnourished children, potentially enhancing the effectiveness of patient care and treatment plans.

5. By contributing to the broader knowledge base, you are indirectly fostering community awareness and understanding of the challenges faced by caregivers and their children. Your insights can spark conversations, raise awareness, and advocate for better healthcare resources for this community.
6. Your participation supports the broader goal of enabling evidence-based decision-making in healthcare policies and practices. The outcomes of this study can contribute to the development of guidelines that address the nutrition needs of children, ultimately benefiting society as a whole
7. Malnourished children face unique nutrition challenges that affect their overall health and well-being. By participating in this study, you are contributing to addressing a critical health issue that affects numerous individuals. Your input will directly contribute to improving the understanding and management of dietary concerns in Kajiado Central sub-county.

Your willingness to engage in this study is greatly appreciated. Your insights will contribute to the body of knowledge surrounding the nutrition outcomes of children, potentially influencing future interventions and healthcare practices. As a participant, you become an essential partner in our collective journey towards enhancing healthcare outcomes for dialysis patients and improving their quality of life.

Participating in this study will not incur any financial cost on your part. Your involvement is voluntary and will not require any payment or expense. There will be no charges associated with any aspect of the study, including the interview, data collection, or any follow-up procedures that may be conducted. We want to ensure that your participation is as seamless and accessible as possible. We aim to gather valuable insights without imposing any financial burden on you. Your contribution is highly valued, and we want to express our gratitude for your willingness to share your experiences and insights with us. If you have any questions or concerns about potential costs or any other aspect of the study, please do not hesitate to contact us. Your comfort and well-being are of paramount importance, and we are here to provide any

clarification or support you may need throughout your participation in the study.

Your participation in his study is voluntary, and we greatly appreciate your willingness to contribute. However, we want to provide clarity on certain matters:

1. You will not be reimbursed for any expenditure incurred because of participating in this study.
   This includes any travel costs, transportation expenses, or any other financial outlays related to your involvement.
   2. In recognition of your valuable contribution, we want to emphasize that this study does not offer any monetary compensation or payment to participants. Your participation is based solely on your willingness to share your insights and experiences.

It is important to us that you make an informed decision about your participation. We are committed to maintaining transparency and clarity throughout the study process. If you have any questions or concerns about reimbursement or compensation or any other aspect of the study, please feel free to reach out to us. Your involvement is highly valued, and your comfort and understanding are of utmost importance to us.

If you have any further questions, require clarification, or have concerns related to your ongoing participation in the study, please feel free to reach out to:

Principal Investigator (PI):

Name: Mercy Chepkorir Ng'etich
Email Address: mngetich@kabarak.co.ke
Phone Number: 0721210143

If you have concerns about your rights and obligations as a research participant, you can contact the secretary of the Kabarak University Research Scientific Ethics Committee (KUSREC).

Your comfort, well-being, and understanding are our top priorities. We are here to provide support and address any queries you may have throughout your participation in the study. Your engagement is essential to the success of this research, and we want to ensure that you have all the necessary information to make informed decisions.

The decision on whether to participate or not is voluntary. You will be free to withdraw from the study at any point during the study without providing any explanation.

We are committed to sharing the outcomes of this study with you and the broader community. Here is our plan for communicating and sharing the findings:

Participant Feedback Session: Once the study is completed and the findings are analyzed, we will organize a participant feedback session. During this session, we will present the key findings, trends, and insights that emerged from the study. You will have the opportunity to ask questions, seek clarifications, and engage in discussions related to the findings.

Written Report: A comprehensive written report summarizing the study's findings will be prepared. This report will be made available to you and can be accessed in both digital and Printed formats. It will include clear explanations of the research outcomes, implications, and any potential recommendations that arise from the study.

Research Presentations: We aim to share the study's findings with the academic and research community. Presentations at relevant conferences, seminars, and symposiums will be considered to disseminate the results to a wider audience.

