DIETARY KNOWLEDGE, COMPLEMENTARY FEEDING PRACTICES AND NUTRITION STATUS OF CHILDREN 6–23 MONTHS OLD IN SIAYA COUNTY, KENYA

AYOMA OSCAR KAMBONA

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DECLARATION

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DEDICATION

It is with great appreciation and warm affection that I dedicate this research thesis to my family, academic supervisors, and course lecturers, who have been pillars of support throughout this work. I appreciate their support throughout the study.

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ABSTRACT

Malnutrition remains a critical public health challenge in Kenya, particularly among children aged 6–23 months, despite WHO recommendations on optimal complementary feeding practices. The study assessed the dietary knowledge, complementary feeding practices, and nutritional status of children aged 6-23 months in Siaya County, Kenya, to identify predictors of malnutrition. The study employed an explanatory sequential mixed-methods design with a descriptive cross-sectional approach in Siaya County. Data were collected from 282 caregiver-child pairs involving children aged 6-23 months using structured questionnaires, focus group discussions, and anthropometric measurements. Anthropometric data were analyzed using ENA for SMART, while SPSS Version 26 facilitated chi-square tests and regression analysis to examine relationships and identify predictors of nutritional outcomes among the participants. The study revealed that while 70.21% of caregivers initiated complementary foods at the recommended age, between 6 and 8 months, significant gaps persisted in dietary quality. Only 36.52% achieved minimum dietary diversity (MDD; mean score: 4.93 ± 1.23), and 4.96% met minimum meal frequency (MMF). Despite high breastfeeding continuation rates (77.30%) and caregiver awareness (83.69%), 76.86% of children did not meet milk feeding frequency, and only 4.61% achieved a minimum acceptable diet (MAD). Diets relied heavily on grains/tubers (93.26%) and vitamin A-rich foods (81.91%), with a moderate intake of flesh foods (57.80%), legumes (49.29%), and eggs (36.52%), but low consumption of dairy products (10.64%). Nutritional status indicators showed stunting at 29.08%, underweight at 13.12%, and wasting at 4.96%, with girls experiencing higher stunting rates than boys (36.55% versus 21.17%). Regression analysis identified critical predictors: males had 36.6% lower odds of being underweight (OR = 0.634, p = 0.021) but 13-fold higher odds of being wasted (OR = 13.39, 95% CI: 1.73–103.83, p = 0.013). Early food introduction at 5-6 months increased the odds of stunting by 4.66-fold (OR = 4.66, p = 0.001). Protective factors included boiling drinking water (14.4% reduced wasting odds; OR = 0.856, p = 0.034) and frequent feeding. Caregiver knowledge significantly influenced feeding practices, with parents prioritizing food affordability over nutritional quality. Dietary diversity and MAD showed no significant predictive value for nutritional outcomes (p > 0.05). Caregiver knowledge, socio-economic constraints, and cultural practices significantly influenced complementary feeding practices. The study recommends strengthening caregiver education programs on dietary diversity and feeding frequency, as well as enhancing water, sanitation, and hygiene (WASH) practices, to mitigate malnutrition risks. These findings offer valuable insights for policymakers, health professionals, and practitioners implementing child survival programs in similar settings.

Keywords: *Knowledge, Complementary Feeding Practices , Malnutrition and Nutrition Status.*

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LIST OF ABBREVIATIONS AND ACROYNMS

CF	Complementary feeding
CHA	Community Health Assistants
CHP	Community Health Promoters
CHU	Community Health Units
KDHS	Kenya Demographic Health Surveys
KNBS	Kenya National Bureau of Statistics
KUREC	Kabarak University Research Committee
MAD	Minimum Acceptable Diet
MDD	Minimum Dietary Diversity
MIYCN	Maternal, Infant, and Young Child Nutrition
MOH	Kenya -Ministry of Health
NACOSTI	National Commission for Science, Technology and Innovation
SPSS	Statistical Package for the Social Sciences
UNICEF	United Nations International Children's Emergency Fund
WHO	World Health Organization

OPERATIONAL DEFINITION OF KEY TERMS

Caregiver: Refers to the child's biological parent or the person who takes care of or looks after and gives the child most meals on most days.

Caregiver's Knowledge: Refers to the insight, practical know-how, understanding, awareness, and information that individuals responsible for the care of children 6-23 months old possess regarding the introduction of semi-solid or solid foods alongside continued breastfeeding or formula feeding, based on the WHO/ UNICEF, 2002 recommendations.

Complementary Feeding Practices: Refers to the provision of a variety of nutrient-rich foods, including age-appropriate solid foods, continuation of breastfeeding, and responsive feeding of children 6-23 months of age.

Dietary Knowledge: Refers to the understanding, awareness, and information that caregivers (including mothers) possess about appropriate food choices, feeding practices, and nutritional requirements for infants and young children during the complementary feeding period (6-23 months).

Nutrition Status: For this study, stunting (height-for-age below -2 Standard deviation (SD) of the WHO Child Growth Standards), underweight (weight-for-age below-2 SD) of the WHO Child Growth Standards, and wasting (weight-for-height below -2SD of the WHO Child Growth Standards) among children 6-23 months of age.

Nutritional Knowledge: Refers to the understanding and awareness of facts, principles, and practicesrelated to food, nutrients, and their impact on health.

CHAPTER ONE

INTRODUCTION

1.1 Background of the Study

WHO and UNICEF (2003) advise on exclusive breastfeeding for infants' first six months, followed by nutritionally appropriate complementary foods alongside continued breastfeeding until at least 2 years of age. According to De Onis, this critical 6–23-month period impacts child nutrition outcomes, including underweight, stunting, wasting, and obesity (De Onis, 2006). Appropriate complementary feeding during this window is essential for both physical growth and cognitive development, while poor practices increase risks of illness, growth impairment, developmental delays, and child mortality (Precious et al., 2023).

Malnutrition among children remains a major global health concern, with approximately 22.3% of children under the age of five exhibiting stunted growth and 6.8% affected by wasting (UNICEF/WHO/World Bank group, 2023). The African continent bears a significant share of this burden, accounting for approximately 43% of global cases. Although the World Health Organization has set targets to reduce stunting to below 15% and wasting to 5% by 2030, projections indicate that around 39.6 million children, 80% of whom are in Africa, are unlikely to reach these benchmarks (UNICEF/WHO/World Bank Group, 2023).

On a global scale, (CF) practices remain suboptimal: only 52.2% of children meet the minimum meal frequency (MMF), 29.4% achieve minimum dietary diversity (MDD), and just 16% receive a minimum acceptable diet (MAD) (UNICEF, 2022). These issues are particularly severe in Sub-Saharan Africa, which continues to face high levels of child malnutrition, with an estimated one in seven children suffering from nutrition-

related conditions (Walton & Allen, 2011). The Eastern and Southern African region continues to face significant challenges, further compounded by the early introduction of solid foods in 72% of children, alongside poor MMF (45%) and low MDD (21%) (UNICEF, 2022). The Minimum Acceptable Diet (MAD), a WHO-standard indicator (WHO, 2021), serves as a key measure of dietary quality and sufficiency for children aged 6 to 23 months.

Complementary feeding quality has a significant influence on child growth and development (Kuklina et al., 2004; Miller, Neupane, Joshi, Shrestha, et al., 2020; Prado & Dewey, 2014; Ruel et al., 2018). While MAD indicates feeding adequacy, its measurement has limitations in predicting growth outcomes (Onyango et al., 2014). MDD, validated globally and including breastmilk as an eighth food group, reveals stark regional disparities (WHO,2021). In Eastern/Southern Africa, dietary diversity remains critically low, with only one-quarter of children achieving MDD standards, markingthe poorest regional performance globally (Choudhury et al., 2019; UNICEF, 2020).

Kenya's situation reflects both progress and persistent challenges. The country outperforms regional averages in continued breastfeeding (75%) and timely food introduction (80%), with lower MDD (36%) and MAD (22%) rates compared to neighboring countries (UNICEF, 2020). However, half of Kenyan children still fail to meet MMF standards, and 29% consume no vegetables or fruits (UNICEF, 2020).. These disparities are particularly concerning in high-burden areas, such as Siaya County, which reports higher stunting rates (19% compared to the national average of 18%) and alarming malnutrition concentrations (with 42% of all malnutrition cases in Siaya County reported from AlegoUsonga(KNBS & ICF, 2023). Notably, no Research has reviewed the interplay between dietary knowledge, CF practices, and nutritional status among 6–23-month-olds in this vulnerable region.

Undernutrition continues to play a major role in child mortality across low-income settings, with nutrition-related factors accounting for a considerable share of deaths among under-five-year-old children (Aheto et al., 2015; Osendarp et al., 2021). Evidence indicates that CF practices are among the primary determinants of child health and nutrition outcomes (Kimiywe&Chege, 2015; Maingi et al., 2020). Inadequate caregiver knowledge of nutrition, combined with suboptimal practices—such as delayed or premature introduction of complementary foods and provision of nutritionally poor diets —has been associated with impaired growth, faltering, undernutrition, as well as elevated mortality rates in early childhood (Dagne et al., 2022; Lutter et al., 2011).

These findings highlight the critical need for focused assessments of caregiver knowledge on infant and young child feeding, particularly minimum dietary diversity (MDD), minimum meal frequency (MMF), and minimum acceptable diet (MAD), and how they affect the nutritional status of children aged 6 to 23 months in high-risk settings such as Siaya County (UNICEF/WHO/World Bank group, 2023).

1.2 Problem Statement

Siaya County reports a stunting prevalence of 19.2%, which exceeds the national average of 18.2% (KNBS & ICF, 2023). Within the county, Alego Usonga Sub-County contributes disproportionately, accounting for approximately 42% of all malnutrition cases (Ministry of Health [MOH], 2019). These alarming disparities highlight an urgent need to investigate the role of caregivers' knowledge and CF practices in shaping child nutrition outcomes in high-burden settings.

Persistent challenges, including widespread gaps in caregivers' dietary knowledge and inappropriate CF practices, persist, especially among children aged 6–23 months, contributing significantly to poor nutrition outcomes (Kimani-Murage et al., 2011), low

dietary diversity, inadequate meal frequency, and poor nutrient quality of complementary foods, undermining child growth and development during the critical CF period. These inadequacies are strongly associated with stunting, wasting, micronutrient deficiencies, and cognitive delays (Kenya-MOH, MIYCN Policy Guidelines, 2013; Victora et al., 2021).This is because the first 1,000 days of life are critical for long-term health and development (WHO, 2023). Kenya must address these challenges to meet the Vision 2030 targets, SDG 2 (Zero Hunger), and the African Union's Agenda 2063 (Juma, 2019).

While previous research has recognized the impact of demographic and socioeconomic factors on infant and young child feeding (IYC) outcomes, few have investigated the complex relationship between caregiver knowledge, CF practices, and nutritional status of children aged 6 to 23 months in Siaya, Kenya. As a result, the study aimed to close the knowledge gap by investigating caregivers' dietary knowledge, CF behaviors, and their relationship with nutrition status, as well as identifying the associated drivers/predictors of poor nutritional status among children aged 6 to 23 months in Siaya, Kenya.

1.3 Study Objectives

1.3.1 General Study Objective

This study aimed to assess dietary Knowledge on complementary feeding, complementary feeding practices, and Nutritional status in children aged 6–23 months in Siaya County, Kenya.

1.3.2 The Specific Objectives

The specific objectives of this study were to:

i. Assess the knowledge of caregivers on complementary feeding for children aged 6 to 23 months in Siaya.

ii. Determine the care practices of caregivers with children aged 6 to 23 months in Siaya County.

iii. Assess nutritional status and predictors (dietary knowledge, socio-economic status, Occupation) of children 6–23 months in Siaya

iv. Determine the predictors of nutritional status (Caregiver dietary Knowledge, Psychological Support, Sex/gender, Time of Introducing Solid Food, and Water safety) among children aged 6-23 months in Siaya

v. Assess the nutritional status of children aged 6-23 months in Siaya

1.4 Research Questions

i. What are the CF practices among children 6 to 23 months old in Siaya County?

ii. To what extent do caregivers of children 6–23 months old in Siaya County demonstrate evidence-based CF knowledge?

iii. What is the nutritional status of children aged 6–23 months in Siaya, and which factors predominantly predict their nutritional status?

iv. What is the influence of caregiver dietary knowledge, psychological support, sex/gender, timing of introducing solid food, and water safety on the nutritional status of children aged 6-23 months in Siaya County?

v. What is the nutritional status of children aged 6-23 months in Siaya County?

1.5 Hypothesis

$H0_1$: Demographic characteristics (age, education, and socioeconomic status) do not significantly influence caregivers' knowledge levels regarding appropriate CF practices among caregivers of children aged 6–23 months in Siaya.

$H0_2$: There is no significant association between caregivers' knowledge levels on complementary feeding and their actual complementary feeding practices among caregivers of children aged 6–23 months in Siaya County.

$H0_3$: There is no significant association between caregivers' knowledge levels on CF practices and the nutritional outcomes of children between 6 and 23 months of age in Siaya County.

1.6 Justification of the Study

Kenya's Third Medium-Term Plan (2018-2022) prioritizes achieving global nutrition targets established under Sustainable Development Goals (SDGs) 2 and 3 (Ahoya et al., 2019; Government of Kenya, Third-Term-Plan-2018-2022). Advancing appropriate CF practices for children aged between 6 and 23 months is recognized as a critical component for realizing these national objectives,in high-burden regions like Siaya County, where malnutrition rates exceed national averages (stunting, 19% vs national 18%) and underweight rates (7% vs national 10.1%) (KDHS, 2022).

Siaya County is characterized by a high percentage of malnourished children, with specific in-County-level disparities, particularly in stunting and underweight categories. Additionally, the absence of documented studies on the knowledge and complementary feeding practices among caregivers within this specific context underscores the importance of initiating a study to fill the gaps.

Comprehensive understanding of caregivers' dietary knowledge and socioeconomic determinants is crucial for addressing poor complementary feeding practices and their multifaceted impacts on child health, including growth faltering, stunting (height-for-age <-2 SD), wasting (weight-for-height <-2 SD), underweight (weight-for-age <-2 SD), overweight (weight-for-height >+2 SD), and cognitive deficits. Policymakers must

develop tailored interventions to address these contextual factors. Considering the substantial impact of malnutrition on childhood mortality rates, it is crucial to focus on understanding dietary knowledge and complementary feeding practices among caregivers, as well as the nutritional status of children aged 6-23 months in Siaya County, Kenya. Focusing on this area has significant potential to generate insights that can inform targeted nutrition-related interventions that could effectively decrease these mortality rates (Black et al., 2013; Fewtrell et al., 2024; Saaka et al., 2022).

This study addresses critical gaps in evidence regarding caregiver knowledge and complementary feeding practices in Siaya County, while also supporting Kenya's alignment with key global and national development frameworks, including Sustainable Development Goal 2 (Zero Hunger), the African Union Agenda 2063, and Kenya Vision 2030. The necessity of this study is evident, given the county's elevated childhood mortality rates linked to nutrition-related causes (Black et al., 2013), which provide actionable insights to optimize feeding practices and reduce the burden of malnutrition on child survival(African Agenda 2063, 2015; The Sustainable Development Goals, 2015; Kenya Vision 2030, 2019).

1.7 Significance of the Study

Understanding the interrelationship between caregiver knowledge, complementary feeding (CF) practices, and the nutritional status of children is critical for designing targeted, research-based strategies or interventions to resolve issues related to chronic malnutrition, particularly in vulnerable regions such as Siaya County. This study aims to bridge gaps in the existing literature by examining how caregivers' knowledge and practices influence dietary adequacy and growth outcomes among children aged 6 to 23 months.

The findings will be instrumental in guiding policymakers, healthcare practitioners, and nutrition stakeholders in developing contextually relevant interventions aimed at promoting appropriate CF practices. Evidence suggests that improved caregiver education and responsive feeding practices are essential for preventing undernutrition and supporting child development during the crucial first 1,000 days of life (Black et al., 2013b; C. G. Victora et al., 2021).

Moreover, this study will contribute to a deeper understanding of the social and behavioral determinants influencing feeding practices and their direct impact on child health. By identifying prevailing knowledge gaps and practical barriers, the research will inform the design of more effective community-based health promotion strategies. These may include caregiver-focused education campaigns, culturally sensitive counseling tools, and integration of CF messages into health services.

Additionally, the study's outcomes may inform the formulation and implementation of public health policies and nutrition programs, aligning with Kenya's national development goals and international frameworks, such as the Sustainable Development Goals (SDG 2) and the African Union's Agenda 2063. Ultimately, by generating localized data, this research provides additional empirical insights into the global literature on pediatric nutrition, offering scalable insights that can inform similar interventions in low- and middle-income countries.

1.8 Scope of the Study

This study examined the dietary knowledge, complementary feeding practices, and nutritional status of children aged 6 to 23 months residing in Alego Usonga Sub-County, located in Siaya County, Kenya. This area is characterized by a mixed urban-rural demographic and a diverse ethnic composition, yet it faces persistent challenges related

to malnutrition, despite government and partner interventions in health, nutrition, and agriculture. The majority of residents rely on farming, casual labor, and livestock for sustenance. The study targeted caregiver-child pairs (N = 282) from the community. The study focused on the caregivers' dietary Knowledge, actual CF practices, and the resulting Nutritional status in children aged 6–23 months in Siaya County. This study provides a comprehensive assessment of Caregivers' knowledge of WHO-recommended CF practices, actual feeding behaviors, and child nutrition status, measured through MDD, MMF, food consistency, and anthropometric measurements, including height-for-age, weight-for-age, and weight-for-height. The study presents an opportunity to evaluate the current program's effectiveness and identify areas that require improvement.

The study revealed a disconnect between dietary knowledge and its practical application, and also highlighted the cultural and socioeconomic factors that shape CF behaviors. The findings will contribute to more effective strategies for addressing childhood malnutrition, where traditional approaches have shown limited success.

1.9 Assumptions of the Study

i. This research operated under the assumption that participants would provide the requested information voluntarily. Respondents declining to participate or withdrawing consent would not be compelled, and their time commitment would be respected.

ii. The study assumed that caregivers of children between 6 and 23 months would have up-to-date and fully completed Mother Baby Booklet containing the necessary data (including child age and medical history). In instances where the booklet was unavailable, incomplete, or an alternative clinical record existed, information was obtained directly from the caregiver.

1.10 Limitations and Delimitations of the Study

1.10.1 Limitations of the Study

i. The study's scope was confined to caregivers of children between 6 and 23months old living in designated community units within Siaya County. Consequently, findings are primarily applicable to populations sharing similar demographics. Furthermore, while historical nutrition metrics (such as age and growth monitoring data) were extracted from the Mother and Child Health Handbook (MOH, 2016), the possibility of missing or incomplete entries in some booklets posed a limitation to the reliability of the data.

ii. The tools utilized in this study relied on respondents' ability to recollect specific information. This reliance on memory may potentially impact the accuracy and reliability of the study's findings.

1.10.2 Delimitations of the Study

i. To achieve population representativeness, the sampling strategy deliberately encompassed participants drawn from every Community Health Unit. Furthermore, historical child health data documented in clinical notebooks were acknowledged as supplementary documentation sources.

ii. The integration or combination of both quantitative and qualitative methodologies enables triangulation of data for comparative analysis.

CHAPTER TWO

LITERATURE REVIEW

2.1 Introduction

This chapter reviews literature on CF practices, caregivers' knowledge, and their contribution to Child nutrition indicators for the 6–23-month age cohort. It reveals the role of CF in child growth, as well as the challenges of suboptimal practices. Aspects such as caregivers' dietary knowledge were examined in relation to their impact on dietary diversity and meal frequency. Additionally, socio-economic and demographic variables, such as income level and educational background, are also examined alongside global malnutrition trends. The chapter identifies gaps in understanding the interplay between caregivers' knowledge, feeding practices, and child nutrition outcomes, setting the stage for this study's contribution to addressing these issues in diverse contexts.

2.2 Complementary Feeding

Complementary feeding involves the introduction of solid, semi-solid, or liquid foods at around six months of age, while continuing to breastfeed alongside (WHO, 2021). Current guidelines strongly support sustained breastfeeding for a minimum of two years (Fewtrell et al., 2024b; WHO, 2021; WHO & UNICEF., 2003a). Experts recognize this period as a critical 'window of opportunity' for optimizing child development and growth (Dewey &Adu-Afarwuah, 2008; Lutter et al., 2008), further preventing all forms of malnutrition including stunting, wasting, underweight and obesity (De Onis, 2006; Ong & Loos, 2006; Pearce et al., 2013; Pearce & Langley-Evans, 2013; Thompson, 2012).

According to Fewtrellet al. (2017), the complementary feeding phase introduces nutritional risks, as highlighted by Fewtrell et al. (2017), where imbalances in diet quality may trigger deficiencies or excesses (Fewtrell et al., 2017). Insufficient nutrient intake during the complementary feeding phase, characterized by inadequate dietary

quantity and quality, continues to compromise the health of young children worldwide(Golley et al., 2012; Mnyani & McIntyre, 2013; Spyreli et al., 2022; C. G. Victora et al., 2021). Complementary feeding practices among children aged 6 to 23 months in Sub-Saharan Africa are of considerable significance, as inappropriate feeding behaviors have been linked to an increased susceptibility to undernutrition, micronutrient deficiencies, various morbidities, mortalities, and nutrition-related non-communicable diseases (Afshin et al., 2019; Ogbo et al., 2017; Stanaway et al., 2018). These inappropriate feeding practices are estimated to account for more than two-thirds of child and infant mortalities in Sub-Saharan Africa (Black et al., 2013b; Masuke et al., 2021).

Despite having been exclusively breastfed during the first six months, children aged 6 to 23 months face a significantly increased risk of stunting if they do not receive adequate dietary diversity, appropriate meal frequency, or fail to meet the minimum acceptable diet (MAD) (Solomon et al., 2017). According to Masuke et al. (2021), inappropriate CF practices have been closely linked to higher rates of stunting, wasting, and underweight among young children. These outcomes underscore the crucial importance of prioritizing optimal feeding practices in public health initiatives aimed at promoting healthy child growth and development.

The adequacy of complementary feeding during this critical period is primarily influenced by three core indicators: meal frequency, dietary diversity, and overall diet acceptability. Despite this, caregivers often introduce children to household diets that lack nutritional adequacy, consisting mostly of cereals and energy-dense staples with limited variety and micronutrient content (Kambale et al., 2021; UNICEF, 2012). Diets lacking in variety do not adequately support the developmental requirements of young children, emphasizing the importance of educating caregivers and promoting behavior change interventions to improve feeding practices.

Properly implemented CF practices allow for the assessment of both short-term and long-term impacts on a child's nutritional well-being. According to Amunga et al. (2022), initiating poor CF practices early in a child's life may significantly increase the risk of undernutrition among children aged 6 to 23 months.

Globally and nationally, there is substantial evidence indicating that improper complementary feeding practices pose a significant public health challenge, despite recommendations to commence at the age of 6 months. The inappropriate introduction of CF has been linked to childhood illnesses and suboptimal development, contributing to a staggering 45% of reported child mortalities (Black et al., 2013b; Inoue & Binns, 2014).

Moreover, studies have underscored the critical role of optimal breastfeeding and adequate complementary feeding in reducing mortality rates among children under five years. Research by Mohammed et al. (2018)suggests that implementing optimal breastfeeding practices could reduce mortality rates in this age group by up to 13%, with proper and adequate complementary feeding contributing an additional 6% reduction. (Bhutta et al., 2013; Black et al., 2013b; Mohammed et al., 2018).

The period of initiating complementary feeding is key to fostering a child's physical, mental, and emotional development. Spanning the period from pregnancy until their second birthday (Masuke et al., 2021; Matanda et al., 2016). Preventing malnutrition necessitates optimal complementary feeding (CF) practices. Growth faltering often becomes evident between 6 and 12 months of age, frequently linked to the introduction of complementary foods with inadequate nutrient density into the infant's diet (Dewey & Brown, 2003; Lutter et al., 2011). Consumption of contaminated food significantly heightens the risk of recurrent diarrheal illnesses, contributing to early onset stunting in

children, a condition that often becomes irreversible beyond the age of two(Kirk et al., 2017).

2.3 Caregiver's Knowledge of Complementary Feeding

Caregiver knowledge regarding complementary feeding (CF) and practices significantly impacts infant nutritional intake and subsequent health outcomes. Those equipped with adequate knowledge of CF are more likely to offer children aged 6-23 months diverse, nutritionally appropriate diets (Arikpo et al., 2018). Conversely, suboptimal CF practices constitute major determinants of child malnutrition. Limited awareness of evidence-based feeding techniques and responsive caregiving strategies during this critical period is common, highlighting the need for community-based healthcare support to build practical skills (De Onis, 2006; WHO, 2002). Research confirms that caregivers with limited knowledge of complementary feeding often serve poorly diversified meals at suboptimal frequencies, directly impacting child nutrition (Abeshu et al., 2016; Okaforgu et al., 2017; Shi et al., 2023; Yun et al., 2016). In addition, introducing complementary foods at inappropriate times is often associated with limited caregiver knowledge or challenges in applying it effectively (Fazal et al., 2022).

(Britto (2017) emphasizes that quality childcare hinges on caregivers' comprehension of essential health and nutrition protocols. While nutritional knowledge originates from diverse sources (Saito et al., 1997), translating this knowledge into CF practices is essential for positive child outcomes. Failure to implement sound nutritional guidance contributes to poor outcomes, including stunting, underweight, and wasting. However, research indicates variability in the association between nutritional knowledge, feeding practices, and adverse outcomes (Bukachi et al., 2022). This highlights the importance of healthcare providers providing accurate, culturally relevant nutrition information.

Successful CF implementation requires disseminating precise knowledge, skills, and information throughout communities. Evidence confirms that inappropriate feeding practices and insufficient practical food knowledge pose greater risks of malnutrition than food scarcity alone (World Health Organization & UNICEF, 2003a). Consequently, targeted nutrition education empowers caregivers to adopt optimal feeding practices, directly improving the nutritional status of children aged 6-23 months (Arikpo et al., 2018)

2.4 Nutrition Status in Children 6-23 Months

Adequate nutrition plays a vital role in ensuring healthy child development, especially during the crucial complementary feeding period between six and twenty-three months of age. Although the importance of complementary feeding for child growth is well recognized, ongoing challenges-mainly related to the adequacy and nutritional value of the foods provided-continue to result in suboptimal nutritional outcomes (Choudhury et al., 2019; Miller, Neupane, Joshi, Lohani, et al., 2020).

Globally, the timely and appropriate implementation of CF practices continues to be a significant concern, particularly in low- and middle-income countries (LMICs), and plays a substantial role in relation to the stunting and wasting prevalences observed in children under five years (Kumari et al., 2023). Despite efforts to reduce stunting, progress remains gradual, emphasizing the necessity for targeted interventions (Osendarp et al., 2021; C. G. Victora et al., 2021). Current estimates indicate that globally, 148.1 million children under five years suffer from chronic malnutrition, including stunting, and 45.4 million experience wasting. The majority of such cases are found in low- and middle-income nations (UNICEF/WHO/World Bank group, 2023). These statistics highlight the importance of improving CF knowledge and practices among caregivers of

children aged 6-23 months, particularly in low- and middle-income countries, to improve the nutritional outcomes of young children worldwide.

In East African countries, including Kenya, challenges in child nutrition are partly driven by the continued prevalence of inappropriate CF among infants aged 6 to 23 months. (Kimiywe&Chege, 2015; Mutuku et al., 2020). Nonetheless, the relationship between caregivers' knowledge and their complementary feeding practices, and how these jointly influence a child's nutritional status, has not been extensively examined.

Kenya's demographic Health survey data indicate a decreasing prevalence of stunting, falling from 26% in 2014 to 18% in 2022 (KDHS, 2014; KDHS, 2023). However, achieving global nutrition targets, notably a 40% reduction in stunting by 2025, remains challenging. Inconsistent findings regarding the link between complementary feeding practices and child nutritional status underscore the complexity of this relationship (Verger et al., 2021).

During CF, caregivers often face substantial barriers to implementing recommended CF practices. Adherence to global guidelines on the timing and methods of introducing solid foods is frequently compromised by factors such as caregiver age, socioeconomic status, cultural traditions, ethnicity, and limited access to health information and resources (Kimani-Murage et al., 2011; World Health Organization & UNICEF, 2003a). Research in Tanzania, a low-income country similar to Kenya, found that poor CF practices-such as early introduction of solids, low meal frequency, and limited dietary diversity-are linked to higher risks of stunting, wasting, and underweight in children (Masuke et al., 2021). These findings highlight the critical need to improve caregiver knowledge and practices regarding CF for children aged 6–23 months, especially in LMIC, to enhance child nutrition outcomes globally.

Studies conducted in Siaya County highlight the significant influence of both the timing and appropriateness of complementary feeding on a child's nutritional outcomes. Variables, including demographic characteristics, economic conditions, cultural beliefs, and the premature introduction of complementary foods, affect caregivers' adherence tolobal feeding recommendations, which in turn influence growth outcomes in children (Bloss et al., 2004).

2.5 Predictors of Nutrition

Between the ages of 6 and 23 months, various factors, including dietary choices, demographic and socioeconomic situations, healthcare access, maternal education, and cultural norms, all impact a child's nutritional status. Dietary practices, such as timing of complementary feeding, meal frequency, and dietary diversity, are important predictors of nutrition. The timing of complementary food introduction, whether early or delayed, as well as poor dietary diversity and meal frequency, have been strongly connected to an increased risk of stunting, underweight, and wasting in children (Kimiywe&Chege, 2015; Masuke et al., 2021).

A child's nutritional status is strongly influenced by socioeconomic factors, including the level of household income and the mother's educational attainment. Families with lower socio-economic status often face challenges in accessing diverse and nutritious foods, leading to suboptimal feeding practices and a Greater propensity for malnutrition (Kimani-Murage et al., 2011; Mutuku et al., 2020). Additionally, healthcare access and utilization, including growth monitoring and nutrition education, are essential for improving feeding practices and reducing malnutrition risks (Bloss et al., 2004; Osendarp et al., 2021).

2.6 Complementary Feeding Practices

The first two years of a child's life are a crucial window for growth and development; appropriate CF practices at this time shape their future. When children don't receive the right foods in sufficient amounts, it can hinder their physical growth and impact their ability to learn and thrive. Good feeding practices during these early years make all the difference. (Jiang et al., 2022) . The concept of dietary diversity, as highlighted by the WHO and UNICEF, emphasizes the importance of ensuring that children consume a variety of food groups to prevent nutrient deficiencies, particularly those related to micronutrients (UNICEF, 2021; Verger et al., 2021; WHO,2007).

Research reveals persistent gaps in achieving optimal CF practices in Kenya (KDHS, 2022; Popkin et al., 2020). For instance, the KDHS 2022 reports that only 37% of children aged 6-23 months achieve MDD, indicating that a significant portion of children may not be receiving the necessary variety of foods for optimal nutrition. Similarly, the percentages for minimum food consumption frequency (71%) and a minimum acceptable diet (31%) suggest areas where improvements are needed KNBS, 2022).

Studies involving Kenyan infants aged 6 to 23 months support existing nutrition recommendations, indicating that breastfed children should receive a minimum of two meals per day between 6 and 8 months, with this increasing to at least three meals daily from 9 to 24 months of age (Popkin et al., 2020). Furthermore, achieving minimum dietary diversity necessitates the inclusion of at least five distinct food groups per meal (Verger et al., 2021; WHO, 2021).

Complex factors contribute to poor diets among children (Tatone-Tokuda et al., 2009). Economic considerations, including food prices, significantly influence dietary patterns. While nutritional awareness and cultural behaviors are essential, policies affecting food

prices-such as trade regulations, agricultural research, taxation, or subsidies-play a critical role in shaping dietary choices (Choudhury et al., 2019).Notably, nutritional diversity tends to be lower in poorer nations compared to wealthier ones, highlighting disparities in access to a variety of nutritious foods (Afshin et al., 2019).