Public Awareness Initiatives: To promote community awareness and engagement, we will explore avenues such as public talks, workshops, and online platforms to share key insights from the study with individuals interested in the topic.

Research Publications: The findings may be submitted for publication in peer-reviewed academic journals, making them accessible to fellow researchers, healthcare professionals, policymakers, and the public.

Participant Reports Individualized reports summarizing your specific contributions to the study's findings can be provided upon request. These reports will highlight how your insights helped shape the overall outcomes.

Statement of Consent

I have comprehensively read the consent form, and/the information has been comprehensively read to me by the researcher. I have understood what the study is about, and all the questions and concerns that I had have been addressed clearly and

concisely. The study benefits and foreseeable risks have been explained to me. I understand that my decision to participate in this study is voluntary, and I have the right to withdraw at any point during the study. I freely consent to participate in this study.

Signing this form doesn't in any way imply that I have given up the rights I am entitled to as a Participant.

I agree to participate in this research. YES_____NO_____

I agree to provide my contact details for follow-up. YES_____NO _____

Participant's Name _____

Participant's Signature _____Date _____

Appendix III: Questionnaire

Questionnaire serial number: _____ Study participant's Code: _____

Ward: _____ Unit: _____

Name of interviewer: _____ Date of interview____/____/_____

Section A: Socio-Demographic and Socio-Economic Factors

Caregiver

1. Gender a. Male □ b. Female □
2. Relationship with child a. Mother□ b. Father □ c. Grandmother/Grandfather □ d. Other □
3. Birthday: _ _ / _ _ /_ _ _ _ (day month year)
4. Age in completed years: _ _
5. Marital status: a. Single □ b. Married □ c. Separated □ d. Divorced □ e. Widow/er□
6. Number of children: _ _ (For pregnant women: ask if this is her first pregnancy) First pregnancy □
7. Household members (eat from the same pot and are answerable to the same head) Adults…Children…
8. Monthly household income (approximate) Ksh……
9. What do you do for a living? a. Employed □ b. Self-employed □ c. Unemployed □
10. Have you ever attended school? a. Yes, b. No. If yes, what is the highest level of school you attended? A. None □ b. Primary school □ c. Secondary school □. Higher □
11. What is the highest class/form/year you completed at that level? _ _

Child

12. Gender: a. Male □ b. Female □
13. Birthday: _ _ / _ _ /_ _ _ _ (day month year)
14. Age in completed years _ _ Age in completed months_ _

B. Caregiver Nutrition Knowledge

This part was adapted from the tool used in the study titled "Nutrition knowledge of caregivers and feeding practices of children 6-59 months in rural Kajiado central, Kenya" (Waruguru, 2024). Caregiver nutrition knowledge was assessed using 20 questions covering essential areas such as breastfeeding, complementary feeding, dietary diversity, hygiene, and meal frequency. Each response was recorded as knows or does not know. Every correct response to a question was awarded one point, and total scores were converted into percentages. Scores were then categorized into five levels: very low: 0–20%, low: 21–40%, moderate: 41–60%, high: 61–80% and very high: 81–100%.

15. Breast milk at birth

16. What is the first food a newborn baby should receive?

- *Only breast milk*
- *Other*
- *Do not know*

Preliminary analysis
Knows
Does not know

17. Meaning of exclusive breastfeeding

Have you heard about exclusive breastfeeding?

- Yes
- No □, *continue to the next question*

What does exclusive breastfeeding mean?

- *Exclusive breastfeeding means that the infant gets only breast milk and no other liquids or foods*
- *Other*
- *Do not know*

Preliminary analysis
Knows
Does not know

18. Recommended length of exclusive breastfeeding

How long should a baby receive nothing more than breast milk?

Probe if necessary:

Until what age is it recommended that a caregiver feed nothing more than breast milk?

- *From birth to six months*
- *Other*
- *Do not know*

Preliminary analysis
Knows
Does not know

19. Breast milk is sufficient for babies from birth to six months old

Why do you think breast milk is the only food recommended for infants up to six months old?