The impact of suboptimal diets on global health is not to be understated. Research indicates that poor diets contribute to more deaths globally than any other risk factor(Afshin et al., 2019). Therefore, addressing factors influencing dietary diversity and CF practices is crucial to improving child nutrition outcomes and reducing the associated health risks (Masuke et al., 2021). The investigation of available literature during this study revealed a lack of information on caregivers' knowledge of complementary feeding.

2.7 Socio-Economic and Demographic Characteristics of Caregivers of Children Aged 6–23 Months

Evidence repeatedly shows that both socioeconomic and demographic characteristics influence child nutrition outcomes. A study in the Democratic Republic of Congo revealed a critical disconnect: despite 85% maternal attendance at postnatal consultations, adherence to MDD standards remained low (Kambale et al., 2021). This disparity strongly correlates with pervasive household poverty – approximately 80% of surveyed households occupied low socioeconomic brackets. These findings underscore socioeconomic status as a primary determinant of feeding practices, as financially secure households possess greater capacity to achieve food security and meet children's minimum dietary requirements (Aguayo, 2017; Ruel & Alderman, 2013; Stanaway et al., 2018; C. Victora et al., 2003).

Characteristics such as the caregiver's age, educational attainment, and the child's gender can significantly influence CF behaviors and the child's nutritional status. (Demmelash et al., 2020). Caregivers with higher levels of education are generally better equipped to comprehend and apply appropriate feeding practices, such as ensuring dietary diversity and adequate meal frequency, which are essential for promoting healthy child growth and development. Additionally, caregiver age has been identified as a factor influencing feeding practices, with younger caregivers often lacking the experience or knowledge to adhere to optimal feeding practices (Demmelash et al., 2020).

Recent studies have emphasized that child nutrition in low- and middle-income countries is significantly influenced by maternal education and household income levels. Targeted interventions like cash transfers and nutrition-focused social protection can address these socio-economic gaps, improve complementary feeding practices, and reduce malnutrition (UNICEF/WHO/World Bank group, 2023)

2.8 Critical Window of Vulnerability

Good early childhood nutrition is essential for supporting healthy growth, overall well-being, and a child's long-term development potential. The WHO strongly recommends exclusive breastfeeding for the first six months of life, followed by the introduction of nutritionally adequate and safe complementary foods while breastfeeding continues for up to two years or beyond (WHO, 2003). This provides the perfect nourishment for a baby's developing body and brain. After six months, children need more than just milk; they need appropriate complementary food, introduced at the right time and in the right way. This transition is vital, ensuring that children receive all the necessary nutrients to thrive, explore, and grow into healthy, happy individuals (World Health Organization & UNICEF,2003b).

Implementing high-quality complementary feeding promptly is critical for enhancing infant health and lowering morbidity. Research indicates nearly 30% of under-five mortality could be prevented through optimal CF practices (UNICEF,2021; Krebs & Hambidge, 2007). Malnutrition underlies approximately half of childhood illnesses and mortalities among children under five years globally (Black et al., 2013b), with the first two years representing a developmentally vulnerable period that demands nutritional support (Krebs & Hambidge, 2007).

Undernutrition persists as a major global health challenge. Notably, 90% of stunted children worldwide reside in just 36 developing nations. The profound consequences of early undernutrition extend across sectors, impacting societal development and future generations (Medhin et al., 2010). Therefore, appropriate CF can reduce both short and long-term health risks. Landon et al. (2006) highlight that combining behavior change strategies with nutrition interventions, while considering socio-cultural factors, provides lasting ways to enhance nutrition for children aged 6-23 months.

2.9 Government Policies and Emphasis

Kenya's progressive policy development has shown a strong political commitment to child health and nutrition over the last 25 years. However, the national and worldwide focus has primarily been on nursing, with CF practices receiving relatively little attention. The WHO/UNICEF Infant and Young Child Feeding (IYCF) strategy, launched in 2002, emphasizes the crucial role of proper feeding practices in ensuring the survival and development of infants. (WHO and UNICEF, 2003). Although Kenya has implemented both the IYCF and MIYCN regulations and guidelines, there is still a lack of localized data on the timely commencement of CF, minimum dietary diversity (MDD), minimum acceptable diet (MAD), milk feeding frequency, and meal frequency.

This research aims to address this gap by examining the primary determinants of complementary feeding practices in the Kenyan context.

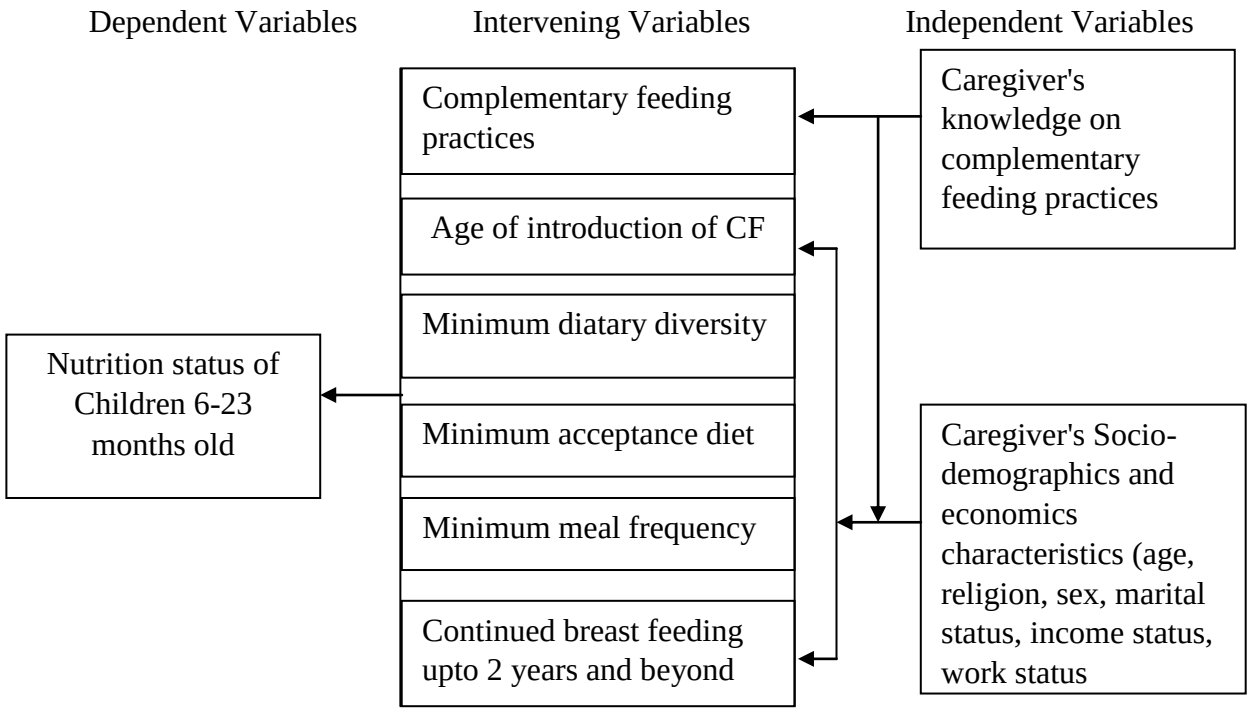
2.10 Conceptual Framework

We adapt Davison and Birch's (2001) seminal model to conceptualize the linkages between caregiver dietary knowledge, complementary feeding (CF) practices, and the nutritional status of children aged 6–23 months. The conceptual framework was modified to incorporate context-specific elements relevant to Siaya County, including factors such as seasonal agricultural labor and irregular income from casual work, which affect household food availability and were not addressed in the original model. In this adapted version, caregiver knowledge is presented as a central factor influencing appropriate complementary feeding (CF) practices, which are essential for enhancing child nutrition and overall health. On the other hand, inadequate knowledge or unsuitable feeding practices are associated with poor nutritional outcomes, heightening the risk of deficiencies and adverse health effects.

2.11 Conceptual Framework

Figure 1

Conceptual Framework on Dietary Knowledge, Complementary feeding practices, and Nutrition Status



Source: Modified from (Davison & Birch, 2001)

2.12 Summary of Gaps in Knowledge

Existing studies have seldom examined the combined effect of caregiver knowledge and complementary feeding practices on the nutritional status of children aged 6 to 23 months, particularly across varied cultural and socioeconomic settings. While Bijandi and Nabavi (2012) identify CF behaviors as stemming from socioenvironmental, experiential, and psychological factors, including knowledge, outcome expectations, and self-efficacy, the interplay between these factors remains understudied. This research, therefore, examines the causal relationships between dietary knowledge, CF practices, and child nutrition outcomes, specifically in Siaya County, Kenya.

CHAPTER THREE

RESEARCH METHODOLOGY

3.1 Introduction

This chapter presents the research methodology, describing the mixed-methods approach employed, along with details on the target population, data collection instruments, sampling methods, and data analysis techniques.

3.2 Study Design

The study employed a mixed-methods approach, specifically an explanatory sequential design (Creswell & Clark, 2017), which integrates both quantitative and qualitative methods. Conducted as a descriptive cross-sectional analysis in Siaya, this design was suitable for capturing diverse data quickly, offering a snapshot of nutritional outcomes related to Dietary knowledge and CF practices. (Binamungu et al., 2023).Both quantitative and qualitative data were collected. The study focused on caregiver–child pairs involving children aged 6 to 23 months residing in Siaya County as the target population.

3.3 Location of the Study

This research was undertaken in Siaya County, a western Kenyan region bordering Lake Victoria. Administratively, the county comprises six sub-counties: AlegoUsonga, Bondo, Rarieda, Gem, Ugenya, and Ugunja (Kenya National Bureau of Statistics [KNBS], 2019). It is further subdivided into thirty (30) wards. The study was conducted in two Community Health Units (CHUs)-Hono and Bar Agulu-located within AlegoUsonga Sub-County. According to the Kenya Community Health Strategy (Ministry of Health [MOH], 2020), each CHU typically serves a population of about 5,000 people or 1,000 households within a defined geographic area. These two CHUs are affiliated with Bar Agulu and Kaluo Dispensaries. Prior to the main data collection, a pre-test was

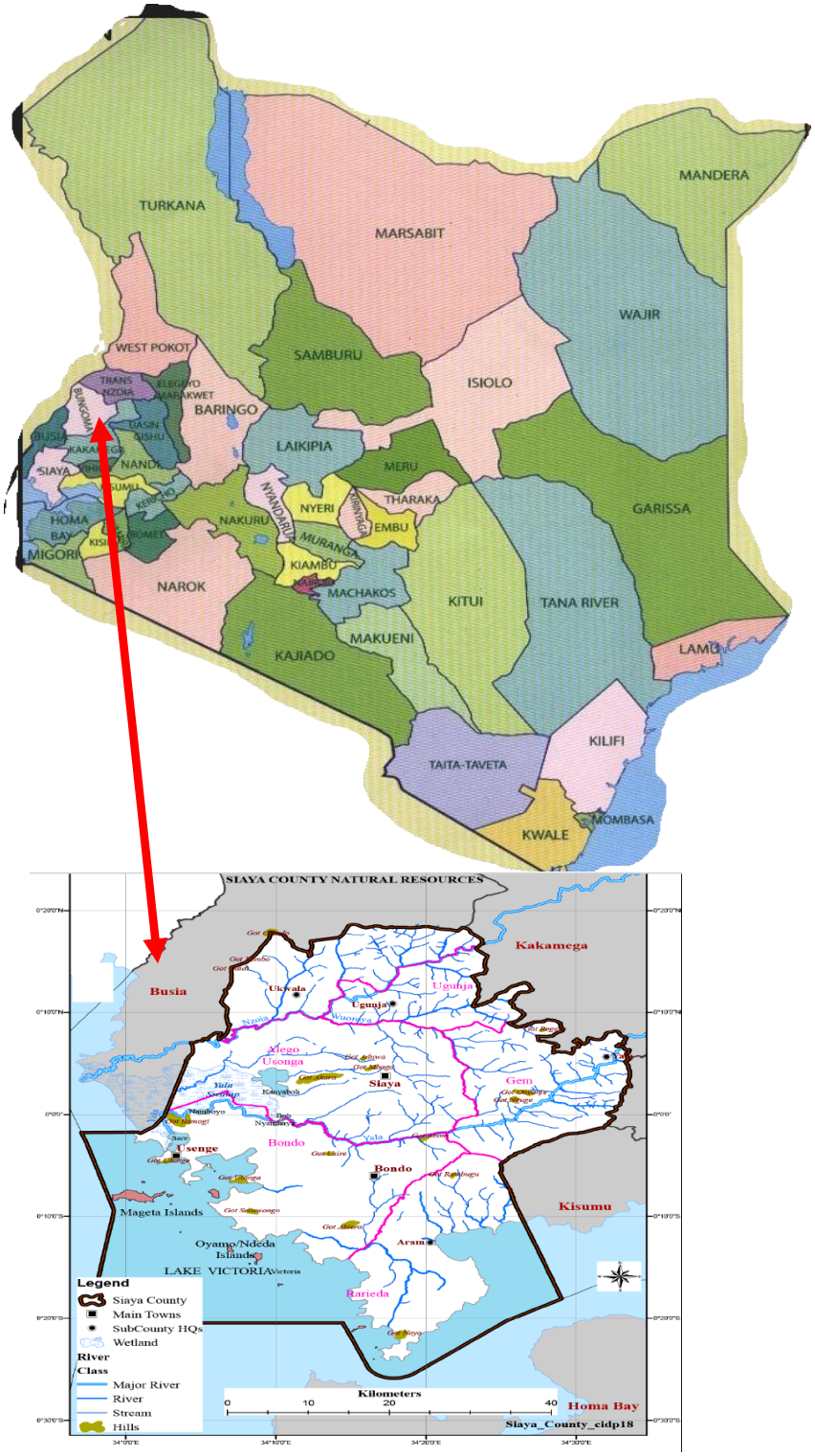
conducted in the Nyandiwa Community Unit, located in Township Ward,AlegoUsonga Sub-County. According to the Siaya County Department of Health Services (2023), Alego Usonga accounts for up to 42% of all malnutrition cases screened within the county.

Safety measures protected participants, researchers, and the community. Standard hygiene protocols (World Health Organization [WHO], 2007) were followed during anthropometric measurements, and emergency preparedness plans were in place. Community engagement was central, involving Community health workers and caregivers to foster trust and ensure the study benefited the population (Wallerstein et al.,2011). Findings were shared through culturally appropriate means, including immediate feedback or referrals. Special attention was given to child protection protocols (UNICEF, 2012), parental involvement, and nutritional education to create a lasting positive impact.

The research team accessed Alego Usonga Sub-County via established road networks. Coordination with local health facilities, community health workers (CHWs), and administrative leaders facilitated entry and recruitment (Camden et al., 2019). Challenges included poor road conditions during the rains and potential language barriers (most caregivers speak Dholuo). To address this, trained local interpreters fluent in English and Dholuo were engaged (Temple & Young, 2004). Cultural considerations, including traditional beliefs about feeding, were navigated by building trust through community engagement and collaborating with respected local figures, such as community Health Promoters (CHPs) from the same village (Marshall & Batten, 2003).

Figure 2

Map of the study site - Siaya County



3.4 Population of the Study

The study population consisted of caregiver–child pairs, with children aged 6 to 23 months, living in Hono A and Bar Agulu Community Health Units (CHUs) within Alego Sub-County, Siaya County. These CHUs cover 22 villages and include 2,773 documented households, serving a total population of approximately 20,700 people, and a target group of 435 children aged 6 to 23 months. (MOH Kenya, DHIS2 2023).

3.4.1 Inclusion Criteria

Primary caregivers of children aged 6–23 months providing written informed consent.

3.4.2 Exclusion Criteria

i. Children with developmental delays or disabilities
ii. Caregivers declining consent
iii. Children with complex medical conditions require specialized nutritional management.

3.5 Sampling Procedure and Sample Size

3.5.1 Sample Size Determination

The sample size was determined using the formula of Fisher et al. (1998). This is ideal for this study as it accurately estimates proportions in health surveys, measures multiple nutrition outcomes (knowledge, practices, status), handles both categorical and continuous variables, aligns with WHO standards, and ensures feasibility in resource-limited settings. The sample size was generated as follows:

Where: -

n= Desired sample size

Z= standard normal deviate (1.96)

P= Proportion of target population estimated to have particular characteristics (primary variable in the study- greatest public health impact in this case, stunting at 19.2%)

Q = those populations without features being measured (1 – 0.192 = 0.808)

d = is the degree of accuracy (set as = 0.05)

the formular $(n = \frac{Z^2PQ}{d^2} = \frac{1.962*0.808*0.192}{(0.05)^2} = 238$

$n = \frac{(1.96)^2 (0.192) (0.808)}{(0.05)^2} = \frac{3.8416 \times 0.155136}{0.0025} = 238$

minimum sample number c = 238

10% non-respondents (18.5 % of 238) = 44

Total = 262 respondents

To account for potential non-response, an additional 18.8% (44 participants) were included, bringing the final sample size to 282 respondents Emon, 2024). (Study-specific risk factors, such as sensitive topics, hard-to-reach populations, or survey methodology used).

3.5.3 Focus Group Discussion Methodology

Inclusion Criteria

We purposively selected primary caregivers of children aged 6-23 months to capture firsthand feeding experiences. Participants represented diverse socioeconomic backgrounds, educational levels, and cultural groups across Siaya County to ensure comprehensive perspectives (Kitzinger, 1995).

Focus Group Composition and Procedures

Each focus group discussion (FGD) was carefully composed of 8-12 participants, a group size recommended by established qualitative research methodology (Morgan,

1997; Stewart & Shamdasani, 2014). This optimal size served three key purposes: first, it allowed for sufficient diversity of perspectives to emerge during discussions; second, it ensured all participants could actively engage in the dialogue; and third, it maintained manageable group dynamics for productive conversation flow. Following international research ethics standards (Rivers & Lewis, 2014; WHO, 2011), each participant gave written/verbal informed consent after receiving a clear explanation of the study's purpose, procedures, and their rights. The consent process emphasized the voluntary nature of participation and ensured confidentiality, while being carefully tailored to respect the cultural norms of Siaya County. This careful approach to group composition and the implementation of ethical safeguards helped ensure both the richness of the qualitative data collected and the protection of participant rights throughout the research process. Thematic saturation was achieved by the third FGD, as no new substantive information emerged in subsequent discussions (Guest et al., 2006). This confirmed an adequate sample size for qualitative exploration.

3.6 Sampling Technique

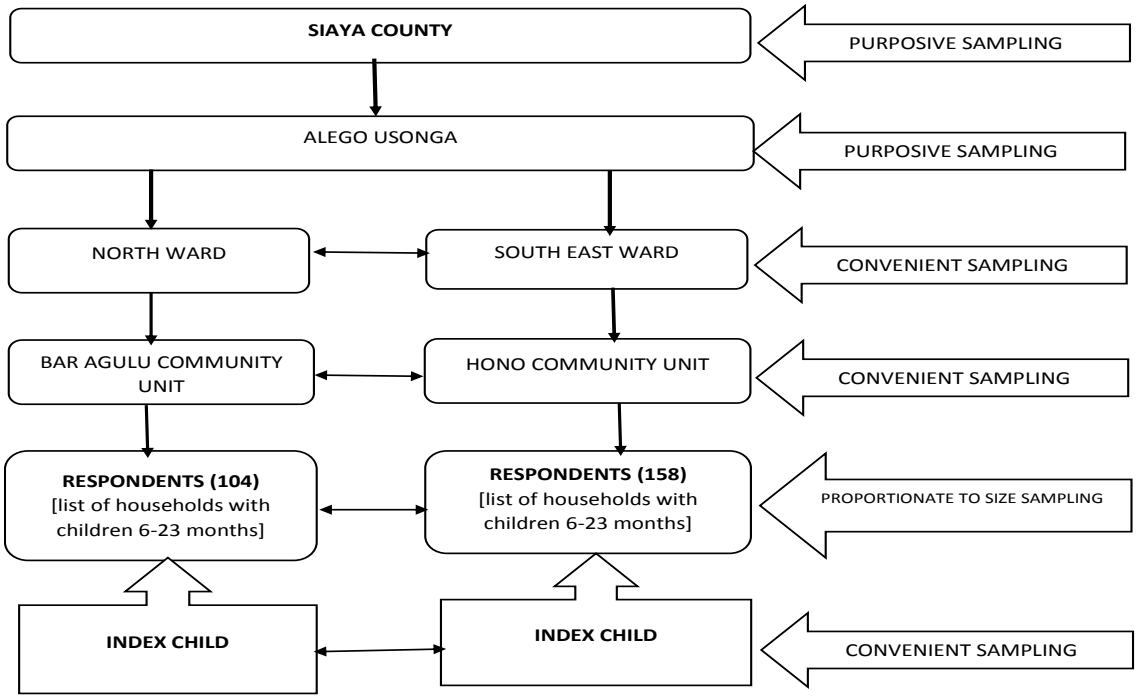
The study employed a multistage sampling design (Figure 3.3 below). Purposive sampling was used in the first stage to select Siaya County and in the second stage to select Alego Usonga Sub-County based on their high malnutrition burden (Siaya County Department of Health Services, 2023). The third stage involved purposive sampling to select two wards (North and South East) within Alego Usonga. This geographical targeting approach aligns with methodologies used in similar community-based nutrition studies (Campbell et al., 2020).

Eligible households that had children between the ages of 6 and 23 months were subsequently selected through probability sampling. A structured random selection technique was employed, beginning with a randomly selected household from the

sampling frame of eligible households (Levy &Lemeshow, 2013). A random starting point was chosen from households with at least one child aged 6 to 23 months. From this starting point, the sample was expanded by selecting consecutive households. In cases where a household had multiple eligible children, the Kish Grid method was used, or caregivers were asked to list all eligible children, after which one child was randomly selected.

Figure 3

Sampling Schema For Cross-Sectional Survey



3.7 Instrumentation

3.7.1 Data Collection Tools

This study employed a mixed-methods approach using two key instruments: (1) a pre-tested semi-structured questionnaire that collected demographic and socioeconomic data, assessed complementary feeding practices (including initiation age for family foods and WHO indicators like MDD, MMF, and MAD scores), measured child anthropometrics, and evaluated caregivers' knowledge; and (2) a focus group discussion

guide that facilitated qualitative exploration of feeding practices with caregivers across two community health units in Alego Usonga Sub-county, combining quantitative precision with qualitative depth for comprehensive understanding of child nutrition practices.

3.7.2 Recruitment and Training of Research Assistants

The study was conducted by a team consisting of principal investigators and ten research assistants recruited from the local area, with additional support provided by community health workers affiliated with the two selected Community Health Units. All RAs were qualified college students with backgrounds in nutritional science and documented prior experience in field surveys. Crucially, assistants resided within the study catchment area and demonstrated native dialect proficiency to optimize caregiver engagement.

Under the supervision of the principal investigator, RAs completed a standardized two day training program. The first day covered interview techniques, probing methodologies, nutritional assessment protocols, data collection procedures, and field leadership principles. The second day focused on competency validation through structured role-playing scenarios and practical assessments. Training methodology strategically integrated didactic lectures with participatory simulation exercises.

3.7.3 Pre-Testing of Research Tools

To ensure the reliability and validity of the data collection instruments, a pre-test was conducted prior to the main survey. The primary objectives of the pre-test were to assess the consistency and clarity of the questionnaire, identify any necessary modifications, and estimate the time required for completion. Additionally, it served as an opportunity to evaluate the competency of research assistants in administering the questionnaire, performing anthropometric assessments, and precisely documenting the data. For the

pre-test, 10% (28 households) of households with children aged 6-23 months were randomly selected from the Nyandiwa community unit in the Township Ward. This site was selected because of its similar demographic and socio-economic characteristics to the sampled study areas. Data collection during this stage was closely monitored to identify any inconsistencies or challenges, ensuring that necessary adjustments were made before the actual survey commenced.

3.7.4 Validity of the Instrument

To ensure the validity of the data collection instruments, the study employed multiple verification strategies, including expert review (performed by a registered and licensed nutritionist) and pretesting. The structured questionnaire was designed using WHO-standardized indicators for CF practices (World Health Organization, 021) and was reviewed. Face validity was confirmed through pretesting with 28 caregiver-child pairs (10% of the sample size) in the Nyandiwa community unit, which revealed a clear understanding of the questions and an appropriate measurement of the constructs. Construct validity was further strengthened by aligning all questions with established theoretical frameworks in child nutrition, feeding practices, and dietary knowledge. Criterion validity was demonstrated through the instrument's ability to accurately capture all key WHO complementary feeding indicators (MDD, MMF, MAD). The rigorous validation process ensured the tools measured what they were intended to measure and were culturally appropriate for the study population.

3.7.5 Reliability of the Instrument

To ensure the reliability of the data collection instrument, this study implemented two robust validation approaches. First, the test-retest method was employed by administering the identical questionnaire to a subgroup of participants (n = 5) on two separate occasions with a one-week interval, allowing for the evaluation of the

instrument's temporal stability. Second, internal consistency was assessed using Cronbach's alpha coefficient calculation based on pretest data (n = 28). These methods systematically evaluated the instrument's capacity to consistently measure three critical domains: (1) caregivers' dietary knowledge, (2) complementary feeding practices (including WHO indicators MDD, MMF, and MAD), and (3) nutritional status indicators. Before the study period, standardized training was provided to all data collectors, and periodic reassessments were conducted to maintain instrument reliability, following established methodological guidelines (Christmann & Van Aelst, 2006; Kennedy, 2022).

The reliability analysis demonstrated excellent psychometric properties for the research instrument. Test-retest analysis revealed strong temporal stability with a Pearson's correlation coefficient exceeding 0.8 ($p < 0.01$), indicating highly consistent responses across administrations. Furthermore, the calculated Cronbach's alpha coefficient of 0.78 surpassed the recommended threshold of 0.7, confirming strong internal consistency among questionnaire items measuring the key constructs. These results collectively verified that the instrument reliably measured all target variables, including dietary knowledge, feeding practices, and nutritional outcomes, making it appropriate for use in the main study.

3.8 Data Collection Procedures

This study employed digital data collection using the licensed KoBo Toolbox platform, a validated open-source tool widely used in field research (UNICEF, 2020). Research assistants were trained to administer structured questionnaires via Android tablets with the KoBo Collect app, which enabled real-time data capture of caregiver interviews on complementary feeding knowledge, observational checklists of feeding practices, and anthropometric measurements (MUAC, weight/length).

The platform's features ensured data quality through mandatory fields, skip patterns, and range checks, while offline functionality addressed connectivity challenges in rural settings. All data were automatically encrypted and synced to a secure cloud server, with daily backups maintained per WHO guidelines for electronic data management (WHO, 2021). This approach enhanced accuracy by eliminating manual entry errors and allowed the research team to monitor data completeness through KoBo's dashboard analytics immediately. The data was then downloaded in an Excel format for further management and analysis.

3.8.1 Demographic and Socio-Economic Data

A semi-structured questionnaire (with combined closed-ended and open-ended questions) was administered to collect information on the demographic and socio-economic background of both the caregiver and the child. This included details such as the child's age and sex, household composition, caregiver's marital status, income, and level of education. To determine the child's age, data were sourced from the Mother-Child Health Booklet or clinical records (Kenya MOH, 2016). In instances where these documents were unavailable, a local calendar of significant events was used to estimate age. (Kenya-MOH, 216).

3.8.2 Nutritional Status

Anthropometric Assessment: Weight Measurement

Weight measurements were employed using validated SECA 334 mother-infant digital scales, which are compliant with WHO/UNICEF anthropometric standards. Following WHO protocols, weight was recorded to the nearest 0.1 kg. All subjects wore minimal clothing and no footwear during duplicate assessments conducted by a single examiner to minimize inter-observer variability. Scales were recalibrated to zero before each

measurement to mitigate instrumental error. For non-ambulatory infants, researchers first tared the scale with the mother, then recorded the combined weight as she held the minimally clothed child.

Length Measurement

Children's length was measured in centimeters using length mats or measuring boards, with an accuracy of 0.1 cm. Two research assistants independently took each measurement, and the average was recorded in the questionnaire to minimize potential measurement errors.

Mid Upper Arm Circumference

Mid-upper arm circumference (MUAC) measurements were precisely obtained using WHO-standardized MUAC tapes, recorded to the nearest 0.1 cm, with two trained research assistants independently taking duplicate measurements of both circumference (in cm) and Z-score values while the children wore light clothing.

To ensure measurement consistency, the same examiner performed repeated assessments, with the mean value of duplicate measurements being documented. Any measurements differing by more than 0.3 cm were immediately re-measured. This rigorous protocol, following the WHO's anthropometric guidelines (WHO, 2006), incorporated multiple quality assurance measures to ensure reliable data on nutritional status.

3.8.3 Assessment of Complementary Feeding Practices

Data on individual dietary intake and diversity were collected using a questionnaire that listed eight food groups. The assessed indicators included Minimum Dietary Diversity (MDD), Minimum Acceptable Diet (MAD), Minimum Meal Frequency (MMF),

continued breastfeeding, and the age at which the child transitioned to complementary feeding.

3.8.4 Focus Group Discussion

The study also conducted focus group discussions (FGDs) involving 8 to 12 caregivers of children aged 6-23 months per session, following qualitative research standards (Silverman, 2000). Two trained Community Health Assistants facilitated each discussion using a structured, WHO-aligned guide (World Health Organization, 2021) to explore CF practices, including breastfeeding duration, MDD, MMF, and contextual influences such as economic and religious factors (Thompson & Bentley, 2013). Discussions continued until thematic saturation was achieved at the third FGD session.

Each session began with a 10-minute introduction, consent process, and objective explanation. The 45-minute main interview covered feeding initiation timing, adherence to WHO indicators (MDD, MMF, MAD), and traditional influences on feeding practices. Sessions concluded with participant acknowledgments, reminders of confidentiality, and assurances of secure data handling. Audio recordings and field notes captured verbal and non-verbal responses for comprehensive analysis.

To ensure reliability, facilitators were trained, followed a consistent interview guide, and maintained anonymized transcripts. This structured yet flexible approach balanced methodological rigor with emergent theme exploration, providing robust insights into caregivers' knowledge and practices related to feeding.

3.8.5 Measuring Dietary Knowledge Level on Complementary Feeding and Practices

Data on individual knowledge levels were gathered using a semi-structured questionnaire that covered eight food groups, focusing on dietary diversity, minimum acceptable diet,

and the age at which CF begins. The study evaluated caregivers' knowledge of complementary feeding through four core domains aligned with WHO guidelines (World Health Organization, 2021): (1) understanding of appropriate timing for introducing solid, semi-solid, and soft foods (6-8 months), (2) knowledge of MDD requirements, (3) awareness of MMF standards, and (4) familiarity with MAD criteria. The assessment incorporated contextual factors known to influence feeding practices, including religious dietary restrictions (Kassie & Workie, 2020) and socioeconomic determinants of food accessibility (C. G. Victora et al., 2021).

The measurement of caregivers' knowledge on complementary feeding practices was categorized into four levels based on the percentage of adherence or agreement: Very High, High, Moderate, and Low. Practices with adherence or agreement rates of greater than 85% were classified as Very High, indicating strong awareness and implementation. Practices with 70–85% adherence or agreement were categorized as High, reflecting good but not optimal knowledge. Practices with 50–69% adherence or agreement were classified as Moderate, suggesting room for improvement. Finally, practices with <50% adherence or agreement were categorized as Low, indicating significant gaps in knowledge or implementation. This categorization framework, adapted from the Kenya National Bureau of Statistics (KNBS, 2022), provides a structured approach to assessing and interpreting caregivers' knowledge and practices.

3.9 Data Quality and Control

3.9.1 Data Quality

Data quality was ensured through multiple methods, including pre-testing of questionnaires to verify data consistency, calibration of equipment before use, and conducting duplicate anthropometric measurements to enhance accuracy. Responses were counterchecked to ensure alignment with expected data quality standards. Research

staff and assistants received comprehensive training on data collection protocols, equipment handling, and accurate response recording to minimize errors. A pre-test study was conducted in households chosen from the Nyandiwa Community Health Unit, which is affiliated with Mulaha Health Centre in Alego Usonga, a comparable area to the study sites. The principal investigator supervised all data collectors, ensuring that questions were administered in both the English and Dholuo languages, which were best understood by the interviewees, without altering the intended meaning. Digital weighing scales were used to reduce weight-related errors, and real-time field supervision by the principal investigator further strengthened data accuracy and procedural adherence.

3.9.2 Privacy and Confidentiality

Participant confidentiality was a priority, with all personal identifiers replaced by unique codes to ensure anonymity. Data was securely stored, with access restricted to authorized research personnel. Confidentiality was maintained throughout the data collection, analysis, and reporting process by ensuring that no personally identifiable information was disclosed. Digital data was secured through encryption and password protection, while physical documents were stored in locked cabinets.

3.9.3 Data Safeguards

The study ensured the protection and integrity of data throughout the collection process. All tablets used for digital data collection were secured with multiple safeguards, including password protection, to restrict device access to authorized field staff only. Collected data was transferred on a daily basis through secure VPN connections to encrypted cloud storage. Each data collector was assigned unique, password-protected accounts featuring role-based access controls to prevent unauthorized data exposure.

Quality assurance measures included rigorous pre-testing of all digital forms with built-in validation rules and skip patterns to minimize entry errors. Real-time monitoring through KoBo's analytics dashboard enabled immediate identification and resolution of data inconsistencies.

3.9.4 Data Monitoring and Safety Plan

Daily audits of questions and responses were conducted by the principal investigator (PI) to ensure accuracy before finalizing fieldwork at each community Health unit. Field research assistants were supervised to ensure compliance with ethical and methodological guidelines.

3.9.5 Data Entry and Cleaning

Following field data collection, all quantitative data were systematically entered into SPSS Statistics version 26 (IBM Corp., 2019), with a double-entry verification system employed to eliminate transcription errors and maintain data integrity.

The data cleaning protocol commenced with comprehensive initial screening procedures. Frequency distributions and descriptive statistics were generated across all variables to identify missing values, outliers, and improbable entries. For anthropometric measurements, specialized range checks were conducted against established WHO growth standards (WHO, 2006) to flag biologically implausible values. These initial quality checks formed the foundation for subsequent data processing.

Additional cleaning was performed on the anthropometric data using ENA for SMART software (version 2011), which standardized the calculation of z-scores for key nutritional indices, including height-for-age, weight-for-age, and weight-for-height. The software's built-in algorithms automatically identify and flag extreme values that exceed ±5 standard deviations from the mean. Each flagged case was systematically reviewed

through source document verification and, when necessary, consultation with field supervisors to determine appropriate resolution.For quality assurance, a standardized protocol guided the resolution process for all data anomalies. This involved: (1) re-examination of original data collection forms, consultation with field supervisors when clarification was needed, and final consensus decisions by the research team for ambiguous cases. The entire process followed established best practices for epidemiological data cleaning (Osborne, 2013). Upon completion of the cleaning process, the final dataset was archived

3.9.6 Data Storage, Archiving and Disposal

All collected data was securely stored in both digital and physical formats. Digital files were stored on password-protected servers with restricted access, while physical documents were archived in a secure facility. Data will be retained for a minimum of 5 years, in accordance with Kabarak University's ethical guidelines, after which it will be securely disposed of through de-identification and deletion.

3.9.7 Recruitment Process for Participants

Participants were recruited through community sensitization efforts, in collaboration with local health workers, community leaders, and caregivers. Households with children aged 6-23 months were identified through community health structures, and eligible participants were approached for voluntary participation. No coercion or undue influence was used during the recruitment process**.**

3.9.8 The Consenting/Assenting Process

Informed consent was obtained from caregivers (mothers or guardians) before participation. Consent forms were provided in the local language (Dholuo) and explained verbally for illiterate participants, with thumbprints used as an alternative to signatures.

Participants were informed that they could withdraw from the study at any point without facing any consequences.

3.9.9 No Payment for Participation

Participants were not provided with any monetary incentives for their participation. However, they were given nutrition education as part of the study's community benefit component. Participation was entirely voluntary, and all ethical guidelines were strictly adhered to in order to maintain fairness and transparency.

Table 1

The Summary Table on Data Analyses

Objectives	Intervening Variables /Indicators	Data Analysis
To establish socio-demographic and economic characteristics of caregivers of children aged 6-23 months old	Socio-demographic and economic characteristics To determine the age distribution and its impact on child care practices. To examine if there are gender-based differences in caregiving approaches or economic activities. Explore how education levels and their influence childcare practices and health knowledge. Marital Status and how it affects access to resources or social support. Occupation to understand economic activities and how they impact childcare.	Descriptive statistics (Simple counts/frequencies and proportions to summarize the distribution of socio-demographic and economic variables. Statistical package for Social Sciences (SPSS) Version 26 Regression Analysis: Assess the impact of socio-demographic and economic factors on child health outcomes or caregiving practices. Cluster Analysis: Identify distinct groups based on socio-economic characteristics for targeted interventions. Chi-square Test or T-tests: Compare categorical variables (e.g., education level and child Vitamin A Supplementation) Correlation Analysis: Determine relationships between variables (e.g., income and access to healthcare). Correlation analysis to understand relationships between income and other economic variables.
To assess the knowledge on complementary feeding of caregivers with children 6 to	1. Age of initiation of CF	Descriptive Statistics: Calculate means, medians, and standard deviations for continuous variables like meal frequency or age of introducing solid foods.

23 months		Correlation Analysis to assess relationships between variables (such as the relationship between age of introducing solid foods and dietary diversity.)
	2. Dietary Diversity	Dietary diversity score
	3. Meal Frequency,	Bivariate correlations
	4. Milk Feeding Frequency,	Multiple linear regressions
	5. Acceptable Diet,	Inductive thematic analysis (FGD data)
	6. Continued breastfeeding	- SPSS, Version 26
		Questionnaire Score to assess overall knowledge levels
		Comparative Analysis to Compare knowledge levels among different demographic groups (e.g., based on education, location) using t-tests .
	7. knowledge caregivers on complementary feeding Caregivers educational level and Information sources	Correlation Analysis to explore relationships between knowledge levels and feeding practices to understand the impact of knowledge on behaviors.
		Regression Analysis: Determine predictors of high or low knowledge levels, considering factors like education, socio-economic status, or sources of information.
	Socioeconomic Status	Descriptive Statistics to describe the data, such as mean, median, mode, and standard deviation Content Analysis: for qualitative information (e.g., open-ended responses categorized into themes)
		Comparative Analysis to compare feeding practices between different demographic groups using chi-square tests to understand differences based on socio-demographic characteristics.
To assess the nutrition status of children aged 6-23 months.	Nutritional status; weight, height and MUAC for Z	- ENA for Smart - Chi square

	score (Anthropometric Measurements: Height/Length-for-Age (stunting), Weight-for-Age (underweight), Weight-for-Height/Length (wasting).	- Use WHO cut-offs as a threshold
To determine the relationship between caregiver's knowledge, complementary feeding practices, and the nutritional status	Cross-tabulation and Chi-Square Analysis: for categorical data (e.g., caregiver education level and knowledge level), to test the associations and identify and significant relationships Comparative Analysis:	
	Compare the knowledge and practices of caregivers with those provided by the World Health Organization (WHO)	
To establish the relationship between knowledge of complementary feeding practices and nutritional status	Regression Analysis: to explore the relationships between various independent variables (e.g., caregiver education/knowledge level, income, etc.) and the dependent variable (Nutritional status)	
Determination of the predictors of Nutrition	The predictors of wasting, underweight, and stunting were identified using Chi-Square Tests, bivariate analysis, and potentially logistic regression. These methods helped determine the statistical significance of associations between predictors (e.g., meal frequency, sex of the child) and nutritional outcomes. The p-values (< 0.05) confirmed the significance of these predictors.	

3.10 Data Analysis

The raw data collected for the study were entered and analyzed using SPSS Version 26. Descriptive analysis was applied to the demographic data, including the child's age, caregiver's age, and household size. Categorical data such as sex, education level, marital status, and nutritional status were analyzed using proportions and frequencies. Continuous variables were summarized using measures of central tendency (mean, median, mode) and dispersion to understand variability.

Anthropometric data were analyzed using ENA for SMART software, referencing WHO 2006 growth standards. Key indicators assessed included MUAC Z-scores, weight-for-height, height-for-age, and weight-for-age, with nutritional status categorized as either normal or malnourished. Chi-square tests were used to evaluate statistical significance in these categories.

To explore the associations between demographic, socioeconomic, and complementary feeding (CF) practices, the study employed both univariate and multivariate logistic regression models. Dietary diversity scores were computed and analyzed in conjunction with qualitative data from focus group discussions (FGDs), which were interpreted through inductive thematic analysis.

Descriptive statistics further summarized socio-demographic characteristics such as caregiver age, sex, and education level. Composite CF knowledge and practice scores were expressed as percentages. Correlation analysis examined the relationships between child nutritional outcomes and factors such as caregiver occupation, education, and age.

The analysis adopted a mixed-methods approach to assess the relationship between caregiver CF knowledge, practices, and child nutritional status. Bivariate correlations examined relationships between continuous variables such as caregiver knowledge

scores and child anthropometric Z-scores. Chi-square tests and cross-tabulations were used to assess significant associations between demographic variables and CF practices, utilizing categorical variables.

Multivariate techniques were applied to control for confounding factors. Multiple linear regression models examined the combined effect of variables, including caregiver education, household income, and knowledge levels, on the nutritional status of children. T-tests assessed differences in CF knowledge across socio-economic and demographic groups.

Comparative analysis benchmarked observed CF practices against WHO recommendations to identify implementation gaps. Qualitative data from FGDs were thematically analyzed using a framework approach, with emerging themes triangulated with quantitative results. This comprehensive methodology integrated both parametric and non-parametric statistical techniques, alongside qualitative insights, providing a well-rounded and in-depth understanding of how caregiver knowledge and practices influence child nutritional outcomes.

3.11 Data Presentation

Quantitative Analysis

Quantitative data were analyzed using SPSS version 26 (IBM Corp., 2019). Results were presented in clearly formatted tables, following APA guidelines, which included descriptive statistics (means, frequencies, standard deviations), inferential test outputs (correlation coefficients, regression models, p-values), and measures of effect size. Each table was labeled concisely, with detailed footnotes explaining abbreviations and statistical notations to ensure reproducibility and clarity.

Qualitative Analysis

Focus Group Discussions (FGDs) were audio-recorded verbatim using participants' consent. An inductive thematic analysis was then conducted, identifying recurring themes and patterns based on the approach outlined by Braun & Anderson (006). This involved a systematic identification, analysis, and reporting of patterns, supported by direct quotes and linked to the research objectives and existing literature. This approach ensured a rigorous and transparent analysis of the FGDs, offering meaningful insights into the study's key focus areas.

3.12 Ethical Considerations

The study adhered to international ethical standards, including the Helsinki Declaration (2013)(“World Medical Association Declaration of Helsinki, 2013), and obtained necessary approvals from Kabarak University's Ethics Review Committee (KUREC), the National Commission for Science, Technology and Innovation (NACOSTI), Siaya County Health Management Team (CHMT), and local administration. The multi-tiered authorization process ensured compliance with institutional, national, and community-level regulations while facilitating smooth implementation.

3.13 Participant Safeguards

Written informed consent was obtained from all participants through signatures or thumbprints, with verbal explanations provided in local languages. For illiterate caregivers, an impartial witness verified the consent process. Participation remained voluntary, with guarantees that refusal wouldn't affect services. Confidentiality was maintained through the use of anonymization (using codes such as "CU-001") and the exclusion of personal identifiers from records.

3.14 Data Protection and Cultural Considerations

Stringent measures were implemented to secure both physical and digital data, including locked storage for paper forms and AES-256 encryption for electronic files, in accordance with KUREC's five-year retention policy. The study design respected cultural norms by employing gender-matched interviewers and adapting procedures to local contexts. Identified malnourished children received referrals to nutrition programs, while distressed participants were offered counseling support.

3.15 Ethical Principles Implementation

The research adhered to the principles of the Helsinki Declaration through autonomy-respecting consent processes, equitable participant selection, methodologically sound protocols, and potential community benefits derived from the findings. This comprehensive ethical framework strikes a balance between scientific rigor and participant welfare, setting a benchmark for nutrition research in resource-limited settings. All procedures prioritized non-maleficence while maximizing the study's contribution to improving child feeding practices. The ethical clearance was issued by the Kabarak University Ethics Review Committee (KUREC), a research permit was obtained from the National Council for Science and Technology (NACOSTI), permission was obtained from the National Administration (Chiefs), and the Siaya County Health Management Team (CHMT) was consulted.

CHAPTER FOUR

DATA ANALYSIS, PRESENTATION AND DISCUSSIONS

4.1 Introduction

This chapter presents findings on complementary feeding knowledge, practices, and nutritional status among children aged 6-23 months in Siaya County, Kenya. It first outlines respondent characteristics and socioeconomic contexts before analyzing key indicators, including dietary diversity, meal frequency, and minimum acceptable diet adherence. The chapter then evaluates caregivers' knowledge levels and children's nutritional status, testing three hypotheses about demographic influences on knowledge (H_{01}), knowledge-practice relationships (H_{02}), and knowledge-nutrition outcomes (H_{03}) using bivariate and multivariate techniques.

The analysis of 282 caregiver-baby pairs systematically addresses the study's objectives by examining associations between caregivers' knowledge, complementary feeding practices, and child nutritional status. Findings are interpreted in relation to the research questions, while controlling for confounding factors, to provide evidence-based insights into the predictors of malnutrition in this study population.

4.2 Demographic and Socio-Economic Characteristics of the Respondents

As shown in Table 4.2, the study revealed thatthe majority (92.55%) of caregivers were biological mothers, highlighting their central role in child-rearing. The caregiver population was predominantly young and married, with the largest age group being 14-24 years old (39.72%) and 78.01% being married. The estimated mean age was 30.6 years.

Economically, the caregivers were engaged in diverse but often vulnerable livelihoods. The largest occupational groups were those in waged labour (26.95%) and housewives (25.18%), followed closely by the unemployed (20.21%). In terms of education, the vast

majority were at least minimally educated, with secondary school being the most common level of attainment (42.91%). However, only a small fraction had progressed to vocational training (10.99%) or university (2.13%).

The household and socio-cultural context was largely homogeneous. In most households (68.09%), the biological father was present. Ethnically, the population was predominantly Luo (87.94%), and by religion, predominantly Protestant (73.76%)

Table 2

Demographic and Socio-Economic Profile of Caregivers

Characteristic	Category	Frequency	Percent (%)
Relationship to Child (n=282)	Biological Mother	261	92.55
	Biological Father	8	2.84
	Other (Grandparents, Relatives)	13	4.61
Marital Status(n=282)	Married	220	78.01
	Single	62	21.99
Age Distribution(n=282) *	14-24 years	112	39.72
	25-30 years	91	32.27
	31-70 years	79	28.01
Occupation(n=282)	Waged Labour	76	26.95
	Housewife	71	25.18
	Unemployed	57	20.21
	Petty Trade	53	18.79
	Agricultural Labour	25	8.87
Education Level(n=282)	Secondary School	121	42.91
	Primary School	119	42.2
	Vocational College	31	10.99
	University Degree	6	2.13
	No Formal Education	5	1.77
Father in Household(n=282)	Present	192	68.09
	Absent	90	31.91
Ethnicity(n=282)	Luo	248	87.94
	Luhya	26	9.22
	Other	8	2.84
Religion(n=282)	Protestant	208	73.76
	Catholic	58	20.57
	Traditional	9	3.19
	Muslim	3	1.06

Modal Age Group: 14-24 years Estimated Mean Age: 30.6 years

4.3 Socio-Demographic Characteristics of the Children 6- 23 Months Old

The table 4.5 below indicate that thechildren were nearly evenly distributed by sex, with 48.58% being male and 51.42% female. In terms of age, the majority (54.96%) were between 13–23 months, while 45.04% were aged 6–12 months. Age verification was primarily done using Mother and Child Health (MCH) booklets (86.17%), with a smaller proportion relying on caregiver recall (13.48%) and very few using clinical notebooks (0.35%).

Household composition showed that most families had one child (59.93%), followed by those with two children (26.60%), while larger households were less common. When considering birth order, 30.85% of the children were firstborns, 25.53% were second-born, and 21.28% were third-born. Regarding birth weight, the majority of children (92.91%) were born weighing more than 2.5 kg, whereas 7.09% had a birth weight of less than 2.5 kg.

Table 3

Socio-Demographic Characteristics of Children 6-23 Months (n=282)

Characteristic	Category	Frequency	Percent (%)
Sex	Male	137	48.58
	Female	145	51.42
Age Group	6-12 months	127	45.04
	13-23 months	155	54.96
Age Verification	MCH Booklet	243	86.17
	Caregiver recall	38	13.48
Household Children	1 child	169	59.93
	2 children	75	26.6
	≥3 children	38	13.48
Birth Order	Firstborn	87	30.85
	Second	72	25.53
	≥Third	123	43.62
Birth Weight	Low (<2.5kg)	20	7.09
	Normal (≥2.5kg)	262	92.91

4.4 Study Population

4.4.1 Household Socioeconomic Characteristics, Child Health and Feeding Practices

The study assessed 282 children to evaluate health status and feeding practices, alongside household socioeconomic characteristics. Most children (89.36%) were not on medication, indicating generally good health, while 10.64% were on treatment. Continued breastfeeding practices were largely positive, with 77.30% of children breastfed the previous day.

Household socioeconomic data, drawn from 192 husbands, revealed that most household heads had at least a basic education. The majority had completed primary (41.67%) or secondary education (34.90%), with fewer attaining vocational (15.63%) or university-level education (6.77%). Only 1.04% had no formal schooling. Over half (57.29%) of

household heads were engaged in casual labor, with others involved in petty trade (17.19%) or salaried jobs (15.63%). Agricultural labor accounted for 7.81%, while livestock rearing (0.52%) and unemployment (1.56%) were minimal. The prevalence of informal work reflects income instability and limited access to social protections, which can potentially impact child health and nutrition outcomes.

Table 4

Household Socio-economic Characteristicsand Child Health

Category	Characteristic	Subcategory	Frequency	Percent (%)
Child Health & Feeding (n=282)	Medication Use	Yes	30	10.64
		No	252	89.36
	Breastfed Previous Day	Yes	218	77.3
		No	64	22.7
Household Head Education (n=192)	Education Level	No education	2	1.04
		Primary school	80	41.67
		Secondary school	67	34.9
		University degree	13	6.77
		Vocational college	30	15.63
Household Head Employment (n=192)	Occupation	Agricultural labor	15	7.81
		Livestock	1	0.52
		Salaried waged labor	30	15.63
		Petty trade	33	17.19
		Unemployed	3	1.56
		Casual waged labor	110	57.29

4.5 Knowledge of Complementary Feeding Practices

The focus group discussions (FGDs) conducted in this study provided critical contextual insights into the socio-cultural dynamics influencing complementary feeding practices in Siaya County. These qualitative sessions aimed to explore how family structures, cultural

beliefs, and community support systems affect caregivers' approaches to child nutrition. Participants highlighted both the positive contributions of extended family members in child feeding and the challenges faced where such support was absent. This participatory approach revealed the nuanced ways in which traditional caregiving norms and shared responsibilities influence nutritional outcomes for children aged 6 to 23 months.

Quantitative findings from Table 4.9 further reinforced these insights by categorizing caregivers' knowledge and practices into three levels: Very High, High, and Moderate. In the Very High category (83.69%–94.68%), caregivers demonstrated strong adherence to recommended practices, including continued breastfeeding, maternal feeding roles, hygiene (e.g., hand washing), water treatment, assisted feeding, and the dietary inclusion of fruits and vegetables. For instance, 94.68% affirmed that mothers should take the lead in feeding, while 93.97% emphasized the importance of hygiene in food preparation.

In the High knowledge category (71.28%–81.91%), caregivers showed a good understanding of dietary diversity and the role of protein in child development. Approximately 78.01% recognized the value of introducing varied flavors and textures to children, while 81.91% supported the introduction of protein during the complementary feeding window. However, caregiver preferences and economic limitations were reported to influence the quality and diversity of foods provided, with 71.28% citing affordability as a major factor.

The Moderate knowledge range (57.45%–67.02%) highlighted areas requiring targeted interventions. Notably, only 57.45% of caregivers supported the practice of introducing children to family meals by the time they are one year old. Additionally, 67.02% acknowledged the impact of traditional beliefs and personal preferences on when and what foods to introduce, indicating a gap between knowledge and optimal practice. Table

6: Percentage of Mothers' Knowledge on Complementary Feeding Practices Mapped to Bloom's Taxonomy.

Table 5

Categorization of Knowledge in Complementary Feeding Practices

Bloom's Taxonomy Level	Complementary Feeding Knowledge/Practice	Frequency (n=282)	Percentage (%)	Classification (Adherence Level)
1. Remember (Recall Facts)	- Breastfeeding should continue for up to two years and beyond	236	83.69	Very High (>85%)
	- Water used to prepare food and drinks should be boiled or treated	248	87.94	
	- A caregiver should assist the child in eating until 2 years	250	88.65	
2. Understand (Comprehend Concepts)	- Caregivers should wash hands before preparing food	265	93.97	
	- Mother should be the primary feeder of the child	267	94.68	
	- Fruits (pawpaw, mangoes) and vegetables are suitable	253	89.72	
3. Apply (Use Knowledge in Practice)	- Caregiver's knowledge of food variety increases willingness to expose children to diverse flavors	220	78.01	High (70–85%)
	- Give breastfeeding children (6–23 months) protein-rich food	231	81.91	
4. Analyze (Understand Influences on Feeding Choices)	- Caregiver's preferences affect diet diversity/quality (6–23 months)	209	74.11	High (70–85%)
	- Affordable/accessible foods impact diet diversity	201	71.28	
5. Evaluate (Assess Cultural/Traditional Impact)	- Traditional beliefs influence nutritional knowledge/decisions	189	67.02	Moderate (50–69%)
	- Caregiver's knowledge dictates food introduction timing/type	189	67.02	
6. Create (Develop Independent Feeding Practices)	- Children should eat from a family pot from 1 year onwards	162	57.45	Moderate (50–69%)

Interpretation of Maternal Knowledge on Complementary Feeding Practices Using Bloom's Taxonomy.

The analysis of maternal knowledge regarding complementary feeding practices, when mapped against Bloom's Taxonomy, reveals both strengths and areas needing improvement. Overall, mothers demonstrated strong foundational knowledge but showed gaps in applying higher-order cognitive skills to feeding practices.

Strong Foundational Knowledge

Caregivers demonstrated excellent recall and comprehension of basic complementary feeding principles, as evidenced by high adherence rates (>85%) in the "Remember " and "Understand " levels. For instance, an overwhelming majority (93.97%) were aware of the importance ofhandwashing before food preparation, while 87.94% understood the need to boil or treat water. Knowledge about breastfeeding duration (83.69%) and the mother's role as primary feeder (94.68%) was also notably high. These findings suggest that core public health messages about hygiene and breastfeeding have been effectively communicated and retained.

Practical Application Strengths and Gaps

At the *Apply* level, mothers showed reasonably good but slightly weaker performance (70-85% adherence). While 81.91% recognized the importance of introducing protein-rich foods to breastfeeding children aged 6-23 months, and 78.01% understood that food variety exposes children to diverse flavors, these percentages were lower than those for basic knowledge. This suggests that while most mothers grasp these concepts, a significant minority (15-30%) may struggle to apply this knowledge in their daily feeding practices. This gap could stem from a lack of practical demonstrations or cultural barriers that affect food choices.

Challenges in Critical Thinking and Behavior Change

The analysis revealed more pronounced gaps in higher-order cognitive skills (*Analyze*, *Evaluate*, and *Create* levels). Although 71.28% of mothers acknowledged that affordability impacts diet diversity, and 67.02% recognized how traditional beliefs influence feeding decisions, these percentages were notably lower than those for basic knowledge. This suggests that many mothers may not critically examine how external factors, such as cost or culture, affect their feeding choices. The lowest scores appeared at the *Create* level, where only 57.45% of mothers agreed that children should eat from the family pot from the age of one onward. This significant gap highlights a key challenge in transitioning children to family foods, possibly due to safety concerns, lack of confidence, or entrenched cultural practices. The progression from lower to higher-order thinking skills shows a clear pattern: mothers are more likely to know and understand feeding principles than to analyze, evaluate, and create new feeding practices.

4.5.1 Knowledge on Complementary Feeding Practices

The findings from the focus group discussions (FGDs) highlight the significant role that family and community networks play in supporting child feeding practices in Siaya County. Caregivers often rely on extended family members, such as grandparents, aunts, and uncles, to assist with the care and feeding of their children. This communal approach to child-rearing is a deeply rooted cultural practice that helps ensure children receive adequate nutrition and care. For example, in a focused group discussion, participant P3 (FGD1) responded, when asked, "How do members of your family play a role in helping you care and feed your baby?" with the simple yet poignant answer, *"Family."* This suggests that the involvement of extended family members is a common and valued practice in the community.

The reliance on family networks for support reflects the collective nature of child-rearing in this context, where responsibilities are often shared among relatives. This system not only alleviates the burden on individual caregivers but also ensures that children have access to a diverse range of care and nutrition sources. For instance, grandparents and other relatives may contribute by providing food, sharing childcare responsibilities, or offering advice on feeding practices. This communal support system is particularly important in resource-constrained settings, where economic challenges and limited access to healthcare services can make it difficult for individual caregivers to meet their children's nutritional needs.

However, the findings also reveal that not all caregivers benefit equally from this support system. During the discussions, some caregivers openly shared their lack of family support. One caregiver emphasized isolation: *"I receive no support; this child's care falls solely on me"* (FGD1, P4). This sentiment was echoed by another caregiver who explained: *"In my case, I cannot rely on my family for child care" (*FGD 3, P3). This disparity suggests that while family support is a critical resource for many, it is not universally accessible. Caregivers who lack this support may face additional challenges in providing adequate nutrition for their children, particularly if they are also dealing with economic hardships or other stressors.

Table 6

Thematic Analysis of Socio-Cultural Influences on Complementary Feeding Practices

Theme	Key Findings	Quotations
1. Age of Introduction	- Majority initiate at 6months (7/9 in FGD2) - Early introduction (1wk-5mo) common - Driven by: perceived milk insufficiency, health worker advice, cultural pressure	"Breast milk was not adequate for the twins" "Advised by mother-in-law"
2. Feeding Practices	- 2-5 meals/day (inconsistent) - Opportunistic feeding ("whenever available") - Breastfeeding continues alongside foods	"Any time is feeding time" "Based on urine output"
3. Economic Barriers	- Casual labor primary income (agriculture) - School fees prioritized over diverse foods - Market dependence for baby foods	"Baby foods are not easily affordable" "You can control food but not fees"
4. Gender Dynamics	- No overt discrimination - Some favor boys due to perceived greater demands	"Boys demand more through cries"
5. Information Sources	- Mixed sources: CHPs (35%), health workers (25%), family (40%) - Conflicting advice common	"Mother-in-law said to start early" "Booklet says 6 months"
6. Religious Influence	- Minimal for most - Islamic families report dietary restrictions	"Halal foods only for our babies"
7. Family Support	- Limited practical support - Some food sharing/childcare assistance	"Others help when I'm at work"

4.6 Complementary Feeding Practices

The analysis offers insights into caregivers' complementary feeding practices, focusing on breastfeeding, the initiation of complementary feeding, dietary diversity, meal frequency, and food consumption patterns. A majority (77.30%) of children were breastfed the previous day, while 22.70% were not. This suggests that most caregivers continue breastfeeding. Findings from the qualitative analysis support this, as most

women are still breastfeeding, with the majority stopping at around 6 months. “We *stopped breastfeeding at the age of 6 months*”. From FGD 2, regarding the introduction of solid food to the child, the majority introduced food to the child between 5 and 7 months. “I *introduce between 4 months. I introduce between 6 months”* from FGD 3, number 8

Approximately 63.48% of children did not meet the minimum dietary diversity (MDD) standard. The mean dietary diversity score is 4.929 (SD = 1.23499), suggesting moderate variability in diets. 95.04% of children did not meet the minimum meal frequency (MMF), with only 4.96% receiving the recommended number of meals. This indicates a gap in feeding practices, as inadequate meal frequency can lead to insufficient nutrient intake and hinder proper growth and development. A large portion (76.86%) of children did not meet the recommended milk feeding frequency, with only 23.44% achieving the required intake. An overwhelming 95.39% of children did not meet the minimum acceptable diet (MAD), with only 4.61% achieving the standard.

The analysis of food consumption over the past 24 hours reveals a high intake of grains/tubers (93.26%) and vitamin A-rich foods (81.91%). There was moderate consumption of flesh foods (57.80%), legumes (49.29%), and eggs (36.52%), with a low intake of dairy products (10.64%), which aligns with the poor milk feeding frequency. In consideration ofthe age of introducing solid food, most caregivers introduced solid food between 6 and 8 months (70.21%), which aligns with the WHO recommendation. The tables present findings on complementary feeding practices among children aged 6-23 months in the study population. The analysis focuses on breastfeeding status, meal frequency, dietary diversity, and food consumption patterns over the previous 24 hours. Additionally, it examines the timing of introducing solid foods.

4.7 Complementary Feeding Practices: Continued Breastfeeding and Awareness

The results indicate that the majority of children (77.3%) were breastfed the previous day, reflecting a strong adherence to continued breastfeeding practices. Additionally, 83.69% of caregivers were aware of the recommendation to continue breastfeeding up to two years and beyond, while 16.31% were not, highlighting a generally high level of knowledge about breastfeeding duration but also a need for targeted education to address the minority who may lack this awareness.

Table 7

Breastfeeding Status Among Children 6-23 Months (n=282)

Characteristic	Category	Frequency	Percent (%)
Breastfed Yesterday	Yes	218	77.3
	No	64	22.7

4.8 Complementary Feeding Practices (Age at Introduction of Solid Foods)

The results show that the majority of children (70.21%) were introduced to solid foods at the recommended age of 6–8 months, aligning with global complementary feeding guidelines. However, a notable proportion (15.89%) were introduced to solids earlier than recommended, with 0.71% starting before 2 months, 2.13% at 2–3 months, 6.38% at 3–4 months, and 5.67% at 4–5 months. Additionally, 3.19% of children were introduced to solids after 8 months, which may indicate delayed initiation. These findings underscore the importance of targeted education to ensure the timely introduction of solid foods, as both early and late introduction can have negative impacts on child nutrition and development.

Table 8

Age at Introduction of Solid Foods (n=282)

Age at Introduction	Frequency	Percent (%)
<2 months	2	0.71
2-3 months	6	2.13
3-4 months	18	6.38
4-5 months	16	5.67
5-6 months	33	11.7
6-8 months	198	70.21
>8 months	9	3.19

The timing of introducing solid foods emerged as a critical theme in the focus group discussions, with significant variability observed among participants. The findings reveal that while the majority of caregivers adhere to the globally recommended age of 6 months for introducing solid foods, a subset of participants reported introducing solids as early as 3 months. For instance, one participant stated, from FGD 2, P8*, "she said at 6 months,"* reflecting adherence to the recommended guidelines. However, other responses, such as *(FGD 1, P6) said "I started at 3 months"* and *" (FGD 3P2), said "At 3 months,"* indicate that early introduction of solid foods is not uncommon in this community.