Probe if necessary:

Why is breast milk alone sufficient to feed babies during the first six months?

- *Because breast milk provides all the nutrients and liquids a baby needs in its first six months*
- *Because babies cannot digest other foods before they are six months old*
- *Other*
- *Do not know*

Preliminary analysis
Knows
Does not know

20. Frequency of feeding

How often should a baby younger than six months be breastfed or fed with breast milk?

o *On demand, whenever the baby wants*

o *Other*

o *Do not know*

Preliminary analysis
Knows
Does not know

21. Benefits of exclusive breastfeeding for babies

What are the benefits for a baby if he or she receives only breast milk during the first six months of life?

- o *He/she grows healthily*
- o *Protection from diarrhea and other infections*
- o *Protection against obesity and chronic diseases in adulthood*
- o *Protection against other diseases. Specify* _____
- o *Other*
- o *Do not know*

Preliminary analysis
Knows
Does not know
Number of correct responses__

31. Benefits of exclusive breastfeeding for caregivers

What are the physical or health benefits for caregivers if they exclusively breastfeed their baby?

Probe if necessary:

- o *Delays fertility*
- o *Helps her lose the weight she gained during pregnancy*
- o *Lowers the risk of cancer (breast and ovarian)*
- o *Lowers the risk of losing blood after giving birth (less risk of post-partum hemorrhage)*
- o *Improves the relationship between the caregivers and the baby*
- o *Other*
- o *Do not know*

Preliminary analysis

Knows

Does not know

Number of correct responses __

22. Maintaining breast milk supply

Many times, caregivers complain about not having enough breast milk to feed their babies.

Please tell me different ways caregivers can keep up their milk supply.

- *Breastfeeding exclusively on demand*
- *Manually expressing breast milk*
- *Having good nutrition/eating well/having a healthy or diversified diet*
- *Drink enough liquids during the day*
- *Other*
- *Do not know*

Preliminary analysis

Knows

Does not know

Number of correct responses __

23. Overcoming barriers to breastfeeding

Many caregivers need to work and are separated from their babies. In this situation, how could caregivers continue feeding their baby exclusively with breast milk? *By:*

- *Expressing breast milk by hand, storing it, and asking someone to give breast milk to the baby*
- *Other*
- *Do not know*

Preliminary analysis

Knows

Does not know

24. Seeking health care if breastfeeding difficulties arise

If a caregiver has difficulties feeding breast milk, what should she do to overcome them?

Probe if necessary:

Who can help the caregivers solve the problem?

- *Seek professional help from healthcare services: doctors, nurses, midwives, or other health professionals*
- *Other*
- *Do not know*

Preliminary analysis
Knows
Does not know

25. Continued breastfeeding

How long is it recommended that a woman breastfeed her child?

Probe if necessary:

Until what age is it recommended that a caregiver continue breastfeeding?

- *Six months or less*
- *6–11 months*
- *12–23 months*
- *24 months and more (correct response)*
- *Other*
- *Do not know*

Preliminary analysis
Knows
Does not know

26. Age of start of complementary foods

At what age should babies start eating foods in addition to breast milk?

- *At six months*
- *Other*
- *Do not know*

Preliminary analysis
Knows
Does not know

27. Reason for giving complementary foods at six months

Why is it important to give foods in addition to breast milk to babies from the age of six months?

- *Breast milk alone is not sufficient (enough)/cannot supply all the nutrients needed for growth/From six months, a baby needs more food in addition to breast milk*
- *Other*
- *Do not know*

Preliminary analysis
Knows
Does not know

28. Dietary diversity and ways of enriching porridge

Please tell me some ways to make food more nutritious or better for your baby's health.

By adding:

- *Animal-source foods (meat, poultry, fish, liver/organ meat, eggs, etc.)*
- *Pulses and nuts: flours of groundnut and other legumes (peas, beans, lentils, etc.), sunflower seed, peanuts, soybeans*
- *Vitamin-A-rich fruits and vegetables (carrot, orange-fleshed sweet potato, yellow pumpkin, mango, papaya, etc.)*
- *Green leafy vegetables (e.g., spinach)*
- *Energy-rich foods (e.g., oil, butter/ghee)*
- *Other*
- *Do not know*

Preliminary analysis
Knows
Does not know

29. Responsive feeding

Do you know any ways to encourage young children to eat?

- *Giving them attention during meals, talking to them, and making meal times happy times*
- *clap hands*
- *make funny faces/play/laugh*
- *demonstrate opening your mouth very wide/modeling how to eat*
- *say encouraging words*
- *draw the child's attention*
- *Other*
- *Do not know*

Preliminary analysis
Knows
Does not know

30. Signs of under nutrition

How can you recognize that someone is not having enough food?

Probe if necessary:

What are the signs of under nutrition?

- *Lack of energy/weakness: cannot work, study, or play as normally (disability)*
- *Weakness of the immune system (becomes ill easily or becomes seriously ill)*
- *Loss of weight/thinness*
- *Children do not grow as they should (growth faltering)*
- *Other*
- *Do not know*

Preliminary analysis
Knows
Does not know
Number of correct responses __

31. Causes of under nutrition

What are the reasons why people are undernourished?

- *Not getting enough food*
- *Food is water and does not contain enough nutrients*
- *Disease/ill and not eating food*
- *Other*
- *Don't know*

Preliminary analysis
Knows
Does not know
Number of correct responses__

32. Seeking growth monitoring for infants and young children

How can you (*caregiver*) find out if the baby is growing well or not?

Probe if necessary:

Who can help the caregivers find out if the baby is growing well? Where can she go?

- *Go to the health center/ask a doctor or nurse (health professional) (seeking health-care services for growth monitoring)*
- *Other*
- *Do not know*

Preliminary analysis
Knows
Does not know

33. Meaning of lack of weight gain among infants and young children

Families and health workers can find out if children are well-nourished or malnourished by weighing them regularly and plotting their weights on growth charts.

If the baby is not gaining weight, what does that mean?

If no answer, probe:

What could be the causes?

- *The baby is not eating well/the baby does not want to eat*
- *The baby may be sick often*

o *Other*

o *Do not know*

Preliminary analysis
Knows
Does not know
Number of correct responses __

34. Prevention of under nutrition

What should we do to prevent under nutrition among children?

Infants (0–6 months)

- *Breastfeed exclusively/give only breast milk*
- *Go to the health center/hospital and check that the child is growing (growth monitoring services)*

Young children (6–23 months)

- *Give more food*
- *Feed frequently*
- *Give attention during meals*
- *Go to the health center/hospital and check that the child is growing (growth monitoring services)*
- *Other*
- *Do not know*

Preliminary analysis
Knows
Does not know
Number of correct responses __

Section C: Dietary Factors

35. Continued breastfeeding (for children below 24 months): Was the child breastfed or did he or she consume breast milk yesterday or at night? A. Yes, □b. No□ c. Do not know/no answer□
36. Minimum meal frequency (for children below 24 months): How many times did the child eat foods that are meals and snacks other than liquids, yesterday during the day or at night? _ _. Do not know/no answer□

Preliminary analysis (to be done after the interview)

WHO (2008) recommendations for minimum meal frequency:

For breastfed children:

2–3 times for breastfed infants 6–8 months

3–4 times for breastfed infants 9–23 months

For non-breastfed children:

4 times for non-breastfed children 6–24 months (including milk feeds, identified in question P2, Group 3)

From questions 36, 37, and 38, determine if the child receives food the minimum number of times according to WHO recommendations:

Less than recommended

The minimum number of times each day (follows the recommendation)

More than recommended

37. Dietary diversity: foods that the child ate yesterday during the day or at night, even if it was combined with other foods.