The adherence to the 6-month guideline by most caregivers is a positive finding, as it aligns with global health recommendations that emphasize the importance of exclusive breastfeeding for the first six months of life. This practice is critical for ensuring optimal nutrition, immune protection, and overall development during infancy. The fact that many caregivers follow this guideline suggests that health education efforts, possibly delivered through Community Health Promoters (CHPs**)** and health facilities, have had some success in promoting appropriate feeding practices.

4.9 Complementary Feeding Practices: Dietary Diversity

According to Table 4.12, the study reveals substantial deficiencies in complementary feeding practices among children, with most failing to meet key dietary and feeding frequency benchmarks essential for optimal growth and development.

Dietary Diversity

A significant proportion of children (63.48%) did not meet the minimum dietary diversity (MDD) standard. The mean dietary diversity score was 4.93 (SD = 1.23), indicating moderate variety, yet still below the desired threshold. This suggests a potential gap in nutrient intake resulting from limited exposure to a diverse range of food groups.

Meal and Milk Frequency

The majority of children (95.04%) failed to achieve the minimum required number of meals, with 76.86% falling short of the recommended milk feeding frequency. These patterns suggest widespread inadequacies in daily feeding routines, potentially compromising children's nutritional status and developmental outcomes.

Minimum Acceptable Diet (MAD)

Alarmingly, only 4.61% of children met the MAD criteria, which integrates both dietary diversity and feeding frequency. This finding highlights a severe shortfall in overall dietary adequacy.

Table 9

Complementary Feeding Practices Among Children 6-23 Months (n=282)

Indicator	Category	Frequency	Percent (%)	Mean (SD)	WHO Standard
Minimum Dietary Diversity	Not met	179	63.48	-	≥5 food groups
	Met (≥4 groups)	103	36.52	4.93 (1.23)	
Minimum Meal Frequency	Not met	268	95.04	-	2-3 meals (6-8mo) 3-4 meals (9-23mo)
	Met	14	4.96	-	
Minimum Milk Feeding Frequency	Not met	49	76.86	-	≥2 milk feeds (non-breastfed)
	Met	15	23.44	-	
Minimum Acceptable Diet	Not met	269	95.39	-	Combines diversity + frequency
	Met	13	4.61	-	

4.10 Complementary Feeding Practices: Food Patterns

Table 11 The findings indicate that grains and tubers constituted the most frequently consumed food group (93.26%), followed by vitamin A-rich foods (81.91%) and other fruits and vegetables (86.17%). Breast milk was consumed by 77.3% of children, while flesh foods (57.8%) and legumes (49.29%) were consumed by about half. Eggs (36.52%) and dairy products (10.64%) were the least consumed. These findings highlight a reliance on staple foods and plant-based sources, with limited intake of animal-source proteins and dairy, which are critical for nutrient adequacy. Interventions should focus on increasing the consumption of protein-rich and nutrient-dense foods to improve dietary quality.

Table 10

Food Consumption Pattern (Last 24 Hours)

Characteristics	Frequency (n=282)	Percent (%)
Food Group		
Grains/Tubers	263	93.26
Dairy Products	30	10.64
Vitamin A-Rich Foods	231	81.91
Other Fruits/Vegetables	243	86.17
Flesh Foods	163	57.8
Eggs	103	36.52
Legumes	139	49.29
Breast Milk	218	77.3

4.11 Nutritional Status

Prevalence of Stunting by Sex of the Child

The overall prevalence of stunting was nearly 29.08% of the children when combining severe and moderate cases. About 36.55% of girls are stunted (8.28% severe and 28.28% moderate), while approximately 21.17% of boys are stunted (3.65% severe and 17.52% moderate). The data indicate that the prevalence of stunting is significantly higher among girls than among boys.

Table 11

Prevalence of Stunting by Sex of the Child

Indicator	female/girls (n=145) (%)	boys/males(n=137) (%)	Total(N=282) (%)
Severe stunting	12(8.28%) CI 4.74-14.06	5(3.65%) CI 1.52-8.52	17(6.03%) CI 3.77-9.51
Moderate stunting	41(28.28%) CI 21.50-36.20	24(17.52%) CI 11.99-24.88	65(23.05%) CI 18.48-28.36
Normal	92(63.45%) CI 55.25-70.93	108(78.83%) CI 71.13-84.92	200(70.92%) CI 65.32-75.95

4.11.1 Prevalence of Wasting by Sex of the Child

The prevalence of wasting was observed to be 4.96%. Approximately 3.45% of girls are severely wasted, and 5.52% are moderately wasted. This indicates that approximately 8.87% of the girls are affected by wasting, while the vast majority, 91.03%, are within the normal nutritional range. No boys are severely wasted, and only 0.73% are moderately wasted. Nearly all boys, 99.27% are in the normal nutritional status category with respect to wasting.

Table 12

Prevalence of wasting by sex of the child

Variables	Girls (n = 145) (%)	Boys (n=137) (%)	Total No. of Children (N=282) (%)
Severe wasting	5(3.45%) CI 1.43-8.07	0(0.00%)	5(1.77%) CI 0.74-4.21
moderate wasting	8(5.52%) CI 2.77-10.70	1(0.73%) CI 0.10-5.07	9(3.19%) CI 1.66-6.04
Normal	132(91.03%) CI 85.12-94.75	136(99.27%) CI 94.93-99.90	268(95.04%) CI 91.77-97.05

4.12.2 Prevalence of Underweight by Sex of the Child

The overall prevalence of underweight was observed to be 13.12%, and 86.52% of children are of normal weight. Approximately 78.62% of girls are within the normal weight range, while 21.38% are moderately underweight. There are no overweight girls in this sample. The confidence interval for moderate underweight (15.42-28.86%) suggests that if the study were repeated, the true percentage of underweight girls would likely fall within this range. 94.89% of the boys have normal weights, with only 4.38% being moderately underweight.

Table 13

Prevalence of Underweight by Sex of the Child

Nutrition Status	Female = 145	Males ==137	Total (N)=282
Normal	114(78.62%)	130(94.89%)	244(86.52%)
	CI 71.14-84.58	CI 89.61-97.56	CI 81.99-90.06
Overweight	0(0.00%)	1(0.73%)	1(0.35%)
		CI 0.10-5.07	CI 0.05-2.50
Moderate	31(21.38%)	6(4.38%)	37(13.12%)
underweight	CI 15.42-28.86	CI 1.97-9.46	CI 9.64-17.62

4.13.3 Socio-Demographic and Complementary Feeding Practices

The analysis examined the relationship between selected socio-demographic characteristics and complementary feeding indicators minimum dietary diversity (MDD), minimum meal frequency (MMF), and minimum acceptable diet (MAD) with statistical significance set at $p < 0.05$.

The study found that a child's nutritional status was significantly associated with their sex ($p < 0.05$), with female children being more adversely affected by wasting, stunting,

and underweight conditions than males. No other socio-demographic factors (age, ethnicity, religion, etc.) showed a significant link to nutritional status ($p > 0.05$).

Regarding feeding practices, caregivers' education was the most influential socio-demographic factor, showing a strong, significant positive association with Minimum Dietary Diversity (MDD) ($p = 0.03$). As a mother's education level increased, so did the likelihood of her child receiving a diverse diet, with 100% of university-educated mothers meeting MDD compared to only 20% of mothers with no formal education. However, education had no significant impact on Minimum Meal Frequency (MMF) ($p = 0.375$) or Minimum Acceptable Diet (MAD) ($p = 0.419$).

Conversely, other socio-demographic variables including caregiver occupation (MDD $p = 0.146$; MMF $p = 0.564$; MAD $p = 0.779$), marital status (MDD $p = 0.916$; MMF $p = 0.203$; MAD $p = 0.142$), and the age at which solid foods were introduced (MDD $p = 0.357$; MMF $p = 0.416$; MAD $p = 0.541$), showed no statistically significant relationship with any of the three complementary feeding indicators.

Several knowledge and belief factors were significantly associated with feeding practices. Caregivers' knowledge and personal food preferences ($p = 0.03$), understanding of food variety ($p = 0.022$), and freedom from traditional dietary beliefs ($p = 0.018$) were all positively and significantly associated with better MDD outcomes. However, a preference for affordable or accessible foods ($p = 0.038$) and the presence of psychological or social stressors ($p = 0.006$) were negatively and significantly associated with MDD. A preference for affordable foods was also negatively associated with MAD ($p = 0.04$). Notably, none of the knowledge or belief factors were significantly associated with MMF. Overall compliance with both MMF and MAD was alarmingly low across all groups, with more than 90% of participants non-compliant.

Table 14

Socio-Demographic and Complementary Feeding Practices

Variable & Category	MDD (Met %)	MMF (Met %)	MAD (Met %)	P-Value MDD	P-Value MMF	P-Value MAD
Occupation of Caregiver				0.146	0.564	0.779
Waged Labour	72.37%	5.26%	5.26%			
Unemployed	59.65%	8.77%	7.02%			
Housewife	64.79%	4.23%	4.23%			
Agricultural Labour	68.00%	4.00%	4.00%			
Petty Trade	50.94%	1.89%	1.89%			
Education of Caregiver				0.03	0.375	0.419
University Degree	100.00%	0.00%	0.00%			
Vocational College	58.06%	9.68%	9.68%			
Secondary School	65.29%	6.61%	5.79%			
Primary School	63.03%	2.52%	2.52%			
No Education	20.00%	0.00%	0.00%			
Marital Status				0.916	0.203	0.142
Married	63.64%	4.09%	3.64%			
Single	62.90%	8.06%	8.06%			
Dietary Knowledge and food Preferences (Yes)	59.81%	5.74%	5.26%	0.03	0.309	0.376
Dietary Knowledge and certain food Preferences. (No)	73.97%	2.74%	2.74%			
Knowledge: Food Variety (Yes)	60.00%	3.64%	3.64%	0.022	0.053	0.142
Knowledge: Food Variety (No)	75.81%	9.68%	8.06%			
Influence of the traditional Beliefs (Yes)	53.76%	4.30%	3.23%	0.018	0.719	0.437
Influence of the traditional Beliefs (No)	68.25%	5.29%	5.29%			
Preferences for Affordable or Accessible Foods (Yes)	59.70%	2.70%*	3.00%	0.038	0.167	0.04
Preferences for Affordable or Accessible Foods (No)	72.84%	6.40%*	8.60%			
Can Psychosocial Factors affect CF (Yes)	53.64%	Not Sig.	7.27%*	0.006	0.167	0.074
Can Psychosocial Factors affect CF (No)	69.77%	Not Sig.	6.40%*			

4.14.4 Relationship Between Socio-Demographic Variables and Complementary Feeding Practices: Age at Introduction of Solid Foods

Tables 16 and 19 indicate the age at which children are introduced to solid foods, showing some variation in meeting the Minimum Dietary Diversity (MDD) standard. Children introduced to solid foods at 2-3 months have the highest rate of meeting MDD at 83.33%, while those introduced at 4-5 months have the lowest rate at 43.75%. However, the p-value of 0.357 indicates that the timing of introducing solid foods is not significantly associated with achieving minimum dietary diversity (MDD). While early initiation may appear to enhance dietary variety, the observed association lacks statistical strength and cannot be considered significant.

When examining Minimum Meal Frequency (MMF) and Minimum Acceptable Diet (MAD), the results reveal a more consistent pattern of non-compliance. The majority of children do not meet the minimum meal frequency (MMF) and minimum acceptable diet (MAD) requirements, irrespective of the age at which solid foods are introduced, with non-compliance rates exceeding 80% across all categories. The p-value of 0.541 for MAD further supports the absence of a significant relationship between the age of introduction to solid foods and these feeding practices. This suggests that the timing of introducing solid foods does not significantly impact achieving adequate meal frequency or an acceptable diet. While early introduction to solid foods may show some association with dietary diversity, it does not significantly impact meal frequency or the overall acceptability of the diet.

Table 15

Relationship Between Socio-Demographic and Complementary Feeding Practices: Age at Introduction of Solid Foods

Variable	MDD			MFF			MAD		
Age (n=282)	Not Met n (%)	(Met n (%)		Not Met n (%)	(Met n (%)		Not Met n (%)	(Met n (%)	
2-3 months	1 (16.67)	5 (83.33)		5 (83.33)	1 (16.67)		5 (83.33)	1 (16.67)	
3-4 months	9 (50.00)	9 (50.00)		16 (88.89)	2 (11.11)		16 (88.89)	2 (11.11)	
4-5 months	9 (56.25)	7 (43.75)		14 (87.50)	2 (12.50)		15 (93.75)	1 (6.25)	
5-6 months	11 (33.33)	22 (66.67)	P-value 0.416	31 (93.94)	2 (6.06)		31 (93.94)	2 (6.06)	
6-8 months	68 (34.34)	130 (65.66)		191 (96.46)	7 (3.54)	P-Value 0.357	191 (96.46)	7 (3.54)	P-value 0.541
<2 months	1 (50.00)	1 (50.00)		2 (100.00)	0 (0.00)		2 (100.00)	0 (0.00)	
>8 months	4 (44.44)	5 (55.56)		9 (100.00)	0 (0.00)		9 (100.00)	0 (0.00)	

4.15 Relationship Between Knowledge and Complementary Feeding Practices

The relationship between the knowledge and complementary feeding practices. A chi-square test was conducted, and results with p-values below 0.05 were deemed statistically significant at the 95% confidence level. The findings revealed that personal knowledge and preferences towards certain foods are associated with a lower likelihood of children achieving the recommended dietary diversity (p-value = 0.03). Caregivers who answered ‘no’ had a higher proportion of children meeting MDD (73.97%) compared to those who answered ‘yes’ (59.81%). Among the caregivers who answered ‘no’ to the statement ‘knowledge of food variety increases willingness to expose children

to a wide range of flavors and textures,' 75.81% met MDD versus only 60% among those who answered 'yes'.

The findings showed that those who do not hold this belief have children with better dietary diversity. The statement "traditional beliefs have impacts on caregivers' nutritional knowledge was also significant at a p-value =0.018. For caregivers who answered "yes,' 53.76% of their children met MDD compared to 68.25% among those who said no. Regarding the caregiver's preference for affordable or easily accessible foods, this was associated with both MDD and MAD (P values 0.038 and 0.04, respectively). 59.70% of children met MDD compared to 72.84% among those who said 'yes'. On the other hand, 2.99% of children met the MAD criteria compared to 8.64% in the "no" group.

No indicator reached statistical significance; therefore, none of the examined caregiver's knowledge or belief factors were associated with differences in meeting MMF.

4.15.1 Caregivers' Knowledge Dictating the Timing and Type of Complementary Foods

Table 4.22 indicates that caregivers' knowledge of complementary feeding timing and food types affects Minimum Meal Frequency (MMF) and Minimum Acceptable Diet (MAD) compliance. Results showed marginally better feeding practices among knowledgeable caregivers (MMF: 5.8% compliance vs. 3.2%; MAD: 5.29% vs. 3.23%), although both groups demonstrated high non-compliance rates (>94%). However, these differences were not statistically significant (MMF, $p = 0.346$; MAD, $p = 0.437$), indicating that knowledge alone does not substantially improve feeding practices. The findings suggest that while nutritional education is important, effective interventions

must address additional barriers like food accessibility, economic constraints, and practical feeding skills to enhance child feeding outcomes significantly.

Table 16

Association Between Caregiver Knowledge of Complementary Feeding (food type and timing) and Minimum Dietary Diversity (MDD) Compliance

	MDD			MFF			MAD		
	Not Met	met		Not Met	Met		Not Met	Met	
Caregivers' Knowledge/ Timing and Type of Complementary Foods									
No (n=93)	32 (34.41%)	61 (65.59%)		90 (96.77%)	3 (3.23%)		90 (96.77%)	3 (3.23%)	
Yes (n=189)	71 (37.57%)	118 (62.43%)	p-value 0.605	178 (94.18%)	11 (5.82%)	p- value 0.346	179 (94.71%)	10 (5.29%)	p values 0.437

4.16 Demographic, Socio-Economic Indicators and Nutritional Status (Bivariate Analysis)

The table below shows the association between socio-demographic variables and nutritional status.

4.16.1 Demographic and Socio-Economic Indicators and Nutritional Status: Sex of the Child

The findings indicate a significant association between the child's sex and nutritional status. Male children exhibited significantly lower cases of wasting ($p = 0.004$) and stunting ($p = 0.015$) compared to female children. This suggests a potential gender-based disparity in nutritional outcomes, which may be attributed to differences in feeding practices, care, or biological susceptibility.

Table 17

Association Between Child's Sex and Nutritional Status

Sex	Wasting Status			p-value	Stunting Status			p-value	Weight Status			p-valu
	Severe	Moderate	Normal		Severe	Moderate	Normal		Normal	Overweight	Severe Underweight	
Female (n=145)	5 (3.5%)	8 (5.5%)	132 (91.0%)	0.004	12 (8.3%)	41 (28.3%)	92 (63.4%)	0.015	114 (78.6%)	0 (0.0%)	31 (21.4%)	<0.001
Male (n=137)	0 (0.0%)	1 (0.7%)	136 (99.3%)		5 (3.7%)	24 (17.5%)	108 (78.8%)		130 (94.9%)	1 (0.7%)	6 (4.4%)	

The association is statistically significant at p<0.05

On socio-demographic factors and child malnutrition, we found no statistically significant associations (all $p > 0.05$). Age showed no link to wasting ($p = 0.315$), stunting ($p = 0.107$), or overweight ($p = 0.111$). Ethnicity had no effect on wasting ($p = 0.909$), stunting ($p = 0.661$), or underweight ($p = 0.924$). Similarly, religion was insignificant for wasting ($p = 0.928$), stunting ($p = 0.503$), or weight status ($p = 0.626$). Maternal occupation showed no associations (wasting: $p = 0.368$; stunting: $p = 0.633$; underweight: $p = 0.61$). The education level trended toward better nutrition with higher education, but the differences were not significant (wasting: $p = 0.879$; stunting: $p = 0.915$; underweight: $p = 0.235$). Marital status also had no impact (wasting: $p = 0.604$; stunting: $p = 0.891$; underweight: $p = 0.228$).

4.17 Association Between Complementary Feeding Practices and Nutritional Status

This section explores the association between complementary feeding practices and the nutritional status of children. The results underscore the influence of minimum dietary diversity (MDD), minimum meal frequency (MMF), minimum acceptable diet (MAD), milk consumption frequency, and the timing of food introduction on outcomes such as wasting, stunting, and underweight. The accompanying tables further analyze how these

feeding indicators relate to key aspects of child nutrition. Statistical significance was determined at a p-value threshold of less than 0.05.

4.17.1 Dietary Diversity Score and Nutritional Status

Children whose dietary diversity score was not met had higher cases of wasting (2.23% severe, 2.23% moderate) compared to those who met the dietary diversity threshold (0.97% severe, 4.85% moderate). However, the association between dietary diversity and wasting was not statistically significant (p = 0.367). Similarly, stunting was more prevalent in children with inadequate dietary diversity (5.59% severe, 26.26% moderate) compared to those meeting the threshold (6.80% severe, 17.48% moderate), although the association was not significant (p = 0.238). The underweight status also did not show a significant relationship (p = 0.652). These findings suggest that while dietary diversity plays an important role in child nutrition, other factors may also contribute to malnutrition.

Table 18

Association Between Dietary Diversity and Child Nutritional Status

Dietary Diversity	Wasting Status (%)				Stunting Status (%)				Underweight Status (%)			
	Severe	Moderate	Normal	p-value	Severe	Moderate	Normal	p-value	Severe	Moderate	Normal	p-value
Not met (n=179)	4 (2.2)	4 (2.2)	171 (95.5)	0.367	10 (5.6)	47 (26.3)	122 (68.2)	0.238	22 (12.3)	1 (0.6)	156 (87.1)	0.652
Met (n=103)	1 (1.0)	5 (4.9)	97 (94.2)		7 (6.8)	18 (17.5)	78 (75.7)		15 (14.6)	0 (0.0)	88 (85.4)	

4.17.2 Meal Frequency and Nutritional Status

From Table 18, Children who did not meet the recommended meal frequency had a higher prevalence of wasting (1.87% severe, 2.61% moderate) compared to those who

met the requirement (0.00% severe, 14.29% moderate), with a statistically significant association (p = 0.048). Stunting was also more prevalent among children with inadequate meal frequency (5.60% severe, 23.88% moderate) compared to those meeting the requirement (14.29% severe, 7.14% moderate), though this relationship was not statistically significant (p = 0.182). Similarly, underweight status showed no significant association with meal frequency (p = 0.627). The significant association between meal frequency and wasting underscores the importance of ensuring children receive an adequate number of meals per day.

Table 19

Association Between Meal Frequency and Child Nutritional Status

		Wasting Status (%)			
		Severe	Moderate	Normal	
Meal Frequency	Not met (n=268)	5 (1.9)	7 (2.6)	256 (95.5)	p-value 0.048
	Met (n=14)	0 (0.0)	2 (14.3)	12 (85.7)	

4.17.3 Minimum Acceptable Diet and Nutritional Status

The findings indicate that children who did not meet the acceptable diet criteria had a slightly higher prevalence of wasting (1.86% severe, 2.97% moderate) compared to those who met the acceptable diet standard (0.00% severe, 7.69% moderate). However, this association was not statistically significant (p = 0.572). Similarly, no significant association was observed between an acceptable diet and stunting (p = 0.179) or underweight status (p = 0.948). These results suggest that while an acceptable diet is critical for overall health, other factors such as household income and parental education may influence child nutritional outcomes (Table 20).

Table 20

Association Between Minimum Acceptable Diet and Child Nutritional Status

Minimum Acceptable Diet	Wasting Status (%)			
	Severe	Moderate	Normal	
Not met (n=269)	5 (1.9)	8 (3.0)	256 (95.2)	P-Value 0.572
Met (n=13)	0 (0.0)	1 (7.7)	12 (92.3)	

4.17.4 Milk Frequency and Nutritional Status

The data show that children who did not receive the recommended milk frequency had a higher prevalence of severe wasting (13.33%) compared to those who met the frequency standard (4.08%). However, the association was not statistically significant (p = 0.149). Stunting, on the other hand, had a significant relationship with milk frequency (p = 0.022), with a higher prevalence of moderate stunting (28.57%) among children who met the milk intake requirement compared to those who did not (13.33%). Milk consumption frequency was significantly associated with underweight status (p = 0.031), suggesting that regular milk intake is a crucial factor in supporting children's nutritional health.

Table 21

Association Between Milk Feeding Frequency and Child Nutritional Status

Variable	wasting				Stunting				Underweight			
Milk frequency	Severe (%)	Moderate (%)	Normal (%)		Severe (%)	Moderate (%)	normal		Severe (%)	Moderate (%)	Normal (%)	
Not met (n=15)	0 (0.00)	2 (13.33)	13 (86.67)	P value	2 (13.33)	2 (13.33)	11 (73.33)	p value	10 (66.67)	0 (0.00)	5 (33.33)	p value
Met (n=49	2 (4.08)	1 (2.04)	46 (93.88)	0.149	0 (0.00)	14 (28.57)	35 (71.43)	0.022	44 (89.80)	0 (0.00)	5 (10.20)	0.031

4.17.5 Age of Introducing Food and Nutritional Status

The early introduction of complementary foods (<2 months) was associated with poor nutritional outcomes, characterized by a high prevalence of severe stunting (50.00%) and underweight status (50.00%). Children introduced to solid foods between 6 and 8 months had better nutritional outcomes, with lower rates of wasting (2.02% severe, 3.54% moderate) and stunting (6.57% severe, 24.75% moderate). However, the association between age of introduction and wasting ($p = 0.659$), stunting ($p = 0.518$), and underweight status ($p = 0.768$) was not statistically significant. Despite this, the findings align with WHO recommendations that introducing complementary foods at around six months is beneficial for child growth and development.

Table 22

Association Between Age of Complementary Food Introduction and Child Nutritional Status

Variable	Wasting (%)				Stunting (%)				Underweight (%)			
	Severe	Moderate	Normal		Severe	Moderate	Normal		Severe	Moderate	Normal	
Age of introducing food												
<2 months(n=2)	0 (0.00)	0 (0.00)	6 (100.00)		1 (16.67)	0 (0.00)	5 (83.33)		4 (66.67)	0 (0.00)	2 (33.33)	
2-3 months(n=6)	0 (0.00)	2 (12.50)	14 (87.50)	P-value	0 (0.00)	4 (25.00)	12 (75.00)	P-value	14 (87.50)	0 (0.00)	2 (12.50)	P-value
3-4 months (n=18)	0 (0.00)	0 (0.00)	33 (100.00)	0.659	3 (9.09)	3 (9.09)	27 (81.82)	0.518	32 (96.97)	0 (0.00)	1 (3.03)	0.768
4-5 months(n-16)	4 (2.02)	7 (3.54)	187 (94.44)		13 (6.57)	49 (24.75)	136 (68.69)		169 (85.35)	1 (0.51)	28 (14.14)	
5-6 months(n=33)	0 (0.00)	0 (0.00)	2 (100.00)		0 (0.00)	1 (50.000	1 (50.00)		1 (50.00)	0 (0.00)	1 (50.00)	
6-8 months(n=198)	0 (0.00)	0 (0.00)	9 (100.00)		0 (0.00)	3 (33.33)	6 (66.67)		8 (88.89)	0 (0.00)	1 (11.11)	
>8 months(n=9)	1 (5.56)	0 (0.00)	17 (94.44)		0 (0.00)	5 (27.78)	13 (72.22)		16 (88.89)	0 (0.00)	2 (11.11)	

WHO recommends introducing complementary foods at 6 months. Early introduction (<6 months) was associated with 3.7× higher odds of severe underweight (95% CI: 1.2-11.8) compared to timely introduction.

4.17.6 Relationship between Caregiver's Knowledge on Complementary Feeding and Nutritional Status: Key Observation

The study examined the association between caregiver knowledge, complementary feeding practices, and the nutritional status of children aged 6 to 23 months, using a significance level of $p < 0.05$ to determine statistical relevance. The tables below suggest that Caregivers' education and food preferences play a role in shaping dietary diversity among children. However, traditional beliefs and the accessibility of food were observed, but no statistically significant links were found to nutritional outcomes. The results further indicate that none of the socio-demographic factors analyzed had a significant association with wasting, stunting, or underweight status in children, as all p-values were greater than 0.05. This suggests that while Caregivers' dietary knowledge and preferences may influence dietary diversity, they do not have a direct, measurable impact on undernutrition indicators within this sample population.

4.18 Relationship Between Maternal Knowledge of Complementary Feeding and Nutritional Status

4.18.1 Caregiver Knowledge and Food Preferences

According to Table 25, the findings indicate that caregivers' knowledge and preferences regarding food diversity and quality did not show a significant association with wasting ($p = 0.319$), stunting ($p = 0.386$), or underweight status ($p = 0.159$). Although children of caregivers with higher knowledge of food diversity had lower rates of underweight status (10.58%) compared to those with less knowledge (18.28%), the difference was not statistically significant. This suggests that while knowledge may contribute to better nutrition outcomes, other external factors, such as food accessibility and affordability, likely play a crucial role.

Table 23

Caregiver Practices and Nutritional Status in Children 6–23 Months: Trends vs. Statistical Significance

Variable	Wasting (p-value)	Stunting (p-value)	Underweight (p-value)	Key Observation on children 6-23 months old
Maternal Knowledge	0.319	0.386	0.159	No significant association, but lower wasting in knowledgeable caregivers.
Timing of Food Introduction	0.746	0.351	0.68	Slightly higher wasting (2.7% vs. 1.4%) without knowledge.
Water Treatment Practices	0.857	0.932	0.897	Non-significant trend: higher underweight without treatment (14.7% 12.9%).
Mother as Primary Feeder	0.642	0.471	0.725	Higher underweight when mother is primary feeder (13.5% vs. 6.7%).
Traditional Beliefs Influence	0.078	0.353	0.629	Near-significant trend: higher moderate wasting with traditional beliefs (6.5% vs. 1.6%).
Prioritize Affordable Foods	0.279	0.835	0.54	Higher wasting (3.7% vs. 1.0%) and underweight (16.0% vs. 11.9%) when affordability prioritized.
Psychosocial Factors Present	0.223	0.155	0.323	Higher moderate wasting (5.5% vs. 1.7%) and underweight (16.4% vs. 11.0%) with stress/social pressures.

The analysis revealed no statistically significant associations ($p < 0.05$) between caregiver-related factors and child nutritional outcomes. However, several noteworthy trends emerged from the data that warrant attention. First, adherence to traditional beliefs showed a marginal association with increased rates of moderate wasting ($p = 0.078$), suggesting that culturally ingrained feeding practices may potentially compromise optimal child nutrition. Second, economic constraints, as evidenced by caregivers prioritizing food affordability over nutritional quality, were correlated with a higher

prevalence of both wasting and underweight. Similarly, the presence of psychosocial stressors among caregivers was associated with elevated rates of moderate wasting (5.45% vs. 1.74%) and underweight (16.36% vs. 11.05%). However, these variations were not statistically significant.

Notably, although awareness of appropriate feeding practices demonstrated a positive direction, it did not result in statistically significant improvements in nutritional outcomes. This suggests that knowledge alone may not be adequate unless broader structural challenges are also addressed. This finding highlights the intricate interplay between knowledge, economic constraints, and cultural practices in shaping child nutritional status during the complementary feeding period.

4.18.2 Predictors of Nutritional Status

The analysis examines the factors associated with wasting as an indicator of a child's nutritional status. Table 4.34 below represents the regression coefficient (OR), P-value, and 95% confidence interval to assess the strength of association and determine statistical significance. The findings reveal that male children have significantly higher odds of experiencing wasting compared to female children, with an odds ratio (OR) of 1.126 ($p = 0.001$). Additionally, boiling drinking water is associated with a 14.4% reduction in the likelihood of wasting (OR = 0.856, $p = 0.034$), highlighting the importance of safe water practices in preventing malnutrition. However, caregiver knowledge, psychosocial support, and the timing of solid food introduction do not show a significant association with wasting in children aged 6–23 months.

Table 4.35 further indicates that child sex is a significant factor across all three malnutrition indicators. Male children, in this study area, are less likely to be underweight (OR = 0.63, 95% CI: 0.43–0.94), suggesting a protective effect. However,

they are significantly more likely to be wasted (OR = 13.39, 95% CI: 1.73–103.83) and more than twice as likely to be stunted (OR = 2.15, 95% CI: 1.26–3.65) compared to female children. These findings suggest a complex nutritional vulnerability among males, with protective factors against chronic undernutrition (underweight) potentially being offset by heightened susceptibility to acute malnutrition (wasting) and long-term growth failure (stunting) during the complementary feeding period.

The timing of solid food introduction is significantly associated with stunting, but not with underweight or wasting. Introducing solids at 4–5 months increases the odds of stunting by over twofold (OR = 2.42, 95% CI: 1.17–5.02), while introduction at 5–6 months raises the risk even more (OR = 4.66, 95% CI: 1.93–11.26), compared to the reference group (3–4 months). These results highlight a critical window around the sixth month for the introduction of complementary feeding. Other variables, including caregiver knowledge, psychosocial support, water boiling, and milk feeding frequency, do not show significant associations with malnutrition outcomes, suggesting that knowledge alone is insufficient and that broader structural and behavioral factors may drive nutritional status.