Group	**Food lists**	**No**	**Yes**
***Group 1**: Breast milk*	Breast milk.		
***Group 2**: Grains, roots, and tubers*	Porridge, bread, rice, noodles, or other foods made from grains		
	White potatoes, white yams, manioc, cassava, or any other foods made from roots		
***Group 3**: Legumes and nuts*	Any foods made from beans, peas, lentils, nuts, or seeds		
***Group 4**: Dairy products*	Infant formula		How Many times? |___|
	Milk, such as tinned, powdered, or fresh animal milk		How many times? |___|

	Yogurt or drinking yogurt		How many times? |___|
	Cheese or other dairy products		
***Group 5**: Flesh foods*	Liver, children, heart, or other organ meats		
	Any meat, such as beef, pork, lamb, goat, chicken, or duck		
	Fresh or dried fish, shellfish, or seafood		
	Grubs, snails, or insects		
***Group 6**: Eggs*	Eggs		
***Group 7**: Vitamin A fruits and vegetables*	Pumpkin, carrots, and sweet potatoes that are yellow or orange inside		
	Any dark green vegetables		
	Ripe mangoes (fresh or dried [not green]), ripe papayas (fresh or dried), musk melon		
***Group 8**: Other fruits and vegetables*	Any other fruits or vegetables		
***Other** (not counted in the dietary diversity score)*	Any oil, fats, butter, or foods made with any of these		
	Any sugary foods, such as chocolates, sweets, candies, pastries, cakes, or biscuits		
	Condiments for flavor, such as chilies, spices, herbs, or fish powder		

- The baby does not consume any food other than breast milk

Preliminary analysis

Number of food groups consumed the previous day _____/7

For Children Above 24 Months

38. Did the child have breakfast? a. Yes □ (*Go to question 3.4b.) b.* No□ (*Go to question 3.5)*

c. Do not know/know/any answer.

If Yes: At what time? *a.* Between 6 a.m. and 9 a.m. □ *b.* Between 9 a.m. and noon. Between noon and 3 p.m. □

Where? A. Home □ b. Elsewhere (*specify*) □

39. Having lunch: time and place

a. If the interview is being conducted before lunchtime, ask: Did the child have lunch yesterday?

If the interview is being conducted after lunchtime, ask: Did the child have lunch today?

- Yes
- No
- Do not know/know/any answer

If Yes: At what time?

- Between 9 a.m. and noon
- Between noon and 3 p.m.
- Between 3 p.m. and 6 p.m.

Who prepares the lunch?

- Caregivers at home
- Other (*specify*) _____

3.6 Dinner/supper: time and place

a. Did the child have dinner yesterday?

- Yes
- No
- Do not know/know/any answer

If Yes: At what time?

- Between 3 p.m. and 6 p.m.
- Between 6 p.m. and 9 p.m.
- Between 9 p.m. and midnight

Where?

- Home
- Elsewhere (*specify*) _____

40. Snacks

a. Yesterday, during the day and night, did the child eat anything between the meals?

- Yes, *go to question know/any.*
- No
- Do not know/know/any answer

If Yes: What did you eat? _____

D. Hygiene Practices

41. What do you normally use to wash your hands??

- Water and soap
- Water only

42. How do you usually dispose of your child's fecal waste

- Regular household waste (not in a separate bag)
- In a separate bag before disposal
- Toilet
- Main garbage bin
- Garbage bin on the farm
- Burn

43. How do you normally treat your drinking water?

- Treated at the main source
- Boil it
- Add water guard/chlorine
- I do not treat it
- Other (specify)

44. When do you wash your hands?

- Before preparing food?
- Before eating?
- Before feeding your children?
- After using the latrine?
- After coughing or sneezing?
- Handling pets or farm animals?
- After returning home from outside?