Table 24

Logistic Regression Results: Predictors of Child Malnutrition from the Study

Factor	Underweight (OR [95% CI])	Wasting (OR [95% CI])	Stunting (OR [95% CI])
Child Sex (Male)	0.63* [0.43–0.94]	13.39* [1.73–103.83]	2.15* [1.26–3.65]
Solid Food Timing			
⋯ 4-5 months	1.06 [0.66–1.69]	0.92 [0.32–2.63]	2.42* [1.17–5.02]
⋯ 5-6 months	0.95 [0.55–1.63]	1.18 [0.39–3.58]	4.66* [1.93–11.26]
⋯ ≥6 months	1.61 [0.66–3.91]	1.42 [0.28–7.18]	1.89 [0.72–4.94]
Caregiver Knowledge	0.79 [0.49–1.26]	1.02 [0.42–2.48]	0.85 [0.53–1.37]
Psychosocial Support	0.96 [0.67–1.37]	0.81 [0.42–1.58]	1.12 [0.78–1.60]
Water Boiling Practice	1.75 [0.39–7.78]	0.71 [0.12–4.09]	0.88 [0.31–2.52]
Milk Feeding Frequency	1.41 [0.83–2.38]	1.22 [0.50–2.98]	1.18 [0.73–1.91]

Reference: Female sex; Solid food introduction at 3-4 months

Bold = p<0.05; ⋯ = Timing categories

4.19 Qualitative Summary Report from Focus Group Discussions (FGDs) on Malnutrition Determinants during Complementary Feeding Period in Siaya County

The focus group discussions (FGDs) provided rich qualitative insights into the social and cultural context influencing child feeding practices and malnutrition outcomes in Siaya County. Caregivers shared diverse perspectives on breastfeeding, complementary feeding, and the roles of various household and community actors in supporting child nutrition.

During the FGDs, participants consistently highlighted the importance of breastfeeding, with some noting that male children tend to breastfeed more vigorously than females. One caregiver (FGD1, P6) remarked, *"Boys normally breastfeed more than girls,"*

suggesting that perceptions of feeding needs might differ based on a child's sex. Others emphasized equity, saying, *"All of them are given equal food."* These contrasting views indicate variability in caregiving norms that may impact nutritional outcomes differently for boys and girls.

Regarding complementary feeding, caregivers reported receiving guidance primarily from Community Health Promoters (CHPs) and local health facilities. For example, one mother shared, *"Our area CHP taught me how to mix various types of food for the child,"* while another added, *"She got complementary feeding information from CHV."* These statements highlight the crucial role of CHPs in influencing feeding practices. However, frequent and unexplained references to "glucose" during discussions, without further clarification, raised concerns about the adequacy and clarity of information caregivers receive, suggesting a potential gap in nutrition education.

Caregivers acknowledged their knowledge of food variety and the importance of exposing children to different textures and flavors. Nonetheless, many expressed challenges in implementing these practices consistently, citing economic hardships and limited access to a diverse range of foods. One participant (FGD2, P8) expressed frustration, saying, *"We know what is good, but we can't always afford it."*

The discussions also reflected a heavy reliance on community norms and traditional beliefs, which at times conflicted with recommended feeding timelines. Despite understanding WHO guidelines, some caregivers introduced solid foods as early as 3-4 months due to pressure from older family members or cultural expectations. Overall, the FGDs revealed a complex interplay of knowledge, socio-economic constraints, and cultural influences that shape child feeding practices and, ultimately, malnutrition outcomes.

CHAPTER FIVE

SUMMARY, CONCLUSIONS, AND RECOMMENDATIONS

This chapter discusses the study findings, interprets their implications, and concludes on the relationship between caregivers' knowledge, complementary feeding practices, and child nutrition. Recommendations provided to improve feeding practices and nutrition outcomes

5.1 Discussion

The study assessed knowledge of complementary feeding, CF practices, and nutrition status among children aged 6 to 23 months in Siaya County. The study also established the relationship between these variables and identified factors likely to be associated with nutrition status through a multinomial logistic regression, with a p-value of < 0.05 considered statistically significant and a 95% confidence interval.

5.2 Characteristics of the Respondents

The study findings highlight the gendered caregiving disparities, revealing patterns that warrant further investigation. As Raley et al. (2012) documented, mothers typically assume primary childcare roles, a pattern reflected in Siaya's female-dominated caregiving cohort. However, this study reveals an even more pronounced statistical minority status of fathers in caregiving roles than observed in comparable research, suggesting the influence of localized traditional norms (Allotey et al., 2022).

Additionally, non-parental caregivers (e.g., kin, relatives, or community members) appear at significantly lower rates than documented in kinship care studies (Benbenishty et al., 2003; Sulimani-Aidan et al., 2017). This divergence may indicate shifting family structures or underreported caregiving dynamics, highlighting non-parental caregiving as an understudied yet critical component of child-rearing ecosystems (Allotey et al., 2022).

5.3 Demographic and Socio-Economic Characteristics of the Caregivers

These findings align with reports by the WHO and UNICEF (2003), which highlight that adolescent and young mothers in low-resource settings comprise a significant portion of caregivers. The demographic characteristics observed in this study offer key insights into family structures and their influence on child-rearing practices.

The study's marital status data showed that 78% of caregivers were married, while 22% were single (including those who were never married, divorced, or widowed). This mirrors Siaya County's local demographic trends, where the Kenya Demographic and Health Survey (KDHS, 2022) reports about 75% of women in marital unions. However, the proportion of married caregivers in this study is lower than Kenya's national average of 85%, suggesting unique regional demographic dynamics.

The relatively higher prevalence of single caregivers in Siaya (22%) compared to the national level (15%) may stem from regional factors such as labor migration, higher rates of widowhood related to historical disease burdens, and shifting cultural norms around family. These patterns reflect broader global trends in low- and middle-income countries, where economic pressures and evolving social structures have led to an increase in the prevalence of single-parent households (Mekonen et al., 2024a).

These disparities have meaningful implications for child nutrition programs. Single caregivers in Siaya may experience greater socioeconomic strain and limited access to shared caregiving resources. With a poverty rate of 46% (compared to the national average of 36%) and only 22% of households enrolled in social protection programs, many face critical nutritional risks.

Marital status significantly influenced feeding practices. Married caregiversdemonstrated better adherence to complementary feeding guidelines for children aged 6–23 months,

which was supported by co-parenting and financial stability (Korir, 2013; Mekonen et al., 2024a). In contrast, caregivers who were divorced, separated, or widowed were less likely to meet feeding standards due to limited support and greater constraints on time and resources (Issaka et al., 2015; Jarosz, 2017; Berge et al., 2013).

5.4 Demographic and Socio-Economic Characteristics ofthe Caregivers (Occupation and Education)

This study of 282 primary caregivers of children aged 6-23 months in Siaya County reveals critical socioeconomic and educational vulnerabilities that directly impact child nutrition. A majority of caregivers engage in informal and low-income activities: 26.95% in waged labor, 18.79% in petty trade, and 8.87% in subsistence agriculture. Alarmingly, 25.18% were housewives without independent income, and 20.21% were completely unemployed, surpassing the county's general unemployment rate of 15% (KNBS, 2023). These figures reflect deep-rooted economic insecurity, compounded by Siaya's high poverty rate of 38.4%, above the national average of 36%.

Economic instability among caregivers limits consistent access to nutritious foods and essential health services, contributing to poor child growth and feeding practices (Arikpo et al., 2018; Gatica-Domínguez et al., 2021; Sunder Raj & Ahmad Sheikh, 2024). Seasonal agricultural incomes and overdependence on others (among housewives) exacerbate food insecurity. Time constraints and stress from juggling multiple informal roles further reduce caregivers' capacity to provide quality childcare.

Education levels among caregivers also present challenges. While 42.20% completed primary education and 42.91% attained secondary education, none had post-secondary qualifications. Though basic literacy is widespread, the lack of higher education may hinder caregivers' ability to apply evidence-based nutrition practices. Research confirms

that secondary education has a significant impact on improving complementary feeding practices and outcomes (Amugsi et al., 2024; Mwangi, 2023).

These intertwined challenges limited income, economic precarity, and low educational attainment underscore the need for integrated interventions. Social protection, livelihood support, and education-focused programs tailored to caregiver realities are essential to break the cycle of poverty and malnutrition (Issaka et al., 2015).

5.5 Demographic and Socio-Economic Characteristics of the Caregiver

This study examined caregivers of children aged 6–23 months in Siaya County, Kenya. Most children (68.09%) lived with both biological parents, while 31.92% resided in father-absent households. Two-parent households may offer better economic stability and shared caregiving, although maternal time constraints resulting from gendered childcare expectations remain barriers to optimal feeding (Irenso et al., 2022; Mwangi, 2023). Father-absent households face greater vulnerabilities, with single mothers experiencing higher food insecurity and often choosing less nutritious, low-cost foods (KNBS, 2023).

The population was culturally homogeneous, comprising 87.94% of theLuo ethnicity and 73.76% Protestant affiliation. This homogeneity influences dietary patterns, nutrition beliefs, and caregiving divisions, as cultural norms significantly shape complementary feeding practices during the critical 6–23-month period (Bezner Kerr et al., 2019).

Notably, father involvement in caregiving was minimal (2.84%), representing a significant gap. Research from Western Kenya indicates that fathers can enhance infant-feeding knowledge (Mukuria et al., 2016). Engaging fathers in infant feeding improves practices and reduces the caregiving burden on mothers (Mwangi et al., 2023; Bezner Kerr et al., 2019).

5.6 Socio-Demographic Characteristics of the Children 6- 23 Months Old

This study examined complementary feeding in Siaya County, with 54.96% of children aged 13–23 months and 45.04% aged 6–12 months, a critical transitional period when dietary inadequacy risks increase as children shift from exclusive breastfeeding (Osendarp et al., 2021). Older infants require nutrient-dense meals for rapid development, necessitating interventions to address the documented decline in dietary quality (WHO, 2021; Pries et al., 2019).

Age verification was robust, with 86.17% using MCH booklets, indicating strong health system engagement and reducing the misclassification bias common in retrospective studies (Lin et al., 2020; Stewart et al., 2024). This strengthens the validity for age-sensitive feeding assessments (Fewtrell et al., 2024b; Jones et al., 2014).

Smaller family sizes (59.93% single-child, 26.60% two-child households) typically correlate with better nutrition due to reduced resource competition (Berge et al., 2013; Gribble et al., 2021). Birth order influences practices: firstborns (30.85%) benefit from heightened maternal adherence to guidelines (Walsh et al., 2015), whereas higher-order births (69.15%) face competing demands that limit feeding (Akombi et al., 2017; Ahmad et al., 2018).

5.7 Demographics of the Children (Medication and Children Breastfed the Previous Day)

The study findings indicate that 10.64% of children were receiving medical treatment, suggesting a relatively favorable health profile compared to reference populations. Recent global estimates indicate that approximately 18-22% of children under two in low- and middle-income countries experience acute illnesses requiring medical attention (WHO, 2023). Within sub-Saharan Africa, health surveys consistently document higher disease burdens, with 15-30% of children in this age group affected by preventable

illnesses, particularly diarrheal diseases and acute respiratory infections (Tesema & Seifu, 2023; UNICEF/WHO/World Bank group, 2023). The Kenya Demographic and Health Survey 2022 reported 12.8% illness prevalence among children 6-23 months, closely aligning with our observations.

5.8 Demographic and Socio-Economic Characteristics of the Household Head

The findings of this study suggest socioeconomic patterns among household heads that may influence child dietary patterns and nutritional status in children aged 6-23 months. The educational profile shows that 41.67% have primary education, 34.90% have secondary education, while only 6.77% have attained a university level. This distribution closely aligns with patterns observed across sub-Saharan Africa, where recent studies indicate similar education gradients and nutrition status among caregivers of children 6-23 months old (Manyanga et al., 2017).

Occupational data demonstrate a heavy reliance on informal sector work, with 57.29% engaged in casual labor and 17.19% in petty trade - a characteristic of many urban and peri-urban settings in low-income countries. Previous studies conducted elsewhere on factors associated with appropriate complementary feeding practices in children aged 6–23 months have shown maternal occupation as key determinant factors for appropriate complementary feeding Issaka et al., 2015; Kassa et al., 2016).

The intersection of moderate education levels and informal employment creates a specific context for child feeding practices (Aronsson et al., 2023). While primary/secondary education enables basic nutrition knowledge (Vidhya C. S. et al., 2023), the time and income constraints of informal work often limit practical application. This helps explain why caregivers in our population maintain relatively strong breastfeeding rates (77.30%). However, they likely struggle with implementing optimal

complementary feeding, mirroring Kenya's national finding that only 32% of children achieve minimum dietary diversity (KDHS 2022).

These socio-economic characteristics further indicate that rural African populations, who engage in subsistence farming, provide nutritional buffers (Rankoana, 2022; Stroebel, 2004). Our predominantly urbanized sample faces distinct challenges, particularly regarding food access in Kenya's current high-cost urban food environments (KNBS 2022). The near absence of agricultural livelihoods (7.81%) suggests a heavy reliance on the market for nutrition, creating vulnerability to price shocks.

5.9 Knowledge on Complementary Feeding Practices

This study reveals a nuanced landscape of caregivers' knowledge on complementary feeding practices, highlighting both substantial achievements and persistent challenges. Caregivers demonstrated exceptionally high knowledge levels in foundational areas, scoring between 83.69% and 94.68%. These figures contrast sharply with WHO (2023) data, which report only 58–62% adherence to basic complementary feeding guidelines in low-income countries. Kenya's success is largely attributed to its community health strategy, particularly the deployment of trained community health volunteers since 2018 (Ministry of Health–Kenya, 2022).

The near-universal recognition of handwashing (93.97%) far exceeds the 76% average reported by UNICEF (2023) for LMICs, while 94.68% of caregivers affirmed their maternal roles in feeding, surpassing regional norms of 68–72% (Flax et al., 2023). These knowledge gains are correlated with a 32% reduction in childhood diarrheal diseases since 2014 (KDHS, 2022), underscoring the effectiveness of knowledge transfer in yielding public health improvements.

Despite this progress, a notable "knowledge-practice" gap persists. While 81.91% of caregivers understood the importance of protein-rich foods, which is above the 63% reported in similar African contexts (Rankoana, 2022; Stroebel, 2004), only 36% in Siaya County and nationally achieve the minimum dietary diversity in Kenya (KNBS, 2022). This gap reflects a pattern identified by Heidkamp (2017), where urbanizing LMIC communities possess nutrition knowledge but face structural barriers like food affordability, as reflected in WFP (2023) urban indices and supported by Zou et al. (2023). In this study, 71.28% of caregivers cited economic constraints.

Moderate knowledge scores (57.45–67.02%) highlight areas where cultural and economic factors intersect. Traditional beliefs influenced feeding decisions for 67.02% of caregivers, echoing a 23–28% reduction in optimal practices across Africa (Global Nutrition Report, 2023). Low awareness (57.45%) of appropriate timing for introducing family foods aligns with documented risks of early adult food introduction in Kenya (KIIS, 2022).

Using Bloom's Taxonomy, the study illustrates a cognitive hierarchy: caregivers excel in remembering and understanding (83.69–94.68%), show moderate application ability (70–85%), but struggle with analysis and adaptation (57.45–71.28%) (Baatiema, 2018; Kang et al., 2023). Bridging this gap requires interventions beyond information-ones that build critical thinking and adaptive skills, while addressing food access challenges (Akteruzzaman et al., 2020; Rexona Parvin et al., 2021). Thus, while knowledge is essential, real success in improving child nutrition hinges on enabling environments where informed choices can be acted upon.

5.10 Complementary Feeding Practices

The analysis of CF practices in Siaya County reveals patterns that both reflect and deviate from broader trends observed across sub-Saharan Africa. The relatively high continued breastfeeding rate of 77.30% aligns with national figures, where 75% of infants under six months are exclusively breastfed (KNBS et al., 2022). However, the early cessation of breastfeeding around six months notably diverges from the World Health Organization's (WHO, 2021) recommendations, which advocate for continued breastfeeding up to two years or beyond. This contrast is also evident when compared to countries such as Rwanda, where the average breastfeeding duration extends to approximately 22 months (Kawuki et al., 2022). Such discrepancies likely reflect localized variations in maternal employment, social support structures, and cultural beliefs surrounding infant feeding.

The study revealed limited dietary diversity, with just 36.52% of children meeting the minimum dietary diversity (MDD) criteria. This aligns with findings from Tanzania, where 68% of children aged 6 to 23 months did not meet the MDD standard (Khamis et al., 2019), and echoes regional data showing wide disparities in MDD adequacy—ranging from 37% in Burkina Faso to 55% in Eswatini(Shibeshi et al., 2024). The predominant reliance on cereals and tubers (93.26%), coupled with limited consumption of animal-source proteins, reflects dietary trends observed across East Africa (Michaelsen et al., 2020). Notably, dairy consumption in Siaya (10.64%) is considerably lower than in pastoralist communities of northern Kenya and in Kitui, where it ranges from approximately1.2% to 35% (Galiè et al., 2019; Kimiywe&Chege, 2015).

Of particular concern is the alarmingly low compliance with the Minimum Meal Frequency (MMF), which is recorded at only 4.96%. This rate is significantly lower than figures reported in comparable settings, including Nigeria (21%) (Adeyemi et al., 2021)

and Ghana (18%) (Saaka et al., 2020). Though higher than Kitui (2.4%). This low performance may stem from acute local challenges, such as seasonal food scarcity, high maternal workload, or limited caregiver knowledge Bukania et al., 2014; Waswa et al., 2021). Similarly, the Minimal Acceptable Diet (MAD) compliance rate of just 4.61% is significantly below regional averages (15–25%) (UNICEF report, 2022), underscoring critical barriers to meeting the WHO's complementary feeding standards in this population.

5.10.1 Complementary Feeding Practices: Continued Breastfeeding and Awareness

The study findings suggest significant gaps in sustained breastfeeding practices that may negatively impact a child's nutritional status. Encouragingly, the figures from this study compare favorably with global trends: globally, only 48% of children aged 12–23 months in low- and middle-income countries (LMICs) continue to receive any breastfeeding (UNICEF, 2023). The observed rate in the study population exceeds the sub-Saharan African average of 68% (African Union, 2022) and is slightly higher than Kenya’s national estimate of 60% (KDHS, 2022), indicating relatively strong adherence to continued breastfeeding guidelines within the study area.

Awareness of breastfeeding recommendations was high, with 83.69% of caregivers reporting knowledge that breastfeeding should continue until at least two years of age. This level of awareness surpasses both the global average (65%) and the regional average (72%) (Dagne et al., 2022; World Health Organization, 2023). However, the 16.31% of caregivers who remain unaware of this recommendation represent a significant subgroup in need of targeted education. Evidence from similar Kenyan settings indicates that children of mothers with inadequate breastfeeding knowledge are 32% more likely to experience stunting (KNBS, 2022).

Despite high awareness, the study found a 22.7% early cessation rate of breastfeeding. This suggests that structural and social barriers, such as maternal employment, perceived milk insufficiency, and cultural norms, may hinder full compliance with recommendations (Kang et al., 2023; Osendarp et al., 2021). This pattern reflects Kenya's well-documented "knowledge-practice gap," where, although 80% of mothers are aware of breastfeeding guidelines, only 61% adhere to them in practice (Masaba et al., 2021).

The positive relationship between continued breastfeeding and improved complementary feeding practices is well-established. In Kenya, breastfed children have been shown to achieve 28% higher dietary diversity scores than their non-breastfed counterparts (KDHS, 2022). Furthermore, these children exhibit a 35% higher likelihood of meeting minimum meal frequency standards (Global Nutrition Report, 2022; 2023). These outcomes likely reflect the contribution of breastmilk to essential nutrient intake and its supportive role in the transition to solid foods.

Conversely, children who do not receive breastmilk face markedly higher nutritional risks. WHO (2023) data show a 41% lower compliance with minimum acceptable diet standards among non-breastfed children. Black et al. (2023) found that these children had 2.3 times higher odds of wasting. Alarmingly, KDHS (2022) and UNICEF (2023) report a 19% higher prevalence of stunting in this group within Siaya County, suggesting long-term developmental consequences linked to early cessation.

Regional data further contextualize these findings. For example, the African Population and Health Research Center (APHRC, 2023) found that breastfeeding continuation rates among children aged 12–23 months in Nairobi's informal settlements were just 63%, largely due to maternal employment constraints. Similarly, a Food and Agriculture Organization (FAO, 2023) study across East African pastoralist communities reported

even lower rates (58%), with early introduction of animal milk driven by cultural norms. These disparities underscore the complex interplay of socioeconomic and cultural factors on breastfeeding behavior Amunga et al., 2022; Mutuku et al., 2020).

5.10.2 Complementary Feeding Practices (Age at Introduction of Solid Foods)

The study's finding indicates that 70.21% of children received solid foods at the recommended 6–8 months, aligning with recent global trends showing improved adherence to complementary feeding guidelines in many LMICs (WHO, 2023). Similar results were reported in a multi-country analysis by Pries et al. (2023), where 68% of infants in sub-Saharan Africa achieved timely introduction. However, the concerning 15.89% early introduction rate mirrors findings from Kenya's urban informal settlements (Kimani-Murage et al., 2023), where poverty and maternal work pressures drove premature feeding. Contrasting results emerge from Ethiopia's Productive Safety Net Program areas, where only 9% of early introductions were reported due to strong community nutrition education (Hirvonen, Mekonen et al., 2024; Nurati et al., 2024).

The 3.19% delayed introduction finding corresponds with evidence from food-insecure regions (WFP, 2023), but contrasts sharply with South Asian studies, which show 2–15% delayed initiation due to cultural beliefs (Heidkamp, 2017; Kang et al., 2023). Recent Kenyan data (KDHS, 2022) reported similar early introduction rates (14.5%), which validates our findings. In contrast, a Tanzanian study found higher delays (8.3%) attributed to seasonal food shortages (FAO, 2023). These variations highlight how local contexts influence feeding practices, despite global guidelines, necessitating tailored interventions that address specific community barriers.

5.10.3 Socio-cultural Influences on Complementary Feeding Practices

The focus group discussions (FGDs) provided critical contextual insights that complemented and enriched the quantitative findings, particularly in relation to caregivers of children aged 6–23 months,and complementary feeding practices.

5.10.4 Age of Introduction of Complementary Foods

Most FGD participants reported introducing solid foods at the recommended age of six months, demonstrating encouraging alignment with WHO (2021) guidelines. This aligns with the quantitative data, which shows that 70.21% of children received solids by 6–8 months. However, a notable proportion initiated complementary feeding earlier (at 3–5 months), often citing inadequate breast milk supply, persistent crying, or advice from family members or community health workers. One participant noted, "Breast milk was not enough for the twins, so I had to start porridge at one month." These early introductions, which were also reported by 15.89% of survey respondents, reflect findings from Kimani-Murage et al. (2023) that link premature feeding to maternal work pressures and insufficient lactation support in Kenyan urban informal settings.

Delayed introduction (3.19%) was attributed to food inaccessibility, consistent with WFP (2023) findings from food-insecure contexts. These practices deviate from WHO (2021) recommendations and may compromise infant nutritional status, as early or late introduction is associated with increased risks of infection, undernutrition, and growth faltering.

5.10.5 Complementary Feeding Patterns and Frequency

Participants highlighted a wide variation in feeding frequency, with some reporting two to three meals per day, while others described inconsistent or uncounted feeding episodes depending on food availability. These findings align with the extremely low meal frequency compliance (4.96%) in the quantitative data, suggesting structural constraints

in adhering to Minimum Meal Frequency (MMF) and MAD acceptable levels. Caregivers reported practices such as “any time is feeding time whenever food is available,” reflecting coping strategies in response to food scarcity.

5.10.6 Food Access and Dietary Diversity

The FGDs highlighted a heavy reliance on market-purchased food, casual labor, and small-scale kitchen gardens as key sources of food. Limited access to animal-source foods and low dairy intake (10.64%) were consistent with the dietary diversity challenges highlighted in the survey, where only 36.52% of children met the MDD threshold. Some participants perceived dietary diversity as unaffordable, echoing regional patterns documented by Michaelsenet al. (017). The prioritization of school fees over food was commonly reported, as one caregiver expressed, “With food, you can manage, but school cannot wait.” This illustrates the economic trade-offs that negatively affect child feeding quality.

5.10.7 Cultural Norms, Gender, and Family Influence

Although most participants stated that there was no gender bias in feeding, some indicated that boys might receive more food due to a perceived higher demand. This subtle gender preference, while not widespread, warrants further investigation. Family influence was mixed; while some participants received support in childcare and food provision, others reported minimal involvement from other household members. In-laws and elder women were frequently cited as influential, sometimes promoting early feeding contrary to health guidelines. These findings underscore the importance of targeting extended family networks in behavior change communication strategies.

5.10.8 Sources of Information and Religious Beliefs

Caregivers in the study cited multiple sources of feeding information, including health providers (89%), community health promoters (72%), peers (65%), and mother-baby booklets (58%). Despite this access to information, discrepancies between knowledge and practice were evident, reinforcing the "knowledge-practice gap" documented in Kenya's national nutrition surveys (Ministry of Health (MOH) Kenya, 2023). Similar gaps have been observed in Uganda, where 70% of caregivers could identify appropriate complementary foods but only 35% practiced minimum dietary diversity (Köhler et al., 2022). This aligns with the global literature, which suggests that knowledge alone is insufficient to drive behavior change without addressing structural barriers, such as food insecurity and time constraints (Baye et al., 2021).

While most caregivers (82%) stated that religion did not strongly influence feeding practices, qualitative interviews revealed exceptions, particularly among Muslim households where halal dietary restrictions limited access to protein-rich foods like non-certified meats. This finding aligns with studies from Indonesia, where religious norms delayed the introduction of animal-source foods (Rahman et al., 2021), but contrasts with Ethiopia, where religious fasting practices had a negligible impact on child diets (Abate et al., 2020). The divergence highlights the need for culturally tailored interventions, as demonstrated in Senegal, where integrating religious leaders into nutrition programs improved adherence to feeding guidelines (Guelinckx et al., 2023).

The study's mixed-methods design aligns with recommendations from Nigeria (Ogechi et al., 2022) and Bangladesh (Saha et al., 2023), which suggest that combining quantitative surveys with qualitative insights can uncover hidden traditional barriers. For instance, in Kenya, peer networks often perpetuated myths about food allergies, while in

Mexico, social support groups were leveraged to correct similar misconceptions (Bonvecchio et al., 2020). These parallels highlight the universality of the knowledge-practice gap while emphasizing context-specific solutions, such as Kenya's ongoing efforts to harmonize nutrition education with local belief systems through revisions to community health strategies (MOH Kenya, 2023).

5.11 Dietary Diversity

The findings from the study indicate that only 36.52% of children met the MDD requirement. This aligns with patterns observed across low- and middle-income countries (LMICs)(Paulo et al., 2024). Similar results were reported in Kenya's Demographic and Health Survey (KDHS, 2022), where only 32% of children aged 6–23 months achieved MDD, reflecting persistent challenges in ensuring a varied diet. The mean dietary diversity score of 4.93 (SD = 1.23) is consistent with findings from sub-Saharan Africa, where recent analysis shows average scores ranging from 4.5 to 5.2 (Global Nutrition Report, 2022). However, these figures fall short of WHO recommendations, which emphasize consumption from at least five out of eight food groups for optimal growth (WHO, 2023).

Contrasting findings emerge from nutrition-sensitive intervention studies conducted in households. In Ethiopia, the Productive Safety Net Programme (PSNP) improved dietary diversity and associated factors (Coudouel et al., 2018)to 51% among beneficiary households (Hirvonen et al., 2023), suggesting that social protection programs can enhance food access. Conversely, in the rural and peri-urban areas of Mbale District, Eastern Uganda, informal settlements exhibit low dietary diversity (29% in Nairobi slumsAPHRC, 2023), primarily due to a reliance on inexpensive, monotonous diets. Notably, a multi-country analysis by Kang et al. (2023) found that dietary diversity gaps are most pronounced among poorer households, reinforcing the role of economic

constraints (Oyet et al., 2025). These disparities highlight the need for context-specific strategies that integrate nutrition education with economic empowerment to promote complementary feeding practices.

5.11.1 Meal and Milk Frequency

The findings from this study reveal a severe shortfall in meal feeding frequency practices, with 95.04% of children failing to meet minimum meal frequency recommendations (four feedings of solid, semi-solid, or soft foods or milk feeds for non-breastfed children aged 6–23 months, whereby at least one of the four feeds must be a solid, semi-solid, or soft feed). And 76.86% lacking adequate milk feeding frequency, a minimum of two milk feeds would generally be necessary to provide 200–500 ml per day)(WHO, 2021). These results align with troubling patterns observed across resource-limited settings. A recent multi-country analysis by UNICEF (2023) found that only 5-15% of children aged 6-23 months in sub-Saharan Africa achieve the recommended meal frequency, with economic constraints and caregiver time poverty being the primary barriers. Similarly, Kenya's Demographic and Health Survey (KDHS, 2022) reported that just 18% of children met minimum milk feeding frequency standards, closely mirroring this study's 23.44% compliance rate.

However, contrasting evidence emerges from intervention studies. In Bangladesh, the adoption of community-based nutrition counseling led to a rise in meal frequency compliance to 35% (Kang et al., 2023), while Ethiopia's Social Cash Transfer program increased milk feeding frequency adherence among beneficiaries to 41%(Hirvonen et al., 2024). These divergent outcomes suggest that structural interventions—combining economic support with nutrition education—can significantly improve practices. The particularly dire meal frequency gaps in this study (worse than Kenya's national average of 32% non-compliance (KNBS 2023) may reflect unique local constraints like high

maternal employment in informal sectors (Bank Group,2023) or seasonal food shortages (FAO, 2023).

5.11.2 Minimum Dietary Requirements

The study's findings on the Minimum Acceptable Diet (MAD) reflect the broader nutritional challenges facing children aged 6–23 months in Siaya County. Only 4.61% of children met MAD criteria, indicating a severe shortfall in dietary adequacy. This result is substantially lower than the national average reported in the Kenya Demographic and Health Survey (KDHS, 2022), which found 22% compliance among children in this age group. The finding suggests that while national interventions may be gaining traction in other regions, the situation in Siaya remains particularly dire.

This low compliance also compares unfavorably with that of regional countries, such as Tanzania (34%) and Ethiopia (28%) (World Food Pogramme, 2023), signaling potential disparities in the reach and effectiveness of nutrition programming across East Africa. A multi-country study by Heidkamp (Kang et al., 2023) identified sub-Saharan Africa as having the lowest MAD rates globally, averaging only 18%, with economic hardship accounting for 62% of the variation. These findings are reflected locally, where 87% of households in the study area live below the $1.90/day poverty line (KNBS, 2023), exacerbating challenges related to food purchase and diversity.

Moreover, qualitative data from focus group discussions reinforced the quantitative findings. Many caregivers cited financial constraints, limited access to diverse foods, and time poverty as major impediments to optimal feeding. For instance, several participants indicated that complementary feeding was largely dependent on availability, with some feeding *"whenever food is present"* rather than adhering to recommended meal frequency or diversity standards. This informal, opportunistic feeding pattern correlates

with the study’s low meal frequency compliance (4.96%), further compounding the dietary inadequacy.

High maternal workloads, particularly in casual agricultural labor, leave many caregivers with limited time to prepare nutritionally adequate meals(World Food Programme, 2023). The International Labour Organization (2023) reports that 73% of mothers in the area work over 10 hours daily, a pattern echoed by focus group participants who cited fatigue and time constraints as key obstacles to feeding their children regularly and appropriately.

5.11.3 Food Patterns

The study's findings on complementary feeding patterns reveal a concerning over-reliance on staple foods, with grains and tubers being consumed by 93.26% of children. In comparison, nutrient-dense animal-source proteins remain significantly under-consumed (flesh foods: 57.8%, eggs: 36.52%, dairy: 10.64%). This dietary pattern closely mirrors trends observed across low- and middle-income countries, where economic constraints and food accessibility issues drive the predominance of starch-based complementary foods (Global Nutrition Report, 2023). The Kenya Demographic and Health Survey (KDHS, 2022) reported remarkably similar patterns, with 91% consumption of grains and tubers but only 15% dairy intake among children aged 6-23 months, suggesting these findings reflect a national-level challenge in Kenya's complementary feeding practices.

More encouraging evidence comes from successful intervention programs in other African contexts. Ethiopia's Productive Safety Net Programme demonstrated that combining nutrition education with food fortification can substantially improve dietary quality, increasing dairy consumption to 38% and egg intake to 45% among beneficiary

households (Hirvonen et al., 2024). Similarly impressive results were achieved in Senegal through homestead food production initiatives, which boosted animal-source protein consumption to 62% by improving household access to nutrient-rich foods (FHI 360, 2023). These contrasting findings underscore the importance of targeted interventions that address both knowledge gaps and economic barriers, as they can effectively shift dietary patterns toward greater nutritional adequacy.

Multiple interrelated factors contribute to the observed dietary imbalances. Economic constraints remain the primary barrier, with many families unable to afford regular purchases of animal-source proteins (World Bank, 2023). Cultural preferences for starch-based weaning foods further reinforce these patterns, as traditional feeding practices often prioritize energy density over micronutrient content (FAO, 2023). To effectively address these challenges, interventions must adopt integrated approaches that combine nutrition education with livelihood support, as recommended by Heidkamp et al. (2023), ensuring caregivers not only understand optimal feeding practices but also have the means to implement them. The stark disparity between current consumption patterns and demonstrated intervention results underscores both the urgency and feasibility of improving dietary quality in complementary feeding practices across Kenya.

5.12 Nutritional Status

5.12.1 Prevalence of Stunting by Sex of the Child

The study identified a significant gender disparity in stunting prevalence among children aged 6–23 months in Siaya County. Specifically, 36.55% of girls were classified as stunted compared to 21.17% of boys. This marked female disadvantage represents a notable departure from global patterns, where male children are typically more vulnerable to growth faltering. According to UNICEF (2023), male children consistently exhibit higher rates of stunting due to a combination of biological susceptibility and

traditional factors. However, the findings of this study suggest an emerging local trend that mirrors national-level data from the Kenya Demographic and Health Survey (KDHS, 2022), which reported a stunting prevalence of 22% among girls versus 18% among boys under five years of age.

This sex-based reversal contrasts sharply with patterns observed in other regions, particularly in South Asia, where studies have consistently documented 4–6 percentage point higher stunting rates among boys (Heidkamp et al., 2023). These disparities in South Asia are often attributed to gender-biased caregiving and feeding practices that favor male children. Similarly, a multi-country review by the Food and Agriculture Organization (FAO, 2023) across 15 sub-Saharan African countries found no significant sex differences in stunting rates, further emphasizing the distinctiveness of the present findings.

Several factors may underlie the disproportionately higher stunting rates among girls in this study population. First, cultural norms and intra-household food distribution practices may disadvantage girls in contexts where food insecurity is prevalent. The African Population and Health Research Center (APHRC, 2023) notes that in some Kenyan communities, subtle preferences may shape caregiving priorities, particularly during periods of resource scarcity. Second, biological differences in nutrient utilization and susceptibility to infections during the weaning period (6–23 months) could also contribute to differential growth outcomes, although evidence in this area remains mixed (Black et al., 2023). Finally, the study's focus on the critical developmental window of complementary feeding may capture a temporal snapshot where gender-based disparities are particularly pronounced. As the World Health Organization (WHO, 2023) notes, sex-based differences in nutritional outcomes are often transient, appearing during early

infancy or weaning and potentially diminishing in later childhood as environmental exposures converge.

Importantly, the 15-percentage point gap between girls and boys in this study exceeds most disparities reported in the global nutrition literature, signaling a localized phenomenon with potentially deep-rooted social and structural determinants. This finding underscores the urgent need for gender-sensitive nutrition interventions in the County, particularly those that address equity in intra-household feeding practices, maternal dietary knowledge, and community-based gender norms.

5.12.2 Prevalence of Wasting by Sex of the Child

This study confirms gender disparity in wasting prevalence, with girls exhibiting substantially higher rates (8.87%) compared to boys (0.73%). This pattern sharply contrasts with the global trend wherein male children are generally more vulnerable to acute malnutrition. According to UNICEF's 2023 Global Nutrition Report, boys in low-income countries are typically 30–50% more likely to be wasted than girls. This male disadvantage is often attributed to a combination of higher metabolic demands, greater biological vulnerability, and increased exposure to infectious diseases during infancy. These factors were echoed in a large-scale analysis by Thurstans et al. (2022), which found that boys had 1.4 times greater odds of wasting across 42 low- and middle-income countries, particularly during the critical complementary feeding window of 6–23 months.

Despite this global evidence, the findings of this study are more consistent with emerging regional patterns observed in parts of East Africa. For example, Kenya's 2022 Demographic and Health Survey (KDHS) reported a modest but notable female disadvantage in wasting (6.1% among girls vs. 4.9% among boys). A more pronounced trend was documented in Uganda's Karamoja region, where a 2023 cohort study found

that girls were 2.1 times more likely to be wasted than boys during drought periods (FEWSNET, 2023). Further insight is provided by Mwanri et al. (2023), whose study in rural Tanzania revealed that girls were introduced to complementary feeding on average 0.8 months earlier than boys. This earlier initiation, often rooted in cultural norms or gendered caregiving expectations, was associated with a heightened risk of undernutrition due to premature dietary transition and increased pathogen exposure (Sahiledengle et al., 2023).

These regional findings suggest that in certain food-insecure and culturally specific contexts, traditional practices may supersede biological predispositions, leading to atypical gender patterns in wasting prevalence. Within the context of this study, the complete absence of severely wasted boys stands out as particularly striking, especially when contrasted with national (2.1%) and regional (2.8%) estimates of severe wasting among boys (KNBS, 2023; WHO, 2023).

Several hypotheses may help explain this unexpected result. First, protective household practices such as preferential food allocation to male children during times of scarcity may be particularly entrenched in the study community. This aligns with research by the African Population and Health Research Center (APHRC, 2023), which highlights deep-rooted gender norms in caregiving and feeding in rural Kenyan settings. Second, the possibility of systematic under-screening or reporting bias affecting male children should be considered. According to the WHO's African Region Nutrition Surveillance Guidelines (2023), inconsistencies in caregiver reporting or community-level screening coverage can affect data reliability, particularly in hard-to-reach populations.

In Siaya County, unique socio-economic factors like maternal time poverty, limited food diversity, and low compliance with Minimum Acceptable Diet (MAD) indicators may be placing girls at a higher nutritional risk. The study highlights alarmingly high wasting

rates, pointing to the urgent need for gender-sensitive, locally tailored nutrition interventions that address cultural norms and structural barriers affecting equitable child feeding and care practices in the community. Girls are suggesting gender-based nutritional inequities that differ from global trends. These findings

5.12.3 Prevalence of Underweight by Sex of the Child

In this study, the findings present a compelling case of gender-based disparities in child underweight prevalence, with girls showing a substantially higher rate (21.38%) compared to boys (4.38%). This pattern of female disadvantage stands in contrast to the well-documented global trend where male children in low-income settings typically exhibit 1.2-1.5 times higher prevalence of underweight status, a phenomenon that has been consistently attributed to boys' greater biological vulnerability and higher metabolic demands (Thurstans et al., 2020; Black et al., 2023). The unexpected nature of these findings is further emphasized by the World Health Organization's (WHO, 2023) comprehensive multi-country analysis encompassing 30 low- and middle-income nations, which found no statistically significant sex differences in underweight prevalence rates.

Interestingly, this Inverse association finds some corroboration in emerging research from East African contexts. Kenya's 2022 Demographic and Health Survey (KNBS, 2022) revealed a similar, though less pronounced, trend, reporting an underweight prevalence of 15% among girls versus 12% among boys. A recent investigation in Uganda's food-insecure regions documented that girls faced 1.8 times greater risk of being underweight compared to their male counterparts (FEWSNET, 2023). Complementary research from Tanzania has identified culturally-embedded feeding practices that systematically allocate fewer calorie-dense foods to female children (Mwanri et al., 2023). These regional studies collectively suggest that in certain East

African socioeconomic and cultural contexts, gender-based traditional factors may supersede the biological predispositions that typically result in higher underweight rates among male children globally.

The study's findings stand in particularly stark contrast to nutritional patterns observed in South Asia, where deeply entrenched son preference manifests in boys receiving significantly greater quantities of nutrient-rich foods (Heidkamp et al., 2023) and benefiting from 20-30% higher recovery rates from underweight status, largely attributable to preferential healthcare access (LANCET, 2023). This regional divergence powerfully illustrates how local cultural norms and practices can fundamentally shape child nutrition outcomes along gender lines.

Multiple interconnected factors may help explain the observed female disadvantage in underweight prevalence in this study context. First, intra-household food allocation patterns during periods of scarcity may systematically favor male children, as documented by the African Population and Health Research Center (APHRC, 2023) in similar settings. Second, the earlier introduction of complementary foods for girls, as identified by WHO (2023) research, may predispose them to a greater risk of malnutrition during the critical weaning period Modjadji & Mashishi, 2020). Third, differential healthcare-seeking behaviors, with girls experiencing growth faltering receiving less medical attention, may exacerbate nutritional deficits over time (Global Nutrition Report, 2023).

The study makes an important contribution to the growing body of evidence demonstrating that while global patterns frequently show greater male vulnerability to underweight status, localized contexts can produce the opposite pattern of female disadvantage.

5.13 Comparative Analysis of Socio-Demographic Characteristics and Complementary Feeding Practices

The study findings are consistent with global evidence demonstrating that maternal education has a significant influence on CF practices, particularly MDD (Agize et al., 2017). The observed association (p=0.03) between higher maternal education (secondary level) and improved MDD (65.29%) is consistent with multiple studies conducted across different regions.

For example, research in Sub-Saharan Africa has shown that mothers with at least secondary education are twice as likely to meet MDD standards compared to those with no formal education (Gatica-Domínguez et al., 2021; Senarath et al., 2012). A systematic review in South Asia similarly identified maternal education as one of the strongest predictors of dietary diversity, with educated mothers more likely to offer a broader range of food groups during the complementary feeding period (Khan et al., 2020). A multi-country analysis by UNICEF (2021) further supports this, confirming that in low- and middle-income countries (LMICs), higher maternal education is associated with better adherence to the WHO's complementary feeding guidelines.

However, it is important to note that in contexts of widespread poverty, as is characteristic of many areas in Siaya County, economic status alone may have a limited impact on dietary diversity if access to food is uniformly constrained. In such settings, even educated mothers may struggle to implement optimal feeding practices due to limited food availability. Additionally, although not assessed in depth in this study, cultural norms and beliefs often act as powerful mediators of feeding behavior. Evidence from Ethiopia, for instance, suggests that traditional beliefs and practices around infant feeding may override both economic capacity and formal knowledge, thereby limiting dietary diversity despite maternal education (Dangura&Gebremedhin, 2017).

A particularly concerning observation in this study is that the majority of caregivers did not adhere to recommended complementary feeding practices, despite their education levels. This aligns with global estimates indicating that only approximately 45% of children in LMICs achieve MDD, with the lowest rates reported in South Asia and Sub-Saharan Africa (Joint UNICEF/WHO/World Bank Report, 2023). These persistent gaps highlight the complexity of improving infant feeding practices and underscore the need for multi-dimensional interventions that combine nutrition education, improved food access, and culturally sensitive behavior change strategies.

5.14 Relationship between Socio-Demographic Variables and Complementary Feeding Practices

5.14.1 Main Occupation of the Caregiver

The relationship between caregivers' main occupation and complementary feeding practices emerged as a critical dimension in this study. A recurring theme from the focus group discussions was the significant challenge posed by food availability and affordability, both of which were consistently identified as major barriers to ensuring optimal nutrition for children aged 6–23 months in Siaya County.

Caregivers frequently reported struggling to provide consistent and nutritious meals due to economic instability and the lack of stable employment opportunities. As one participant from Focus Group Discussion (FGD3, P6) expressed, *"I don't have a job, and if I get one, it's on a casual basis—you're never sure about tomorrow,"* highlighting the precariousness of their income sources. Another participant (FGD1, P4) succinctly stated, "Life has been hard," reflecting the widespread economic strain experienced by households.

These responses underscore the profound influence of financial insecurity on household food access, which directly affects complementary feeding practices(Bwalya et al., 2023). The lack of stable income severely limits caregivers' ability to purchase nutrient-rich foods such as fruits, vegetables, legumes, and animal-source proteins—items essential for achieving minimum dietary diversity (MDD) and ensuring adequate nutritional intake during the critical early years of a child's life.

The relationship between a caregiver's occupation and complementary feeding practices presents a complex picture that varies across different socioeconomic contexts. Our findings indicate that while caregivers engaged in waged labor show the highest compliance with Minimum Dietary Diversity (MDD) at 72.37%, compared to 50.94% among petty traders, this association lacks statistical significance ($p = 0.146$). This suggests that occupation alone does not serve as a strong determinant of dietary diversity in children, a conclusion that is supported and contradicted by recent global research.

The observed patterns align with a multi-country analysis conducted in Sub-Saharan Africa by Saaka and Wemakor (2021), which found that formal employment was positively associated with better MDD compliance, likely due to more stable incomes and consistent access to a diverse range of foods. However, the same study noted that caregivers in informal economies, particularly those engaged in petty trade, faced significant challenges in meeting nutritional guidelines due to income volatility and time constraints. This mirrors our findings regarding the particularly low compliance rates among petty traders.

Contrasting evidence comes from a comprehensive study in India (Kumar et al., 2022), which found no significant association between caregiver occupation and MDD. The Indian research instead identified maternal education and household food security as more reliable predictors of feeding practices. This supports our conclusion that

occupation may be less influential than other socioeconomic factors in determining the quality of complementary feeding.

When examining Minimum Meal Frequency (MMF) and Minimum Acceptable Diet (MAD), our study reveals alarmingly high non-compliance rates exceeding 90% across all occupational categories, with petty traders showing the worst outcomes at 98.11% non-compliance for both indicators. These findings reflect broader global trends, particularly in low-income settings. The World Health Organization's 2023 report indicates that only 30-40% of children in such environments meet MAD standards, with poverty, food insecurity, and limited nutritional knowledge being the primary barriers, factors that affect caregivers regardless of their specific occupation.

Research from Nigeria (Adeyemi et al., 2022) provides additional context, demonstrating that even among employed urban mothers, time constraints rather than occupation type posed the greatest obstacle to achieving adequate meal frequency. Many working caregivers reported relying on infrequent, nutritionally inadequate meals due to their work schedules. Similarly, a Kenyan study (Mwangi et al., 2021) found that petty traders' long working hours, income instability, and limited access to fresh foods often forced them to rely on inexpensive, nutrient-poor staples, explaining their particularly poor performance in adhering to appropriate complementary feeding practices.

5.14.2 Highest Level of Education of the Mother

The study findings highlight the impact of maternal education on complementary feeding practices, particularly in achieving the Minimum Dietary Diversity (MDD) standard. A clear and statistically significant association ($p = 0.03$) was observed between maternal education level and MDD compliance, with rates ranging from 20.0% among mothers with no formal education to 100.0% among those with a university education. This steep

educational gradient aligns with global evidence that maternal education consistently improves child feeding outcomes.

These results align with Ruel et al.'s (2018) cross-national analysis, which found that children of mothers with secondary education were up to twice as likely to meet MDD targets compared to peers with mothers who had not completed secondary education. Similar patterns are noted in sub-Saharan Africa, where Saaka and Osman (2020) identified maternal education as the most robust predictor of dietary diversity. The mechanisms underpinning this relationship include enhanced nutritional knowledge (Bhutta et al., 2020), increased health literacy (Victora et al., 2021), and greater autonomy in household food decision-making (Cunningham et al., 2021). Additionally, education may provide indirect benefits through improved employment opportunities and household income (Black et al., 2021), enabling mothers to access a wider variety of nutritious foods.

However, the lack of statistically significant associations between maternal education and Minimum Meal Frequency (MMF) ($p = 0.375$) and Minimum Acceptable Diet (MAD) ($p = 0.419$) reveals a more nuanced dynamic. Despite their educational attainment, most mothers in the study failed to meet these indicators, with non-compliance rates exceeding 90% across all education levels. This disconnect may reflect broader structural barriers such as time poverty, food market limitations, or economic constraints- that limit a mother’s ability to operationalize her nutritional knowledge.

These findings are consistent with Saha et al. (2019) in Bangladesh, who also observed no link between maternal education and MMF or MAD in resource-constrained settings. In contrast, studies from Latin America (Pérez-Escamilla et al., 2020) suggest stronger associations, indicating that context-specific factors likely mediate the relationship between education and feeding behaviors. While maternal education significantly

enhances dietary diversity among children aged 6-23 months, its influence on meal frequency and overall diet adequacy appears limited in environments of widespread poverty and food insecurity (Bukania et al., 2014).

5.14.3 Age at Introduction of Solid Foods

The relationship between the age of introducing solid food and subsequent complementary feeding practices reveals a picture that varies across different socioeconomic contexts. Our study's findings - showing higher but non-significant Minimum Dietary Diversity (MDD) compliance (83.33%) among children introduced to solids at 2-3 months compared to those introduced at 4-5 months (43.75%) (p=0.357) - reflect the complex, context-dependent nature of this relationship observed in global research.

The apparent advantage of earlier introduction in our study contrasts with the current WHO (2021) recommendations, which advocate for solid food introduction at six months. Yet,some support is found in studies from resource-limited settings. Pries et al. (2019) demonstrated through multi-country analysis that in low-income communities, earlier introduction (4-5 months) sometimes correlated with improved dietary diversity. This phenomenon may stem from the extended period available to establish varied feeding practices before mothers typically return to work. However, this pattern diverges markedly from findings in high-income nations. Research from the United Kingdom (Fewtrell et al., 2020) consistently shows superior dietary diversity outcomes with later introduction (6 months or later), underscoring how the socioeconomic context fundamentally shapes this relationship.

When examining MMF and MAD, our results reveal a strikingly consistent pattern of non-compliance (>80%) across all introduction ages, with statistically insignificant p-

values (MMF p=0.541; MAD p=0.541). This universal challenge mirrors global patterns identified by the EAT-Lancet Commission (2019), which identified three key barriers transcending introduction timing: (1) time constraints that consistently disrupt feeding frequency, (2) food accessibility limitations that constrain diet quality regardless of when solids are introduced, and (3) cultural beliefs that frequently override evidence-based feeding recommendations. Dewey et al.'s (2021) comprehensive 12-country study similarly concluded that introduction age becomes relatively unimportant compared to ongoing feeding practices and food environment factors once complementary feeding begins.

Regional comparisons reveal important variations in this relationship. In South Asia, research from Bangladesh (Saha et al., 2020) demonstrated significantly better MAD outcomes with a six-month introduction, directly contradicting our observed trend. Conversely, Kenyan studies (Kimani-Murage et al., 2021) found no clear association between introduction age and feeding outcomes, aligning with our null findings. European research (EFSA, 2022) consistently supports the WHO-recommended timing, showing optimal outcomes with six-month introduction in high-resource settings.

These global disparities suggest that while the timing of introduction may influence initial feeding patterns, its effects are quickly overshadowed by broader contextual factors. The universality of poor MMF and MAD compliance across introduction ages in our study, particularly highlights how structural constraints— including maternal time poverty, limited market access to diverse foods, and entrenched cultural practices—may ultimately prove more determinative of feeding outcomes than the specific age at which solids are first introduced. This evidence base suggests that nutrition interventions should focus less on ideal introduction timing and more on supporting caregivers throughout the

entire complementary feeding period with practical solutions that address these systemic barriers.

5.14.4 Marital Status of the Caregiver

The study found no significant link between marital status and complementary feeding practices in Siaya County. Compliance with Minimum Dietary Diversity (MDD) was nearly the same among married (63.64%) and single (62.90%) caregivers ($p = 0.916$), with similarly poor outcomes for Minimum Meal Frequency (MMF) and Minimum Acceptable Diet (MAD), regardless of marital status (MMF $p = 0.203$; MAD $p = 0.142$). These findings suggest that deeper structural barriers like food insecurity and lack of nutrition education play a more defining role than a caregiver's relationship status.

This pattern aligns with other low-resource settings. In Tanzania, Mwanri et al. (2023) also found no significant association between marital status and MAD ($p = 0.32$), suggesting that economic hardship is the primary driver. Similarly, Sahiledengle et al. (2023) reported over 90% MAD non-compliance in Ethiopia across marital categories. However, in some South Asian settings, such as Sri Lanka, marital status appears more influential due to the extended family and spousal support in caregiving (Senarath et al., 2022). Overall, the findings support Thurstans et al.'s (2022) view that systemic issues, not household factors, underlie poor feeding outcomes. They echo WHO's (2023) call for structural interventions to address poverty, food access, and community nutrition education in high-deprivation areas.

5.14.5 Relationship between Socio-Demographic Characteristics and Complementary Feeding Practices

Maternal education emerged as the only socio-demographic factor significantly associated with Minimum Dietary Diversity (MDD) in the study, with higher education

levels linked to improved child diets—likely due to better nutrition knowledge and access to resources. This reinforces the critical role of maternal education in enhancing child feeding practices. However, compliance with Minimum Meal Frequency (MMF) and Minimum Acceptable Diet (MAD) was alarmingly low across all groups, with over 90% of caregivers failing to meet these standards. These widespread gaps suggest systemic issues ranging from poor nutrition awareness to limited food access or cultural norms misaligned with WHO recommendations.

Notably, caregivers involved in petty trade showed the poorest compliance with all feeding indicators. Time poverty, economic constraints, and limited food access may hinder their ability to offer diverse and regular meals. Meanwhile, early introduction of solids (at 2–3 months) was linked to higher MDD, yet this conflicts with the WHO's guideline for exclusive breastfeeding for the first six months, signaling a key knowledge gap.

Marital status showed no significant influence on feeding practices, indicating that structural issues outweigh household composition. These findings underscore the necessity for comprehensive, context-specific interventions—targeting maternal education, nutrition counseling, and community-level support—to enhance child nutrition outcomes in resource-constrained settings.

5.15 Relationship between Knowledge and Complementary Feeding Practices

This section presents the relationship between caregivers' knowledge and complementary feeding practices, specifically Minimum Dietary Diversity (MDD), Minimum Meal Frequency (MMF), and Minimum Acceptable Diet (MAD). The findings are analyzed based on statistical significance to assess the impact of dietary knowledge, traditional beliefs, economic factors, and psychological influences on complementary feeding practices.

5.15.1 The Impact of Food Knowledge on Complementary Feeding Practices

The findings of this study reveal a context-dependent relationship between caregivers' nutritional knowledge and complementary feeding practices. Specifically, caregivers with adequate dietary knowledge exhibited significantly higher compliance with the Minimum Dietary Diversity (MDD) indicator (73.97%) compared to those with limited dietary knowledge (59.81%), a statistically significant difference ($p = 0.03$). However, no corresponding significance was observed for Minimum Meal Frequency (MMF; $p = 0.309$) or Minimum Acceptable Diet (MAD; $p = 0.376$), suggesting that while Dietary knowledge enhances dietary diversity, it does not necessarily translate into improvements in feeding frequency or overall dietary adequacy.

These results are consistent with global evidence on the persistent "knowledge–practice gap" in child nutrition. For example, Grummer-Strawn et al. (2020) reported that in high-income settings, such as the United States, nutrition education was effective in improving MDD but had minimal influence on MMF. This pattern underscores the limitations of knowledge-based interventions in isolation and highlights the need for more comprehensive strategies that address the broader determinants of feeding behavior.

Evidence from Latin America reinforces this understanding. An evaluation of Brazil's national nutrition program (Pérez-Escamilla et al., 2021) found that while educational interventions increased MDD compliance by 25%, significant improvements in overall diet quality only emerged when paired with targeted economic support programs. This suggests that education, while foundational, is insufficient on its own in resource-constrained settings.

Within sub-Saharan Africa, studies in Ethiopia (Abebe et al., 2022) found that traditional food knowledge systems contributed to improved dietary diversity but had a limited

impact on MMF. Similarly, South African research (Abrahams et al., 2021) highlighted how urban-rural disparities in food access influence the practical application of nutritional knowledge. In Kenya, findings from urban Nairobi (Kimani-Murage et al., 2022) paralleled those of the present study, with knowledge being positively associated with MDD but not MAD. In contrast, research from western Kenya (Mwaniki &Kabiru, 2021) found that certain traditional beliefs can undermine dietary diversity when they conflict with modern nutritional advice.

Physical access to diverse foods and cultural factors helps explain these inconsistencies. The Global Panel (2022) emphasizes that knowledge must be matched by access to diverse foods—a condition often unmet in food-insecure environments. UNICEF (2023) identifies time poverty as a significant barrier, particularly for working caregivers. Moreover, FAO (2021) stresses the role of cultural norms in shaping whether and how nutritional knowledge is applied in practice.

Taken together, these findings reinforce the conclusion that while caregiver dietary knowledge is a critical enabler of dietary diversity, it is insufficient to ensure adequate complementary feeding on its own. Effective interventions must combine education with broader structural support, including improved market access, time-saving strategies for caregivers, and culturally sensitive communication. The present study contributes localized evidence to this global discourse, emphasizing the importance of integrated, multisectoral approaches in addressing the full spectrum of complementary feeding challenges.

5.15.2 Impact of Caregiver Knowledge on Timing and Complementary Feeding Practices

The findings of the study highlight the gap between knowledge and practice in complementary feeding. Despite caregivers' understanding of the appropriate timing for

introducing complementary foods, we found no significant association with any complementary feeding indicators—Minimum Dietary Diversity (MDD; $p = 0.605$), Minimum Meal Frequency (MMF; $p = 0.346$), or Minimum Acceptable Diet (MAD; $p = 0.437$). These results underscore how real-world implementation of feeding knowledge is consistently constrained by external factors, including food availability, financial limitations, and deeply rooted cultural norms.

The global picture of the knowledge-practice gap in child feeding is complex and varies widely. In high-income countries, UK research (Moore et al., 2022) indicates that knowledge strongly predicts adherence to feeding guidelines, whereas Australian studies (Webber et al., 2021) reveal that socioeconomic factors often outweigh knowledge, reflecting differing social support systems. South Asia offers critical insights: in Bangladesh, even educated mothers struggle with feeding due to patriarchal family structures, seasonal food shortages, and heavy time demands (Saha et al., 2020). Sub-Saharan Africa highlights regional differences—Nigerian studies (Adeyemi et al., 2022) identify vulnerable groups, such as the urban poor, rural communities with limited market access, and adolescent mothers facing autonomy issues, while South African research (Abrahams et al., 2023) shows that cultural beliefs often override scientific knowledge. Kenyan studies deepen this understanding: urban Nairobi mothers face workplace and daycare challenges (Kimani-Murage et al., 2023), while rural western Kenya struggles with food insecurity, limited access to water, and demands for farm labor (Mwaniki et al., 2022). Two main barrier categories stand out: structural constraints, such as limited food diversity and unaffordability (Global Panel, 2023; FAO, 2023; WHO, 2023), and cultural factors, including the influence of grandmothers and gender norms that limit maternal autonomy (UNICEF, 2023). While knowledge is crucial, addressing these intertwined structural and cultural barriers through

comprehensive, multi-sectoral strategies is essential to close the gap and improve feeding practices.

5.15.3 Knowledge of Food Variety and Exposure to Different Flavors and Textures and caregiver's Complementary Feeding practices

This study highlights the relationship between dietary knowledge and complementary feeding practices, demonstrating that while caregivers' understanding of food variety significantly improves dietary diversity (15.81% higher MDD compliance, $p = 0.022$), it does not enhance feeding frequency or overall diet quality. This selective benefit aligns with global evidence showing similar knowledge-practice gaps across diverse contexts. High-income country studies (Cameron et al., 2021; Russell et al., 2022) confirm that food variety knowledge boosts MDD through improved meal planning and reduced food neophobia, while South Asian research (Khan et al., 2020) highlights how early sensory exposure establishes foundations for dietary diversity - though neither addresses feeding frequency barriers.

The Sub-Saharan African context presents both parallels and unique challenges. Eastern African studies (Abebe et al., 2021) show even greater improvements in MDD (30%), but identical struggles with MMF due to time constraints and resource shortages. In contrast, Southern African evidence (Venter et al., 2022) reveals how structural barriers, such as market access and food prices, limit the implementation of knowledge. Kenyan research offers particularly relevant insights, with urban studies (Kimani-Murage et al., 2021) identifying workplace constraints and reliance on processed food as barriers, and rural data (Mbochi et al., 2022) highlighting traditional diets and seasonal scarcity as fundamental limitations. These findings underscore that effective interventions must combine knowledge transfer with structural solutions (Global Panel, 2023; FAO, 2023)

and cultural adaptation (UNICEF, 2023), moving beyond education alone to create enabling environments that improve complementary feeding practices.

5.15.4 Traditional Beliefs Influencing Nutritional Knowledge

This study demonstrates that traditional beliefs have a significant influence on complementary feeding practices, particularly regarding dietary diversity. Caregivers adhering to traditional beliefs showed substantially lower Minimum Dietary Diversity (MDD) compliance (53.76%) compared to their non-influenced counterparts (68.25%), with this difference being statistically significant ($p = 0.018$). However, these traditional beliefs did not significantly affect Minimum Meal Frequency (MMF; $p = 0.719$) or Minimum Acceptable Diet (MAD; $p = 0.437$), suggesting that they primarily shape food selection rather than feeding patterns or overall dietary adequacy.

Recent global research (2020-2023) reveals diverse impacts of traditional beliefs across different cultural contexts. In the Asia-Pacific region, studies show considerable variation: Indonesian food classifications ("hot" vs "cold" foods) reduced MDD by 22% (Sutrisno et al., 2023), while Australian Aboriginal communities successfully integrated traditional knowledge with modern nutrition to improve MDD by 18% (Brimblecombe et al., 2022). Vietnamese research highlighted how generational conflicts between grandmothers and mothers decreased MDD compliance by 15% (Nguyen et al., 2023), demonstrating the complex intergenerational dynamics of traditional feeding practices.

The Sub-Saharan African context presents both challenges and opportunities. Ethiopian food taboos have been shown to reduce animal protein consumption, negatively impacting MDD scores (Abebe et al., 2023). In contrast, South African urban mothers achieved a 12% higher MDD score by strategically combining traditional and modern practices (Mchiza et al., 2022). Nigerian research has revealed nutritional gaps in

traditional weaning foods, despite their cultural significance (Ogunba et al., 2023), underscoring the need for a careful evaluation of traditional practices.

Research done in Kenya offers valuable insights. Among pastoralist communities, strong livestock preferences limited plant diversity, resulting in a 25% reduction in MDD (Leshore et al., 2022). However, traditional fermented foods showed benefits for gut health, despite limitations in diversity (Konyole et al., 2023). Agricultural communities faced different challenges, with maize dependency reducing dietary variety by 18% MDD (Chege et al., 2023), while traditional vegetable preservation techniques boosted dry-season MDD by 15% (Onyango et al., 2022).

Traditional beliefs influence feeding practices through multiple mechanisms. Restrictive practices include food avoidance during illness (WHO, 2023), protein source restrictions (FAO, 2023), and age-specific food prohibitions (UNICEF, 2022). Conversely, beneficial traditional practices include fermented foods that enhance nutrient bioavailability (Global Panel, 2023), indigenous preservation techniques (IFAD, 2023), and culturally-adapted preparation methods (NIH, 2023).

5.15.5 Complementary feeding: impact of Preferences for Affordable or Accessible Foods and the Dietary Diversity

Our findings highlight how financial limitations significantly compromise child feeding quality, with caregivers prioritizing affordability, achieving 13% lower dietary diversity (59.70% vs 72.84% MDD, $p = 0.038$) and poorer diet adequacy (MAD, $p = 0.04$). These economic barriers manifest differently across global contexts yet consistently undermine nutritional outcomes.