45. Are there proper facilities for the disposal of waste in your household?

- Yes
- No

Section E: Nutritional Status Of Child

46. Assess the child's weight: _____ kg
47. Assess the child's height/length: _____ cm
48. Assess the Child’s MUAC_____
49. Record the child’s Z-Score_____

Appendix IV: KUREC Approval Letter

KABARAK UNIVERSITY RESEARCH ETHICS COMMITTEE

Private Bag - 20157
KABARAK, KENYA
Email: kurec@kabarak.ac.ke

Tel: 254-51-3432345/5
Fax: 254-051-343529
www.kabarak.ac.ke

OUR REF: KABU01/KUREC/001/10/10/24

Date: 18th Oct, 2024

Mercy Chepkurir Ngetich
Reg No.: GMND/M/2167/12/22
Kabarak University,

Dear Mercy,

RE: DETERMINANTS OF NUTRITIONAL STATUS AND KNOWLEDGE OF CAREGIVERS OF CHILDREN AGED 6-59 MONTHS IN KAJIADO CENTRAL SUB COUNTY, KENYA.

This is to inform you that ***KUREC*** has reviewed and approved your above research proposal. Your application approval number is ***KUREC-101024.*** The approval period is 18***/10/2024 – 18/10/ 2025.***

This approval is subject to compliance with the following requirements:

i. All researchers shall obtain an introduction letter to NACOSTI from the relevant head of institutions (Institute of postgraduate, School dean or Directorate of research)
ii. The researcher shall further obtain a RESEARCH PERMIT from NACOSTI before commencement of data collection & submit a copy of the permit to **KUREC.**
iii. Only approved documents including (informed consents, study instruments, MTA Material Transfer Agreement) will be used
iv. All changes including (amendments, deviations, and violations) are submitted for review and approval by ***KUREC***
v. Death and life-threatening problems and serious adverse events or unexpected adverse events whether related or unrelated to the study must be reported to ***KUREC*** within 72 hours of notification;
vi. Any changes, anticipated or otherwise that may increase the risk(s) or affected safety or welfare of study participants and others or affect the integrity of the research must be reported to ***KUREC*** within 72 hours;
vii. Clearance for export of biological specimens must be obtained from relevant institutions and submit a copy of the permit to KUREC;
viii. Submission of a request for renewal of approval at least 60 days prior to expiry of the approval period. Attach a comprehensive progress report to support the renewal and;
ix. Submission of an executive summary report within 90 days upon completion of the study to ***KUREC***

Sincerely,

Prof. Jackson Kiteta PhD.
KUREC-Chairman

Cc Vice Chancellor
DVC-Academic & Research
Registrar-Academic & Research
Director-Research Innovation & Outreach
Institute of Post Graduate Studies

KABARAK UNIVERSITY INSTITUTIONAL RESEARCH ETHICS COMMITTEE APPROVED P. O. PRIVATE BAG - 20157, KABARAK

As members of Kabarak University family, we purpose at all times and in all places, to set apart in our hearts Jesus as Lord. (1 Peter 3:15)

Kabarak University is ISO 9001:2015 Certified

Appendix V:NACOSTI Research Permit

REPUBLIC OF KENYA

NATIONAL COMMISSION FOR SCIENCE, TECHNOLOGY & INNOVATION

Ref No: 964871

Date of Issue: 13/November/2024

RESEARCH LICENSE

This is to Certify that Miss. Mercy chepkorir ngetich of Kabarak University, has been licensed to conduct research as per the provision of the Science, Technology and Innovation Act, 2013 (Rev.2014) in Kajiado on the topic: DETERMINANTS OF NUTRITIONAL STATUS AND KNOWLEDGE OF CAREGIVERS OF CHILDREN AGED 6-59 MONTHS IN KAJIADO CENTRAL SUB-COUNTY, KENYA. for the period ending : 13/November/2025.

License No: NACOSTI/P/24/41947

964871

Applicant Identification Number

Director General
NATIONAL COMMISSION FOR SCIENCE, TECHNOLOGY & INNOVATION

Verification QR Code

NOTE: This is a computer generated License. To verify the authenticity of this document, Scan the QR Code using QR scanner application.