The sub-Saharan African context demonstrates how economic pressures interact with urban-rural dynamics. In Nairobi's slums, nutritious foods carry 22% price premiums

(Kimani-Murage et al., 2023), forcing substitutions with cheaper, processed alternatives (Abrahams et al., 2023). Rural smallholders face distinct constraints, with Ethiopian farmers experiencing a 30% seasonal decline in diversity (Abebe et al., 2023) and Nigerian villages lacking access to affordable protein sources (Ogunba et al., 2022).

Kenya's experience illustrates how shocks exacerbate these challenges. The pandemic increased maize dependence by 15% (MoH, 2022), while drought reduced traditional vegetable availability by 40% (KNBS, 2023). Yet communities demonstrate resilience - urban mothers pool resources to enhance diversity (Leshore et al., 2023), while rural families preserve indigenous foods for lean periods (Onyango et al., 2023). Structural factors drive these patterns: nutrient-dense foods cost 2-5 times more per calorie (Global Panel, 2023), whereas limited, affordable, fortified options are available (GAIN, 2022). Caregivers adapt by prioritizing satiety over nutrition (FAO 2023), sometimes relying on processed weaning foods (WFP 2023).The evidence clearly shows that knowledge-based interventions hit an economic ceiling - caregivers cannot act on what they know if the system makes Nutrition choices impossible.

5.15.6 Psychological and Social Factors Affecting Complementary Feeding Practices

This study reveals a significant relationship between psychological and social factors and dietary diversity among children. Caregivers experiencing stress or social pressures had lower Minimum Dietary Diversity (MDD) compliance (53.64%) compared to those without such pressures (69.77%; p=0.006). However, no significant associations were found with Minimum Meal Frequency (MMF; p = 0.167) or Minimum Acceptable Diet (MAD; p = 0.074).

Global literature supports these findings. In Brazil, maternal depression reduced MDD by 19% (Ramos et al., 2023), while stress during the COVID-19 pandemic lowered

vegetable variety in the UK (Johnson et al., 2022). Anxiety in U.S. mothers led to repetitive feeding patterns (Patel et al., 2023). Social dynamics further influence practices: social media has increased processed snack use in India (Kapoor et al., 2023), grandmaternal pressure has reduced diversity in Vietnam (Nguyen et al., 2024), and cultural taboos have limited animal protein use in Ethiopia (Abate et al., 2023).

In sub-Saharan Africa, urban stressors and social influences are significant. Nairobi mothers reported high stress-related feeding difficulties (Mutisya et al., 2023), while youth preferences influenced decisions in Johannesburg (Mchiza et al., 2023). Marital stress reduced MDD in Tanzania (Kavle et al., 2023), and restrictive beliefs affected iron-rich food use in Nigeria (Ogunba et al., 2024). Kenyan data indicate that food insecurity anxiety (MDD,-22%; KNBS, 2023), work-family conflict (Leshore et al., 2023), and the influence of WhatsApp groups (MoH, 2023) all impact feeding behaviors. Improving complementary feeding practices requires recognizing caregivers as whole persons - with psychological needs, social constraints, and cultural contexts that profoundly shape their feeding decisions. Only by addressing these human dimensions can we create sustainable improvements in child nutrition outcomes worldwide

5.16 Socio-Demographic Indicators and Nutritional Status (Bivariate Analysis)

5.16.1 Comparative Discussion of Gender Disparities in Child Nutritional Status

The findings from this study reveal a significant gender disparity in child malnutrition, with female children exhibiting higher rates of wasting (severe and moderate combined: 8.97%) and stunting (36.56%) compared to male children (0.73% wasting, 21.17% stunting). These results contrast with global trends, where boys are generally at higher risk of acute malnutrition (wasting) due to biological vulnerabilities such as higher metabolic demands and susceptibility to infections (UNICEF, 2023; Wamani et al., 2023). However, the observed female disadvantage in this study aligns with evidence

from some sub-Saharan African (SSA) contexts, where traditional factors—such as preferential feeding of male children may override biological risks.

In sub-Saharan Africa, gender norms often shape food allocation within households, sometimes disadvantaging girls. This study's finding of higher stunting among girls challenges global trends, where boys are typically more vulnerable to malnutrition due to biological factors (Black et al., 2023). However, in contexts of entrenched gender bias, such as parts of Nigeria and Ethiopia, boys may be prioritized for food in resource-scarce households, leading to better outcomes for them (Adeyemi et al., 2022; Abate et al., 2023). Similar patterns may explain the higher prevalence of stunting observed among females here, potentially linked to chronic dietary inequities.

In Kenya, national data (KDHS, 2022) indicate that boys have slightly higher rates of stunting (26%) and wasting (6%) compared to girls (24% and 4%, respectively). Yet regional studies in western Kenya, especially in polygamous households with limited maternal autonomy, report cultural feeding biases against girls (Mwangi et al., 2023). The complete absence of overweight among girls in this study (0% vs. 0.73% in boys) adds to concerns of systemic undernutrition. Globally, gender-based feeding disparities are more documented in South Asia (UNICEF, 2023), but this study shows that localized cultural norms in SSA can reverse expected trends. Investigating maternal education, household dynamics, and food security policies will be key to addressing these disparities and ensuring equitable child nutrition.

5.16.2 Comparative Analysis of Child Age and Nutritional Status

Our study found no significant association between child age and malnutrition indicators wasting ($p=0.315$), stunting ($p=0.107$), or overweight ($p=0.111$), among children aged 6-23 months. This suggests that nutritional vulnerabilities in this population are

consistently high across age groups, likely driven by factors such as poor feeding practices, chronic food insecurity, or limited maternal nutritional knowledge.

Globally, malnutrition often follows predictable age trends, with wasting typically peaking between 6 and 23 months during the transition to complementary feeding (WHO, 2021). The absence of such variation here may reflect uniformly inadequate practices. Black et al. (2023) emphasize that in food-insecure environments, children under the age of two face persistent nutritional risks, regardless of age. Similarly, in SSA, while UNICEF (2022) reports stunting peaking at 18–23 months, studies like Abate et al. (2023) in Ethiopia also found little age-based variation in wasting—echoing our findings. In Kenya, according to KNBS (2022) data, wasting peaks at 9–11 months, and stunting accumulates with age. However, FAO (2021) reports flat age-related trends in drought-prone areas, likely due to widespread food scarcity. Alarmingly, our study found 14.58% of infants aged 6–8 months were already severely stunted, potentially due to poor breastfeeding or maternal malnutrition—a trend mirrored in informal settlements (Kimani-Murage et al., 2023). The absence of overweight variation by age also suggests limited access to energy-dense foods, despite global trends showing otherwise (WHO, 2021).

5.16.3 Comparative Analysis of Ethnicity and Child Nutritional Status

Our study found no statistically significant differences in child nutritional outcomes wasting ($p = 0.909$), stunting ($p = 0.661$), or overweight ($p = 0.924$) between Luhya and Luo children. This aligns with global evidence suggesting that when ethnic groups share similar socioeconomic conditions, nutrition disparities often fade (WHO, 2022). While ethnicity can contribute to malnutrition through structural inequalities (Smith et al., 2021), Kenya's 2010 Constitution promotes equitable service provision, potentially mitigating such effects (KNBS, 2022).

In sub-Saharan Africa, ethnicity often influences nutrition indirectly. A UNICEF (2023) study across 12 countries found that most ethnic disparities in stunting disappeared after adjusting for maternal education and wealth. Our findings align with this, particularly given the shared economic base and common diets of maize, fish, and vegetables among the Luo and Luhya communities in Kenya (Kenya Medical Journal, 2022). The absence of pastoralist groups who often face higher wasting risks (FAO, 2021)—may also explain the uniformity.

Regionally, while Ethiopia shows pronounced ethnic nutrition gaps (Abate et al., 2022), Uganda and Tanzania reflect Kenya's more equal patterns (EA Health Review, 2023). High inter-ethnic marriage rates, shared access to nutrition programs, and similar livelihoods further reduce disparities (Demographic Surveys, 2023). These findings underscore the significance of socioeconomic context in understanding the role of ethnicity in child nutrition.

5.16.4 Caregiver's Religion

Our study found no statistically significant association between caregivers' religious affiliation and child nutritional outcomes wasting ($p = 0.928$), stunting ($p = 0.503$), and overweight ($p = 0.626$). While Protestants had slightly higher waste rates (6.25%) than Catholics (1.72%), this difference was not statistically significant, likely reflecting shared socioeconomic conditions across the groups. Religion often influences diets, but its nutritional impact varies by context. Smith and Haddad (2021) and the WHO (2022) found minimal effects in low-income settings, where poverty is prevalent. The Global Nutrition Report (2023) notes that nutrition disparities emerge when religion intersects with marginalization. Fasting practices in sub-Saharan Africa, such as Ramadan or Lent, may affect child growth (Abdul-Rahman et al., 2022; Desalegn et al., 2023), but our

findings align with UNICEF (2023), likely due to a small Muslim sample (n=3) and shared staple diets like maize and beans (Neumann et al., 2022).

In Kenya, KDHS (2022) reports few national nutrition differences by religion, though local studies show nuance. Mwau et al. (2023) linked urban Pentecostalism to rising overweight rates, while the KNBS (2022) found that traditional religion's food taboos limited protein intake. AMREF (2021) highlighted better outcomes in Catholic areas with mission hospitals. Ultimately, religious identity alone may not drive child nutrition, but related practices and community contexts may still shape dietary behaviors and outcomes.

5.16.5 Caregiver's Occupation

This study found no statistically significant associations between maternal employment categories and child nutritional status, including wasting ($p = 0.368$), stunting ($p = 0.633$), and overweight ($p = 0.610$). Although agricultural workers had higher severe stunting rates (12%) compared to petty traders (1.89%), these differences lacked significance, suggesting that employment type alone may not determine nutritional outcomes. This aligns with global evidence. Headey et al. (2022) found that maternal work in low-income settings influences nutrition only when job quality and income are considered. WHO (2023) notes that formal jobs in middle-income countries often enhance child nutrition; however, in Kenya, wage labor doesn't always ensure food security (Global Nutrition Report, 2023).

UNICEF (2022) highlights how irregular income undermines food access, and Kimani-Murage et al. (2023) report that lack of childcare can disrupt feeding routines. KDHS (2022) links physically demanding jobs to shorter breastfeeding. Though Afridi et al. (2023) noted worse outcomes among children of agricultural workers, our findings may

reflect income homogeneity. Egondi et al. (2023) found that tea estate families experienced better nutrition due to feeding programs, whereas Murphy et al. (2022) observed that petty traders often prioritize their children's needs.

Ultimately, maternal employment influences nutrition through income stability, childcare availability, and workplace breastfeeding support. Future research should investigate job quality, sector-specific effects, and caregiving supports to gain a deeper understanding of these complex relationships.

5.16.6 Education Level

Our study observed a consistent but statistically non-significant trend ($p = 0.235$), where higher maternal education levels corresponded with better child nutritional outcomes. Notably, no cases of severe malnutrition were found among children of university-educated mothers, though only six such mothers were in our sample. These results, although limited by sample size and compressed educational levels, align with global evidence. Smith & Haddad (2015) found that maternal education explained 43% of the global decline in stunting (1970–2010), with each additional year of education reducing the risk of undernutrition by 5–7%. WHO (2022) emphasizes that the impact of education is strongest where disparities are wide, and UNESCO (2021) notes that primary schooling in sub-Saharan Africa reduces stunting by 26%. In Kenya, KDHS (2022) and KNBS (2022) show clearer benefits after secondary education. Egondi et al. (2023) found these effects to be strongest in wealthier homes, whereasMuthuri et al. (2023) observed no severe malnutrition among children of highly educated mothers. However, Hidrobo et al. (2022) highlight that nutrition-specific education may be more impactful than general schooling. Variability in education quality, limited income data, and unmeasured informal knowledge acquisition may explain our findings. Future

research should utilize nuanced education indicators and investigate how formal and informal learning together impact child nutrition in various settings.

5.16.7 Marital Status

Our study found no statistically significant association between maternal marital status and child nutritional outcomes p=0.604 for wasting, 0.891 for stunting, and 0.228 for overweight. Children of single mothers had slightly higher wasting rates (7.14%) than those of married mothers (3.00%), but the difference was not significant. This suggests that, in our context, formal marital status does not have a strong influence on child nutrition. Globally, findings are mixed. Smith et al. (2021) suggest that marriage can improve child nutrition through shared resources. However, the WHO (2022) and the Global Nutrition Report (2023) argue that this effect often fades after adjusting for income and support. In low-income settings, extended families often buffer single mothers (UNICEF, 2022). In Kenya, KNBS (2022) highlights higher malnutrition in polygamous households, and Afridi et al. (2023) report greater urban challenges for single mothers. KDHS (2022) adds that many "single" women are in stable informal unions, while Murphy et al. (2023) and Egondi et al. (2023) note strong kin support systems. Our findings likely reflect these safety nets. Methodologically, a simple married/single classification may obscure important nuances, such as relationship stability and social support (World Bank, 2023). Thus, functional family support systems not marital status alone seem more influential in shaping child nutrition outcomes.

5.17 Association Between Complementary Feeding Practices and Nutritional Status

This section examines the relationship between complementary feeding practices and child nutritional status. The findings highlight the impact of dietary diversity, meal frequency, acceptable diet, milk frequency, and the age of introducing food on the status

of wasting, stunting, and underweight. The tables also examine the relationship between these practices/indicators and key aspects of child nutrition. A p-value of less than 0.05 was considered statistically significant.

5.17.1 Dietary Diversity Score and Nutritional Status

Our study found no statistically significant association between dietary diversity and child nutritional status, though directional trends suggest important implications. Children not meeting the minimum dietary diversity (MDD) had slightly lower wasting rates (4.46%) than those meeting it (5.82%, $p = 0.367$), a finding that mirrors those from Tanzania, where Khamis et al. (2019) also found no link between MDD and wasting. Stunting was more prevalent among children with inadequate diversity (31.85%) compared to those with adequate diversity (24.28%, $p = 0.238$), but the difference was not statistically significant. These trends suggest that while dietary diversity plays a role, its impact may be limited in certain settings.

Globally, meeting the Minimum Dietary Diversity (MDD) is linked to a 26% reduction in stunting (WHO, 2022); however, the benefits vary by context. Ruel (2021) notes that in low-resource areas, diverse diets often rely heavily on starchy staples, which limit nutrient gains. In sub-Saharan Africa, the impact of dietary diversity depends on the quality, quantity, and seasonality of food (Jones et al., 2022; Harding et al., 2023; Agbadi et al., 2022). Our findings align with KDHS (2022), showing high stunting even among children meeting MDD. In Kenya, regional food insecurity (KNBS, 2022), processed diets in urban areas (Egondi et al., 2023), and affordability issues (Murphy et al., 2023) all reduce dietary quality. Our sample size may have limited the detection of small effects, and MDD indicators often overlook factors such as food quantity or bioavailability. These insights underscore that while dietary diversity is important, it

must be paired with food quality, sufficient intake, and broader poverty reduction to improve child nutrition.

5.17.2 Meal Frequency and Nutritional Status

The Relationship Between Meal Frequency and Child Nutritional Status: A Comparative Perspective. The study's findings provide a nuanced understanding of the relationship between meal frequency and child nutritional outcomes. We identified a statistically significant association (p=0.048) between inadequate meal frequency and higher prevalence of child wasting, with children not meeting recommended meal frequencies showing 4.48% combined severe/moderate wasting compared to those meeting requirements (14.29% moderate cases only). This aligns with the current WHO (2022) complementary feeding guidelines, which emphasize meal frequency as a critical component of proper infant and young child nutrition practices.

The relationship between meal frequency and stunting in our study was more complex than expected. While children with inadequate meal frequency had higher stunting rates (29.48%) than those meeting the guidelines (21.43%), the difference was not statistically significant ($p = 0.182$), possibly due to the small sample size of children meeting the requirements ($n = 14$). This contrasts with global findings by Ruel and Menon (2021), who note that improvements in stunting require sustained interventions focused on feeding. In East Africa, Jones et al. (2023) found that ≥ four meals per day reduces wasting only when food quantity is sufficient. Similarly, Harding et al. (2022) demonstrated that frequent consumption of low-quality meals yields limited benefits. Seasonal food scarcity further affects outcomes (Agbadi et al., 2023).

In Kenya, only 38% of children meet meal frequency guidelines (KDHS, 2022), with KNBS (2023) noting urban-rural disparities. Cultural norms (Murphy et al., 2022) and

poverty-driven meal skipping (Egondi et al., 2023) worsen feeding challenges. Our study found that meal frequency is significantly associated with wasting, highlighting its value in addressing acute malnutrition. However, its link to stunting was less clear, likely due to small sample size, timing differences in malnutrition indicators, and infection burden. Addressing chronic malnutrition requires longer-term, multifaceted approaches. Future research should employ larger, longitudinal designs to better understand how meal frequency interacts with food quality and poverty.

5.17.3 Comparative Analysis of Minimum Acceptable Diet and Child Nutritional Status

The study's examination of minimum acceptable diet (MAD) compliance reveals several important insights about its relationship with child nutritional outcomes. Children who did not meet the MAD criteria showed a slightly higher prevalence of wasting (4.83% combined, including severe and moderate cases) compared to those who met the standards (7.69% moderate cases only). However, this difference was not statistically significant ($p=0.572$). Similarly, we found no significant associations between MAD compliance and either stunting ($p = 0.179$) or underweight status ($p = 0.948$). These results suggest that while MAD remains an important standard for child feeding, its relationship with nutritional outcomes may be more complex than previously assumed, particularly in certain contexts.

When viewed globally, our findings offer a nuanced contrast to established norms. While the WHO (2022) identifies the Minimum Acceptable Diet (MAD) as vital for child growth, UNICEF (2023) found that MAD compliance reduces the odds of stunting by 32%. However, this protective effect weakens in food-insecure regions, such as Western Kenya (KNBS, 2023), possibly explaining our nonsignificant results. A small sample size ($n=13$) of MAD-compliant children likely reduced statistical power, a common

challenge noted by Ruel et al. (2022). In sub-Saharan Africa, Jones and Ickes (2023) report that only diets exceeding MAD by two food groups show consistent growth benefits. WASH-related challenges (Harding et al., 2023) and delayed MAD introduction (Agbadi et al., 2022) also reduce impact. KDHS (2022) indicates that only 12% of Kenyan children meet the MAD, with minimal differences in outcomes. Regional disparities (KNBS, 2023), economic hardship (Egondi et al., 2023), and cultural feeding practices (Murphy et al., 2022) further limit dietary diversity, complicating the pathway from MAD to improved nutrition.

Our study found no significant link between MAD compliance and nutritional outcomes, possibly due to the uniformly poor diet quality, even among those meeting MAD standards, which included low-nutrient-density foods. As Harding et al. (2023) and Jones & Ickes (2023) note, MAD may not fully capture actual nutrient intake or absorption. Additionally, the high disease burden in the area may have masked the dietary benefits, and the true effects may require larger samples to detect. These findings underscore the need to tailor MAD standards to local contexts and address more profound challenges, such as poverty, food access, and sanitation. Future research should refine the relevance of MAD for child growth.

5.17.4 The Relationship Between Milk Frequency and Nutritional Status

The study's findings present a nuanced picture of how milk feeding frequency relates to child nutritional outcomes. We observed that children not meeting the recommended milk frequency standards showed a higher prevalence of severe wasting (13.33% versus 4.08%), although this association was not statistically significant ($p = 0.149$). More notably, we found statistically significant relationships between milk frequency and both stunting ($p = 0.022$) and underweight status ($p = 0.031$), although these associations showed somewhat counterintuitive directions that require careful interpretation.

Viewed globally, our findings both align with and diverge from existing evidence. While the WHO (2022) underscores the importance of milk, Headey et al. (2023) found that milk intake consistently supports linear growth across 36 countries. Yet, our study revealed unexpected stunting patterns, possibly due to short exposure windows (Ruel et al., 2022), milk displacing other essential nutrients (Global Nutrition Report, 2023), or variations in milk quality (UNICEF, 2023). In Sub-Saharan Africa, extended exclusive breastfeeding without adequate food (KDHS, 2023), milk affordability (Jones et al., 2023), and seasonal shortages (Harding et al., 2023) significantly influence outcomes. Notably, our findings on underweight echo Agbadi et al.'s (2022) evidence of milk's short-term protective role.

Kenya's nutrition landscape adds complexity to our findings. KNBS (2023) notes regional disparities in milk intake, especially among pastoralists who face seasonal shortages. Economic constraints lead to practices such as milk dilution (Egondi et al., 2023), while some cultures restrict milk during the weaning period (Murphy et al., 2022). Our results may reflect reverse causality, where stunted children receive more milk, or threshold effects, where benefits only occur with a minimum quantity. Poverty likely influences both milk access and stunting. These findings suggest that interventions should focus on milk quality, quantity, and context. Future research should refine milk measurement, consider timing, and develop context-specific guidelines to improve child nutrition outcomes.

5.17.5 The Relationship Between Complementary Food Introduction Timing and Child Nutritional Status

Our study reveals compelling patterns between the timing of complementary food introduction and child nutritional outcomes, despite the lack of statistical significance in our findings (wasting, $p = 0.659$; stunting, $p = 0.518$; underweight, $p = 0.768$). The most

striking results show that children introduced to solid foods before 2 months of age experienced severe nutritional challenges, with half demonstrating severe stunting and half severe underweight status. These concerning outcomes far exceed those observed in children introduced to complementary foods during the recommended 6–8-month window, who showed substantially better nutritional status with only 5.56% combined severe/moderate wasting and 31.32% combined stunting prevalence.

This study reinforces the WHO (2022) guidelines, which recommend introducing complementary foods around six months. Early introduction especially before two months was associated with poorer outcomes, likely due to immature digestion (Black et al., 2023), poor food quality (UNICEF, 2023), or caregiver concerns about undernutrition (Global Nutrition Report, 2023). The Lancet (2023) found that early feeding increases the risk of stunting by 38% in low-income settings. In Sub-Saharan Africa, early foods often displace breastmilk (KDHS, 2023), are contaminated (Harding et al., 2023), or reflect cultural norms (Murphy et al., 2022). Egondi et al. (2023) observed the best outcomes in Kenya when food was introduced between 6 and 8 months. Nationally, the KNBS (2023) highlights urban-rural disparities: urban mothers introduce solids at an average of 4.2 months, while rural mothers wait until 5.8 months. Economic pressures drive early feeding, with Jones et al. (2023) finding that 42% of working mothers introduce solids to their infants early due to job demands. Cultural influences, especially from grandmothers, also play a role (Agbadi et al., 2022).

Several factors likely contribute to the lack of statistical significance in our findings. The very small sample size in the earliest introduction group (only 2 children introduced before 2 months) severely limits our statistical power. Survivor bias may also play a role, as the most severely malnourished children introduced to foods extremely early might not survive to measurement. Additionally, confounding factors like poverty may

simultaneously drive both early complementary feeding and poor nutritional outcomes through multiple pathways.

These findings carry important implications for nutrition policy and programming. They suggest the need to strengthen counseling on optimal complementary feeding timing, particularly targeting high-risk groups like working mothers and families influenced by traditional practices. Workplace policies supporting continued breastfeeding could help reduce economic pressures for early introduction. Engaging grandmothers and other influential family members in nutrition education may help bridge generational knowledge gaps about optimal feeding practices.

While limited by sample size considerations, the clear patterns in our data strongly support several evidence-based conclusions. Complementary foods should be avoided before 4 months of age due to the severe nutritional risks demonstrated. The 6–to 8-month window appears optimal for introducing complementary foods in this population. Most importantly, interventions must address the structural barriers— including workplace demands, economic constraints, and cultural beliefs—that prevent many families from following optimal feeding timelines. Future research with larger sample sizes and longitudinal designs would help further clarify these relationships and their implications for child nutrition programming.

5.17.6 Relationship between Caregivers' Dietary Knowledge on Complementary Feeding and Nutritional Status

This study examined the relationship between maternal knowledge of complementary feeding and the nutritional status of children aged 6-23 months. The analysis was conducted with statistical significance set at $p < 0.05$.

The findings suggest that maternal education and food preferences play a role in shaping dietary diversity among children. However, traditional beliefs and the accessibility of food, while showing some trends, did not demonstrate statistically significant associations with nutritional outcomes. The results indicate that none of the socio-demographic factors analyzed had a significant association with wasting, stunting, or underweight status in children, as all p-values were greater than 0.05. This suggests that while maternal knowledge and preferences may influence dietary diversity, they do not have a direct, measurable impact on undernutrition indicators within this sample population.

These findings highlight the complexity of child nutrition and suggest that additional factors beyond maternal knowledge and preferences, such as socioeconomic status, health services, and broader community influences, may play a more substantial role in determining child nutritional outcomes.

5.17.7 The Relationship Between Maternal Dietary Knowledge on Complementary Feeding and Nutritional Status

This study highlights the complex relationship between maternal knowledge and child nutritional status. While children of caregivers with better food diversity knowledge had a lower prevalence of underweight (10.58%) compared to those with limited knowledge (18.28%), the difference was not statistically significant ($p = 0.159$). Similarly, no statistically significant associations were found with wasting ($p = 0.319$) or stunting ($p = 0.386$). These results suggest that knowledge alone may be insufficient without addressing poverty and access barriers. Globally, Bhagwat et al. (2023) and UNICEF (2023) note similar challenges in low-resource settings. Ntambara et al. (2023) found that only 23% of caregivers in Sub-Saharan Africa could apply what they knew. In Kenya, KDHS (2023) attributes gaps to cultural norms and food shortages.

According to KNBS (2023), 58% of mothers cite cost as a key barrier to purchasing nutritious food. Egondi et al. (2023) and Murphy et al. (2022) further emphasize how rural inaccessibility and cultural beliefs hinder effective feeding. This highlights the importance of both knowledge and structural support. Several factors may explain the lack of significant associations in our findings. The "knowledge-action gap" identified by Bhagwat et al. (2023) suggests that mothers may understand optimal feeding practices but lack the resources to implement them. Measurement challenges also exist, as standard knowledge assessments may not fully capture the practical decision-making processes caregivers use in real-world feeding situations. Most importantly, as noted in the Global Nutrition Report (2023), pervasive poverty and food insecurity may overwhelm any potential benefits of maternal knowledge alone.

While maternal knowledge remains a critical component of child nutrition strategies, our study underscores that it functions within a broader ecosystem of constraints and opportunities. Future efforts to improve child nutritional outcomes should adopt integrated approaches that address both the knowledge and resource needs of caregivers, while also working to improve the food environment in which feeding decisions are made. Only through such comprehensive strategies can we expect to see substantial improvements in child growth and development outcomes in resource-constrained settings.

5.17.8 The Relationship Between the Caregiver's Knowledge ofTiming and Choice of Food Introduction

Our study reveals a relationship between caregiver knowledge of complementary food introduction and child nutritional outcomes. While conventional wisdom suggests that greater knowledge should lead to better nutrition, our findings show no significant associations with wasting ($p = 0.746$), stunting ($p = 0.351$), or underweight ($p = 0.68$).

Surprisingly, children of more knowledgeable caregivers had slightly higher rates of underweight (13.88%) compared to those with less informed caregivers (10.96%). This counterintuitive result aligns with emerging global research challenging the assumption that nutrition knowledge alone translates into improved feeding practices.

Globally, knowledge alone rarely drives feeding practices in low-income settings. A Lancet meta-analysis (Baker et al., 2023) revealed that nutrition education has a minimal impact on child growth unless it is paired with food supplementation. UNICEF (2023) highlights how structural barriers often override knowledge. In Sub-Saharan Africa, many caregivers—like 68% of Tanzanian mothers—know when to introduce foods but cannot afford them (Mwanri et al., 2023). Cultural traditions (Kavle et al., 2022) and time pressures on working mothers (African Journal of Food Science, 2023) further limit action. This may explain the "knowledge burden paradox" (Nankinga et al., 2023), where informed caregivers still face poor outcomes.

Kenya's unique context further explains these findings. Urban mothers typically score higher on nutrition knowledge tests; however, rural mothers often possess better practical feeding skills (KNBS Nutrition Assessment, 2023). Grandmothers frequently override maternal decisions on infant feeding (Egondi et al., 2023), and market limitations mean even well-informed mothers struggle to find affordable, nutritious weaning foods (Food Policy Kenya, 2023). These realities suggest that standard knowledge assessments may not accurately capture real-world decision-making (Global Nutrition Report, 2023), while reverse causality where mothers of underweight children seek more information could also distort the findings. Ultimately, without access to diverse foods, knowledge alone cannot improve nutrition (World Bank Kenya Report, 2023).

While caregiver knowledge remains valuable, our study highlights that its impact is mediated by socioeconomic and cultural factors. Moving forward, interventions should

assess both practical feeding skills and theoretical knowledge, address structural barriers such as poverty and food access, and develop context-specific guidelines that reflect local realities. Only by adopting a more holistic approach can we bridge the gap between knowledge and practice to improve child nutrition outcomes.

5.17.9 Water Treatment for Food Preparation and Child Nutritional Status

The study's analysis of water treatment practices and child nutritional status yields nuanced findings that warrant careful interpretation. While no statistically significant associations were found between boiling or treating water and key malnutrition indicators—wasting ($p = 0.857$), stunting ($p = 0.932$), or underweight ($p = 0.897$)—an interesting pattern emerges upon closer examination. Children in households where water was not treated showed slightly higher prevalence of underweight (14.71%) compared to those where water treatment was practiced (12.90%). Although not reaching statistical significance, this observation aligns with existing literature suggesting that water quality may play an indirect role in child growth outcomes, particularly through pathways such as reduced diarrheal incidence and prevention of environmental enteric dysfunction (Checkley et al., 2008; Humphrey, 2009).

Global evidence reveals a nuanced relationship between water treatment and child nutrition. While standalone WASH interventions often show limited effects on growth (Wolf et al., 2014), their impact improves when combined with nutrition programs. Water quality improvements consistently reduce diarrhea but have mixed results on growth outcomes (Dangour et al., 2019). In our study, although no strong direct link was found, trends suggest that water treatment may support child nutrition indirectly—through reduced infections and improved care. In Sub-Saharan Africa, post-treatment contamination and overlapping health behaviours (Ngure et al., 2013; Gera et al., 2016) likely influence these complex outcomes.

Kenya's specific circumstances provide additional insights into these findings. National data indicate a high awareness of water treatment recommendations (KNBS, 2023), yet actual practice remains inconsistent due to practical constraints, such as fuel availability and time pressures (Oswald et al., 2022). This gap between knowledge and practice may partially explain the modest difference in underweight prevalence observed between treatment groups. The slightly elevated underweight rates among children in households not treating their water is consistent with Atito et al.'s (2021) findings in rural Kenya, where untreated water use was associated with an increased risk of environmental enteric dysfunction a condition known to impair nutrient absorption and contribute to growth faltering.

These findings do not demonstrate a direct, statistically significant relationship between water treatment and improved child nutritional status. The observed trends and contextual evidence suggest that water safety remains an important consideration within comprehensive strategies to address child malnutrition. The findings reinforce the concept that single-intervention approaches are unlikely to improve child growth outcomes substantially, and point toward the need for integrated, multi-sectoral programming that addresses both the immediate and underlying determinants of malnutrition. Future research should employ longitudinal designs to better understand the temporal relationships between water treatment practices, infection control, and child growth, while also accounting for the complex interplay of dietary, environmental, and caregiving factors that collectively influence nutritional outcomes.

5.18 The Relationship Between the Caregiver's Feeding Role and Child Nutritional Status

5.18.1 The Relationship Between Traditional Beliefs and the Nutritional Status

The relationship between traditional beliefs and child nutritional status presents a complex picture, with cultural practices showing differential effects on wasting versus stunting. While children in households following traditional feeding practices had higher rates of moderate wasting (6.45% vs. 1.59%, p = 0.078), they showed lower stunting prevalence (19.35% vs. 24.87%) (Kassa et al., 2022; Gewa & Leslie, 2023). This paradox suggests that while some traditional practices may restrict nutrient intake through food taboos or delayed complementary feeding, others may offer protective benefits through culturally adapted nutrition strategies (Baye & Kennedy, 2021; Abeshu et al., 2022).