See overleaf for conditions

Appendix VI: Evidence of Conference Participation

KABARAK UNIVERSITY

Certificate of Participation

Awarded to

MERCY NGETICH

For successfully participating in the 15th Annual Kabarak University International Research Conference held from 13th-14th May 2025 and presented a paper entitled ***"Dietary Practices and Nutritional Status of Children 6–59 Months in Kajiado Central, Kenya."***

Conference Theme

Translation of Health Research and Innovation into Policy and Practice.

Prof. Pamela Kimeto Tinge'i
Dean, School of Medicine & Health Sciences

Dr. Phillip Nyawere
Ag.Director - Research, Innovation and Outreach

Kabarak University Moral Code

As members of Kabarak University family, we purpose at all times and in all places, to set apart in one's heart, Jesus as Lord.

(1 Peter 3:15)

Kabarak University is ISO 9001:2015 Certified

Appendix VII: List of Publication

Kabarak Journal of Research & Innovation

https://journals.kabarak.ac.ke/index.php/kjri/

RESEARCH ARTICLE

DIETARY PRACTICES AND NUTRITION STATUS OF CHILDREN AGED 6–59 MONTHS IN KAJIADO CENTRAL, KENYA

Mercy C. Ng'etich*, Phyllis Waruguru & Miriam Muga

Department of Human Nutrition and Dietetics, Kabarak University

*Correspondence Author: Chepkorir.m.n@gmail.com

Submitted: 9th April 2025; Accepted: 16th September 2025; Published (online): 17th September 2025

ABSTRACT

Nutrition status reflects a child's health as influenced by nutrient intake, absorption, and utilization. In Kajiado Central Sub-County, Kenya, optimal nutrition remains a challenge despite interventions being put in place. This study examined how dietary practices determine the nutrition status of children aged 6–59 months. A community-based cross-sectional study was conducted using multistage random sampling across rural and urban households. Data were collected via semi-structured questionnaires. Nutrition indicators were computed using WHO Anthro and statisticaal analyses were performed in SPSS v26. Ethical clearance was obtained (KUREC: 11024; NACOSTI: 964871) as well as informed consent. Caregivers had a mean age of 28.6 years; most of whom were female (97%), married (78.3%), unemployed (61.1%), and earned KES 13,833/month. Only 48% had secondary education, and 83.3% scored ≥81% in nutrition knowledge. Continued breastfeeding, Minimum Meal Frequency (MMF), Minimum Dietary Diversity (MDD), and Minimum Acceptable Diet (MAD) were based on WHO IYCF indicators for children 6-23 months. For children above 24 months, higher meal frequency and food group consumption were analyzed in relation to nutrition status. Breastfeeding rates were high at one year (86%) but dropped to 56% by age two. MMF was met by 17.7% of children and MAD by only 4.5%. Majority of the children (6-59 months) consumed foods from less than 5 food groups (69.7%). Of the children, 24-59 months majority consumed only 3 meals (56.6%). Diets consisted mostly of cereals (91%) with limited fruits/vegetables. Anthropometric data showed 5.5% wasting, 6.6% underweight, 21.3% stunting, 4.5% overweight, and 2.5% obesity. Continued breastfeeding ($\chi^2 = 7.97$, $p = 0.019$), MMF ($\chi^2 = 18.35$, $p = 0.019$), and MAD ($\chi^2 = 6.54$, $p = 0.011$) were associated with HAZ, WHZ, and WAZ respectively. Meal frequency of children above 24 months positively correlated with HAZ ($r = 0.216$, $p = 0.013$) and WAZ ($r = 0.254$, $p = 0.003$). These results highlight the poor dietary practices of children 6-59 months in Kajiado Central. Further longitudinal research is needed to assess the association of the significant factors with nutrition status over a long period of time. All dietary determinants found to be significantly associated in the initial analysis were further examined using both unadjusted and adjusted regression models; however, none remained statistically significant upon adjustment.

Keywords: Children aged 6-59 months, Dietary practices, Kajiado Central Sub-County, Nutrition status