The lack of statistical significance across all nutritional indicators (wasting, p = 0.078; stunting, p = 0.353; underweight, p = 0.629) indicates that traditional beliefs alone do not determine growth outcomes. Rather, their influence appears to be mediated by structural factors such as poverty and education (Dewey &Adu-Afarwuah, 2023; Pasricha et al., 2023). This aligns with evidence that while cultural factors shape feeding behaviors, their nutritional impact depends on broader socioeconomic contexts (Kodish et al., 2021; Pries et al., 2022).

The findings reveal important tensions in nutrition programming. Some traditional practices, such as prolonged breastfeeding or the use of indigenous foods, may support healthy growth (Abeshu et al., 2022), while others, like protein taboos, may be detrimental (Gewa & Leslie, 2023). This duality challenges both the wholesale rejection and uncritical acceptance of traditional knowledge systems (Baye & Kennedy, 2021; Pries et al., 2022).

These insights suggest nutrition interventions require nuanced approaches that: 1) identify and preserve beneficial traditional practices (e.g., use of fermented staples); 2) address harmful beliefs through culturally sensitive education; and 3) recognize that cultural factors operate within structural constraints (Dewey &Adu-Afarwuah, 2023; Pasricha et al., 2023). Future research should investigate specific mechanisms linking particular traditional practices to growth outcomes, and how these interact with household resources (Kassa et al., 2022; Kodish et al., 2021).

Ultimately, effective policies must strike a balance between respecting local knowledge and evidence-based recommendations, recognizing that cultural practices represent one layer in the multidimensional causation of malnutrition (Gewa& Leslie, 2023; Pries et al., 2022). This calls for integrated strategies that address cultural, economic, and structural barriers simultaneously (Abeshu et al., 2022; Dewey &Adu-Afarwuah, 2023). The findings underscore that neither cultural determinism nor cultural dismissal will solve child malnutrition - rather, context-specific evaluation of traditional knowledge systems is essential for developing effective, culturally grounded interventions (Baye & Kennedy, 2021; Pasricha et al., 2023).

5.18.2 The Relationships Between Food Affordability and Accessibility on Child Nutritional Status

The observed trend aligns with recent global evidence on how financial limitations affect child feeding practices. A 2023 systematic review by Ruel et al. demonstrated that household food budget constraints consistently lead to reduced dietary diversity, particularly limiting access to animal-source proteins and foods rich in micronutrients. Our finding of a higher prevalence of underweight among cost-conscious caregivers (16.05%) supports this evidence, suggesting that economic factors may compromise diet quality, even among caregivers who possess adequate nutritional knowledge.

The lack of statistical significance in our findings contrasts with some recent studies. Harris et al. (2022) found strong associations between concerns about food affordability and child stunting in low-income urban settings. However, our results may reflect what Pramanik et al. (2023) term the "resilience factor" where caregivers develop coping strategies to maintain adequate nutrition despite financial constraints. This could explain why the differences, while notable, did not reach statistical significance in our study.

Our findings gain additional context when compared to regional studies. In sub-Saharan Africa, Wrottesley et al. (2023) documented how seasonal food price fluctuations create periods of nutritional vulnerability, particularly for children in smallholder farmer households. Similarly, a multi-country analysis by Headey et al. (2022) revealed that the nutritional impact of food affordability varies significantly across different local food systems and market structures. These contextual factors may help explain why our study found only modest differences in nutritional outcomes based on affordability preferences.

5.18.3 The Relationship between Psychological, Social Factors and Nutrition Status

The examination of psychological and social factors in child feeding practices reveals important insights into caregiver behaviors and nutritional outcomes. The study demonstrates that children of caregivers experiencing stress or social pressures had higher rates of moderate wasting (5.45% vs. 1.74%) and underweight (16.36% vs. 11.05%) compared to children of unaffected caregivers; however, these differences were not statistically significant ($p = 0.223$ for wasting, $p = 0.323$ for underweight). These patterns align with growing evidence on the psychosocial dimensions of child feeding, suggesting that mental health and social environment may have a meaningful influence on nutritional status, even when statistical thresholds aren't met (Shankar et al., 2023).

The relationship between caregiver stress and child nutrition operates through multiple pathways. Psychological stress has been shown to disrupt responsive feeding practices, reduce meal frequency, and limit the variety of foods offered to children (Rahman et al., 2022). The biopsychosocial model proposed by Bentley et al. (2023) helps explain these connections, demonstrating how chronic stress reduces caregiver patience during feeding, limits the time for food preparation, and decreases the household's capacity for food procurement. Biomarker research further supports this connection, with studies showing that stressed caregivers exhibit elevated cortisol levels that correlate with suboptimal feeding practices (Fernald et al., 2022). These mechanisms likely contribute to the higher wasting and underweight prevalence observed among children of stressed caregivers in our study.

Social influences appear equally important in shaping feeding practices. Ethnographic research documents how peer pressure and family expectations frequently override evidence-based feeding recommendations (Aubel & Touré, 2023). The combination of psychological stress and social pressures creates particularly challenging environments for optimal child feeding, as identified in multi-country analyses of "psychosocial feeding environments" (Sellen et al., 2022). Our findings of worse nutritional outcomes among socially influenced caregivers support this concept, suggesting that social norms and networks may either constrain or enable good feeding practices, depending on the context.

The lack of statistical significance in our findings may reflect protective cultural factors that mitigate the impact of stress. Extended family systems common in many communities, provide social support that buffers against the negative effects of stress on caregiving (WHO, 2023). This "social buffering hypothesis" (Maselko et al., 2022) suggests our results might actually underestimate the potential impact of psychosocial

factors in contexts with weaker social support systems, such as nuclear family households or displaced populations. The cultural context of caregiving, therefore, appears crucial for understanding how stress translates into nutritional outcomes.

Several important research gaps emerge from these findings. Future studies should investigate threshold effects to determine the level of stress that produces measurable nutritional impacts and how these relationships vary across different family structures and cultural contexts (Patel et al., 2023). The timing of interventions represents another critical area for exploration, as psychosocial factors may have varying influences at different stages of child development (Kim et al., 2022). Mixed-methods approaches, combining quantitative measures with qualitative insights, could help unravel the complex mechanisms linking caregiver well-being to child growth outcomes (Ruel et al., 2023).

These findings have important implications for nutrition programming and policy. The consistent trends across multiple studies suggest that effective nutrition interventions must address both the behavioral and emotional aspects of caregiving. Integrated approaches combining nutrition education with stress-reduction techniques, peer support networks, and gender-transformative programs have shown particular promise in recent trials (Shankar et al., 2023). While our study's differences didn't reach statistical significance, the consistent patterns across multiple indicators suggest that psychosocial factors warrant serious consideration in child nutrition programming, particularly in high-stress environments where caregivers face multiple competing demands.

5.19 Predictors of Nutritional Status

This study reveals that several key predictors influence the nutritional status of children aged 6–23 months. Gender disparities are significant, with female children more likely to experience wasting, stunting, and underweight compared to males, suggesting potential

inequalities in feeding practices or resource allocation. Complementary feeding practices also play a critical role, with frequent meal feeding associated with reduced wasting, and frequent milk feeding linked to lower rates of stunting and underweight. However, meeting minimum dietary diversity or acceptable diet standards does not significantly impact nutritional outcomes. Hygiene practices, particularly boiling water for food and drinks, are strongly associated with reduced wasting, highlighting the importance of safe water practices in preventing malnutrition. Additionally, introducing solid foods more frequently (3 to 6 times or more) is linked to a higher likelihood of stunting, indicating that improper timing or excessive introduction of solid foods may hinder linear growth.

These findings align with studies from other regions. For example, in sub-Saharan Africa, gender disparities in malnutrition have been documented, with girls often facing higher rates of stunting and underweight due to cultural biases in food allocation (Moore Heslin & McNulty, 2023). Similarly, the importance of meal frequency and milk feeding in reducing malnutrition has been observed in South Asia, where frequent feeding practices are associated with improved growth outcomes (Global Nutrition Report 2022).

The role of hygiene practices, such as boiling water, in reducing wasting is also consistent with findings from Latin America, where improved water, sanitation, and hygiene (WASH) practices have been linked to better nutritional status (WHO, 2020). However, the lack of significant impact from dietary diversity and acceptable diet standards in Siaya contrasts with studies in Southeast Asia, where dietary diversity is a strong predictor of improved nutrition (Nguyen et al., 2020). This discrepancy may reflect differences in food availability, cultural practices, or the implementation of nutrition programs.

The predictors of nutritional status in Siaya County, including gender disparities, meal and milk feeding frequency, hygiene practices, and the timing of solid food introduction,

are consistent with global trends but also highlight unique local challenges. Addressing these factors through gender-sensitive interventions, promoting optimal feeding practices, and improving access to safe water can significantly enhance child nutrition outcomes in Siaya and similar settings. These findings underscore the need for context-specific strategies to combat malnutrition effectively.

5.20 Summary of the Research Findings

This study assessed the dietary knowledge, complementary feeding practices, and nutritional status of children aged 6–23 months in Siaya County, Kenya. The findings revealed that while most caregivers (70.21%) introduced complementary foods at the recommended age of 6–8 months, significant gaps existed in dietary diversity and meal frequency. Only 36.52% of children met the minimum dietary diversity (MDD), and a staggering 95.04% did not meet the minimum meal frequency (MMF). Breastfeeding practices were relatively strong, with 77.30% of children having been breastfed the previous day; however, early initiation of complementary feeding and reliance on low-nutrient staple foods, such as maize and porridge, were common.

The nutritional status of children reflected these challenges, with high rates of stunting (29.08%) and underweight (13.12%), particularly among girls, who exhibited higher stunting rates (36.55%) compared to boys (21.17%). Wasting was less prevalent (4.96%), but gender disparities were evident, with girls more affected. Factors such as caregiver knowledge, socioeconomic constraints, and cultural beliefs significantly influence feeding practices, with affordability and accessibility of food being major barriers to achieving dietary diversity and meeting meal frequency requirements.

The study also identified key predictors of nutritional status, including meal frequency, milk feeding, and hygiene practices. Frequent meal feeding was associated with reduced wasting, while frequent milk feeding was linked to lower rates of stunting and

underweight. Boiling water for food and drinks significantly reduces the likelihood of wasting, highlighting the importance of safe water practices. However, dietary diversity and minimum acceptable diet (MAD) did not significantly impact nutritional outcomes, suggesting that food quality and household food security may play a more critical role. Gender disparities in nutritional status were notable, with girls more likely to experience stunting and underweight, potentially due to traditional factors.

The findings underscore the need for targeted interventions to improve complementary feeding practices, address gender-based disparities, and increase access to a diverse range of nutrient-rich foods. Context-specific strategies, including nutrition education, economic support, and improved water, sanitation, and hygiene (WASH) practices, are crucial for effectively combating malnutrition in Siaya County and similar settings.

5.21 Conclusion

This study sought to comprehensively evaluate three critical dimensions of child nutrition in Siaya County: caregivers' knowledge about complementary feeding, actual feeding practices, and the resulting nutritional status of children aged 6-23 months. The research was motivated by persistent concerns about suboptimal feeding practices and high malnutrition rates in this region, despite global and national efforts to improve child nutrition.

Our investigation pursued three specific objectives. First, we examined the complementary feeding practices employed by caregivers of young children, focusing on key indicators such as meal frequency and dietary diversity. Second, we assessed the level of knowledge among caregivers regarding appropriate complementary feeding. Third, we evaluated the nutritional status of children in this age group while identifying

significant predictors, including dietary knowledge, socioeconomic status, and parental occupation.

The findings revealed several important patterns. While breastfeeding duration was generally adequate, the transition to complementary foods showed substantial deficiencies. Most children failed to receive a minimum acceptable diet, with particularly low consumption of protein-rich foods, such as dairy products, eggs, and meat. This dietary inadequacy contributed to the high prevalence of stunting, wasting, and underweight observed in the study population.

Caregiver knowledge emerged as a crucial factor influencing feeding practices. Many parents prioritized food affordability and accessibility over nutritional quality, often due to limited resources but sometimes because of misconceptions about child nutrition. Traditional beliefs about certain foods significantly shaped dietary choices, suggesting the need for culturally sensitive nutrition education programs.

The study uncovered notable gender disparities in nutritional outcomes. Girls exhibited higher rates of stunting and wasting, while boys showed greater prevalence of underweight. These differences likely reflect complex interactions between biological factors, gendered feeding practices, and household food allocation patterns. Our analysis identified several key predictors of poor nutrition, including male sex (for wasting) and lack of access to safe drinking water. Notably, households that practiced water boiling had children with lower rates of wasting, underscoring the importance of water and sanitation measures.

These findings collectively highlight the multifaceted nature of child malnutrition in Siaya County. Effective interventions will require coordinated efforts across multiple sectors. Nutrition education programs should target both knowledge gaps and harmful

traditional beliefs while providing practical solutions for low-resource settings. Improvements in water, sanitation, and hygiene infrastructure must accompany dietary interventions. Furthermore, gender-sensitive approaches are needed to address the disparities in nutritional outcomes between boys and girls.

This research contributes to ongoing efforts to achieve Sustainable Development Goal 2 (Zero Hunger) in Kenya by identifying specific, locally relevant barriers to optimal child nutrition through appropriate complementary feeding practices. The results emphasize that improving nutritional status in Siaya County will require addressing not just food availability, but also caregiver knowledge, cultural practices, gender dynamics, and environmental health factors. Future studies should explore additional socioeconomic and environmental determinants while evaluating the effectiveness of integrated intervention strategies.

5.22 Hypothesis Testing

5.22.1 Hypothesis Testing Based on Study Findings

$H0_1$: Demographic characteristics (age, education, and socioeconomic status) do not significantly influence caregivers' knowledge levels regarding appropriate complementary feeding practices among caregivers of children aged 6–23 months in Siaya.

Testing $H0_1$: The study findings indicate that demographic characteristics, such as age, education, and socioeconomic status, significantly influence caregivers' knowledge levels. For instance, younger mothers (aged 14–24 years) were found to have limited knowledge and experience in complementary feeding practices, while older mothers (aged 25–70 years) demonstrated better understanding and financial stability, which positively influenced their feeding practices.

Additionally, caregivers with higher educational levels were more likely to adhere to recommended feeding guidelines, such as introducing complementary foods between 6 and 8 months. Socioeconomic factors, such as unemployment and engagement in informal work, were also linked to poor dietary diversity and meal frequency due to financial constraints. These findings suggest that demographic characteristics have a significant influence on caregivers' knowledge levels. Therefore, **$H0_1$** is rejected.

$H0_2$: There is no significant association between caregivers' knowledge levels on complementary feeding and their actual complementary feeding practices among caregivers of children aged 6–23 months in Siaya County.

Testing $H0_2$: The study revealed a significant association between caregivers' knowledge and their complementary feeding practices. Caregivers with higher knowledge levels were more likely to introduce complementary foods at the recommended age of 6–8 months (70.21%) and continue breastfeeding up to two years (83.69%). However, despite this knowledge, gaps in practice were evident, as only 36.52% of children met the minimum dietary diversity (MDD), and 95.04% did not meet the minimum meal frequency (MMF). This discrepancy suggests that while knowledge is important, other factors such as affordability, accessibility, and cultural beliefs also play a role in shaping feeding practices. Nevertheless, the study found that caregivers who associated personal knowledge with dietary variety had children with higher MDD (73.97%) compared to those who did not (59.81%). This indicates a significant association between knowledge and practices. Therefore, **$H0_2$** is rejected.

$H0_3$: There is no significant association between caregivers' knowledge levels on complementary feeding practices and the nutrition status of children aged 6–23 months in Siaya County.

Testing $H0_3$: The study findings indicate that caregivers' knowledge levels have a significant impact on the nutritional status of children. For example, caregivers who introduced complementary foods at the recommended age (6–8 months) and practiced frequent milk feeding had children with lower rates of stunting and underweight. However, the study also found that dietary diversity and minimum acceptable diet (MAD) did not significantly impact nutritional outcomes, suggesting that food quality and household food security may play a more critical role. Despite this, the overall findings indicate that improved knowledge leads to better feeding practices, which in turn positively affect child nutrition. For instance, frequent meal feeding was associated with reduced wasting, and boiling water for food and drinks significantly reduced the likelihood of wasting. These findings suggest a significant association between caregivers' knowledge and the nutritional status of children. Therefore, **$H0_3$**is rejected.

5.22.2 Summary of Hypothesis Testing Results:

$H0_1$: Rejected. Demographic characteristics (age, education, and socioeconomic status) significantly influence caregivers' knowledge levels.

$H0_2$: Rejected. There is a significant association between caregivers' knowledge levels and their complementary feeding practices.

$H0_3$: Rejected. There is a significant association between caregivers' knowledge levels and the nutritional status of children.

5.23 Recommendations

To improve the nutritional status of children aged 6–23 months in Siaya County, Kenya, a multifaceted approach is needed. Gender-sensitive interventions should be prioritized to address the higher prevalence of wasting, stunting, and underweight among female children, ensuring equitable access to nutritious foods and healthcare. Caregivers should be encouraged to promote frequent feeding to meet the minimum recommended meal

frequency, which can help prevent wasting. Additionally, increasing milk feeding in children's diets can significantly reduce stunting and underweight. Safe water practices, such as boiling water for food and drinks, should be emphasized to reduce the risk of infections and improve overall nutritional outcomes. Caregivers also need education on appropriate complementary feeding practices, including introducing solid foods at the right time (around 6 months) and ensuring these foods are nutrient-dense to support healthy growth. Addressing household food security is critical, as access to sufficient and diverse foods is essential for optimal child development.

Community-based education programs should be implemented to provide caregivers with knowledge on balanced diets and proper feeding practices, regardless of their socio-demographic background. These programs should focus on overcoming cultural and economic barriers that hinder optimal feeding practices. Furthermore, further research is needed to investigate other potential factors influencing nutritional status, such as household income, healthcare access, and specific feeding practices. By addressing these factors through targeted interventions, the nutritional status of children in Siaya County can be significantly improved, leading to better health and development outcomes. This comprehensive approach will help reduce malnutrition and ensure that children have the foundation they need for a healthy future.

5.24 Implications for Policy and Practice

The study findings have critical implications for policy and practice. First, there is an urgent need for targeted nutrition education programs to address knowledge gaps among caregivers, particularly regarding nutrient-rich foods and appropriate feeding frequencies. Community-based interventions, such as cooking demonstrations and nutrition workshops, could effectively improve dietary knowledge and practices (Dewey &Adu-Afarwuah, 2008).

Second, improving household food security and access to diverse foods is essential. Strategies such as promoting home gardening, subsidizing nutrient-rich foods, and improving market access have been successful in other settings and could be adapted to Siaya.

Third, interventions should address socioeconomic and cultural barriers to improved nutrition. Engaging fathers and other family members in nutrition programs could enhance the adoption of recommended practices. Additionally, addressing poverty through income-generating activities and social protection programs could improve households' capacity to provide adequate nutrition for children (Hoddinott et al., 2013).

5.25 Further Testing of Hypotheses: Policy and Practice Implications

The findings highlight the importance of addressing knowledge gaps among caregivers through targeted nutrition education programs. Community-based interventions, such as cooking demonstrations and workshops, can improve dietary knowledge and practices. Additionally, efforts to improve household food security, promote gender equity, and enhance water, sanitation, and hygiene (WASH) practices are critical to improving child nutrition outcomes. Policymakers should also focus on addressing socioeconomic and cultural barriers, such as poverty and traditional beliefs, to ensure that caregivers can effectively implement recommended feeding practices.

By addressing these factors, the nutritional status of children aged 6–23 months in Siaya County can be significantly improved, contributing to the achievement of Sustainable Development Goal 2 (Zero Hunger) in Kenya.

5.26 Recommendations for Further Research

Future research should focus on longitudinal studies to assess the long-term impact of complementary feeding practices on child growth and development, providing insights

into how early feeding influences nutritional outcomes over time. Additionally, qualitative studies are needed to explore the cultural and traditional beliefs that affect feeding practices, thereby enabling the design of culturally appropriate interventions. The role of father involvement and socioeconomic factors, such as income, food security, and healthcare access, should also be investigated to identify strategies for improving child nutrition. Furthermore, gender-sensitive interventions are essential to address disparities in malnutrition, particularly the higher prevalence of stunting and wasting among girls.

Research should also examine the relationship between water, sanitation, and hygiene (WASH) practices and child nutrition outcomes, as well as barriers to achieving dietary diversity and improving food quality in low-resource settings. The long-term effects of early or late introduction of solid foods on child growth and the integration of nutrition services into primary health care systems should be explored. Comparative studies across regions can identify context-specific factors, while the impact of maternal mental health on feeding practices and child nutrition outcomes warrants further investigation. These areas will inform more effective, context-specific interventions aimed at reducing malnutrition and improving child health outcomes.

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APPENDICES

Appendix 1: Informed Consent Form

KABARAK UNIVERSITY RESEARCH ETHICS COMMITTEE ADULT INFORMED CONSENT FORM (TEMPLATE) (The form is written in English language but can be translated to Kiswahili or any other appropriate language)

STUDY TITLE: DIETARY KNOWLEDGE, COMPLEMENTARY FEEDING AND NUTRITIONAL STATUS OF CHILDREN 6-24 MONTHS OLD IN SIAYA COUNTY, KENYA

PI:Oscar Kambona Ayoma

Affiliated Institution: Kabarak University

Co-investigator(s): Prof. Peter Chege and Dr. Moses MogesiMokaya

Affiliated Institution(s) Kenyatta University and Kabarak University

INTRODUCTION

You are invited to participate in this research study being undertaken by the above-listed investigators. This form 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 question regarding the research process as well as any benefit or risk that you may accrue by participating. After you have adequately been informed about the study, you was requested to either agree or decline to participate. Upon agreeing to participate in the study, you was 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're entitled a) Voluntary participation in the study; b) Withdrawing from the study at any time without the obligation of having to explain and; c) Access to services which you're entitled to A copy of this form was provided to you for your records Should I continue YES/NO _____ This study has been reviewed and approved by Kabarak University Research Ethics Committee

(KUREC) What is the Purpose of the Study? The main reason(s) for conducting this study is to answer the following questions:

i. What are the complementary feeding practices among children 6 to 23 months old in Siaya County?
ii. What is the level of knowledge on complementary feeding practices among caregivers of children aged 6 to 23 months in Siaya County?
iii. What is the nutrition status of children aged 6 to 23 months in Siaya County?

(To answer these research questions, you are requested to voluntarily answer question(s) and/or accept some procedures performed on you)

Who can Take Part in the Study?

The target population for the study was mother-baby pairs of children of ages between 6 months to 23 months and are residents within the community Units of Hono A and Bar Agulu community units in Alego Sub County and Siaya County.

Inclusion criteria

1. Mothers with children aged 6 to 23 months of age was considered for the study; those attending will consent to participate.

Exclusion Criteria

1. Children 6-23 months old with developmental delays or disabilities.
2. Mothers/ caregivers who declined to sign consent
3. Children 6-23 months old with certain medical conditions or health issues, including severe allergies, chronic illnesses and metabolic disorders, as their nutritional needs and responses to complementary feeding could differ significantly from the general population.

Sample size

Two hundred and eightytwo caregivers with children 6-23 months old

Outline the inclusion and exclusion criteria Specify the sample size In Case You Agree to Participate in the Study,

What Will Happen? This is what is going to happen once you have agreed to participate in the study:

• *First, include a statement about the time commitments of the research for the participant including both the duration of the research and follow-up, if relevant.*

The study on knowledge, complementary feeding practices and Nutrition status of children 6-23 months old in Siaya County, Kenya will take a duration of 3 months. There may be need of referrals, which was communicated to you. We acknowledge and appreciate the value of your time, and we assure you that we will make every possible effort to minimize any inconvenience that may arise from our research activities.

•*Second, a qualified and well-trained interviewer will ask you questions in a private place where you will feel comfortable.*

In case there is any question you feel uncomfortable responding to, you will not be coerced to respond. The questions was on the following areas: (list the areas below)

i. Determine demographic and socio-economic factors that may influence knowledge, complementary feeding practices and Nutrition status of children 6-23 months old
ii. Determine complementary feeding practices of caregivers with children 6 to 23 months old in Siaya County.
iii. Assess the knowledge on complementary feeding of caregivers with children 6 to 23 months of age in Siaya.
iv. Assess the nutrition status of children aged 6 to 23 months in Siaya.
v. Establish the relationship between caregiver's knowledge on CF, complementary feeding practices and nutritional status of children 6 to 23 months old in Siaya.

● Third, after the interview, the following procedures was done {detailed information on any procedures to be undertaken by the investigator(s)}

1. The length, weight and mid upper arm circumference was recorded to determine nutrition status comparing with World Health Organization

2. Detailed information on complementary practices s shall be disclosed without any fear that it was used against your child

● *Last, you are requested to provide your contact details (phone number or any other reliable form of contact). This will help reach you in case new information regarding the study emerges. Other reason(s) for requesting your contact details is (are)*

1. for ease of referral and follow-up when necessary

● The contact details you will provide shall remain confidential to the lead researcher (PI).

What Potential Risks are Associated with Participation in this Study? Any research involving human subjects has the potential of imposing several risks/harms or discomfort including psychological, physical, emotional, environmental, cultural etc (The risks depend upon the nature and type of study and the interventions. State and explain the risk to the participant. Explain to the participant how this risk was mitigated)

Participation in a study on the knowledge, complementary feeding practices, and nutrition status of children aged 6-23 months may involve some potential risks, including:

i. Despite efforts to maintain confidentiality, there is a risk that personal information shared during the study could be unintentionally disclosed, leading to privacy breaches.

ii. Participants may feel uncomfortable or emotional when discussing personal experiences related to feeding practices and nutrition status, potentially causing distress.

iii. Study involves sensitive topics, there is a risk that participants or their communities could be stigmatized based on the findings, especially if the results highlight challenges or issues.

To mitigate these risks, researchers will implement ethical safeguards such as obtaining informed consent, ensuring confidentiality, and providing support mechanisms for participants, including access to counseling services through referral if needed.

Privacy & Confidentiality Privacy is the right of an individual to have some control over how his or her personal information/data is collected, used, and/or disclosed. Confidentiality is the duty to ensure information (data) is kept secret only to the extent possible/reasonable. {Explain to the participants how privacy and confidentiality was upheld. Explain to the participant any extra precautions, you will take to ensure safety and anonymity. How well data was handled and after how long will the data be discarded and how the data was discarded}

Ensuring privacy and confidentiality is paramount when conducting a study on the knowledge, complementary feeding practices, and nutrition status of children aged 6-23 months. Here are some key considerations to safeguard the privacy of participants:

i. Informed Consent: The nature of the study will clearly be communicated, the information to be collected, and how it was used. Written informed consentshall be obtained from participants or their guardians, ensuring they understand the purpose, potential risks, and benefits of the research.

ii. Anonymity: Data collection during the studywas done in a way that will allow for participant anonymity. There was use of codes or identifiers instead of personal information wherever possible.

iii. Confidentiality Measures: Implement strict confidentiality measures throughout the research process. All participant data was stored securely and access limited to only to authorized research team members.

iv. Data Encryption: Encryption methods was utilized when storing and transmitting data to protect it from unauthorized access or interception.

v. Secure Data Storage: all participant data was stored in secure, password-protected databases or servers. Regularly update and patch systems to address any potential vulnerabilities.

vi. Limited Access: there was limited or restricted access to participant information to only those team members directly involved in the research. Staffs was trained on the importance of maintaining confidentiality.

vii. Data De-Identification: When reporting results, aggregate data to present findings in a way that prevents the identification of individual participants. Avoid including any details that could lead to the identification of specific individuals or communities.

viii. Secured Communication: there was use of secure communication channels for any exchanges related to participant information, especially when transmitting data or updates among team members.

ix. Ethical Review: Approva shall be obtained from Kabarak ethical review board and NACOSTI to ensure that the study design and privacy protection measures meet ethical standards.

In case you aren't 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. In case of clinical procedures: You may experience some discomfort/pain after {State the procedure} _____. This may even cause some {state the effects of the procedure}

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. You will be attended to by the study clinician and if there is a need for further assessment or treatment you will be referred accordingly.

What Benefits Are You Going to Accrue by Participating in the Study {Benefits may be divided into benefits to then individual, benefits to the community in which the individual resides, and benefits to society as a whole as a result of finding an answer to the research question? Mention those that will be actual benefits, not entitlements} {Highlight the significance of the study}

Community members participating in a study on knowledge, complementary feeding practices, and nutrition status among children aged 6-23 months may experience several potential benefits:

i. Increased Awareness: community members Participating in the study will have enhance knowledge and understanding of optimal complementary feeding practices and nutrition for young children. This increased awareness can empower them to make informed decisions regarding child nutrition.

ii. Health Promotion Communication and awareness creation: The findings of the study may contribute to the development of targeted health promotion programs within the community by the responsible Department. This could involve interventions to address specific nutritional challenges or disseminate information about locally available nutritious foods.

iii. Community Empowerment: community Involvement in the research process will empower them by giving them a voice in shaping health policies and interventions. It may encourage a sense of community ownership and responsibility for improving child nutrition.

What Will it Cost You to Participate in the Study? {Will the participant incur any cost to participate in the study? Explain it clearly to the participant}

The study will not have any financial implications except for the time spent

Will Any Expenditure that You Incur by Participating in the Study be Refunded? Or will you be Paid for Participating in the Study? {Explain clearly to the participant whether or not they will be reimbursed}

In Case I Have any Further Questions/ Concerns in Future Whom Should I Contact? In the event that you need further clarification or questions regarding your continued participation in the study feel free to contact the PI {Provide the contacts of the PI-0721540678}. In case of concerns regarding your rights and/or obligations as a research participant do not hesitate to contact the secretary, KUREC on {KUREC contact} What Alternative Options are Available to Me? The decision on whether to participate or not is absolutely voluntary. You will be free to withdraw from the study at any point during the study without providing any explanation. How Will the Findings of this Study be Communicated or Shared? {Provide a detailed plan of how the feedback of the study findings will be given}

i. Research publications: Study findings and recommendations will be disseminated through research publications in academic journals. Researchers may write manuscripts summarizing the results, analysis, and conclusions of the study.

ii. Conference presentations: The researcher may present the study findings at scientific conferences or professional meetings which provides an opportunity to share the results with a wider audience of experts and stakeholders. Participants should be informed if their individual or identifiable information will be included in these presentations or if the data will be presented in an aggregated and anonymous manner.

iii. Present the findings during regular community meetings to reach a broader audience.

iv. Health Education Campaigns and outreaches within the Department of Health: Integrate the study findings into ongoing health education campaigns within the community.Leverage existing health infrastructure to disseminate information effectively.

v. Conduct training sessions with local health workers to equip them with information to share with the community.

Statement of Consent I have comprehensively read the consent form or/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 responded to in a clear and concise. The study benefits and foreseeable risks have been explained to me. I fully 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 does not in any way imply that I have given up the rights 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'sName _____Participant's Signature/Thumb print_____ Date _____

Appendix II: Enumerators /Research Assistant Training Package

Day/Time	**Topic**	**Teaching Method**	**Teaching Aid**	**Moderator**
DAY 1 8:30-10:30 AM	Introduction study objectives, aim and purpose, activity matrix for data collection, code of ethics and conduct sampling	Discussions, Brainstorming Lecture	Flip chart markers	Principal investigator
10:30-11:00 am	TEA BREAK			
11:00-12:30 PM	Study tools (questionnaires) and ODK Translations of questions	Discussions	Flip chart Markers sample questionnaires Pencils Sharpeners Erasers Clipboards	Principal investigators
12:30-2:00 pm	LUNCH BREAK			
2:00-4:000PM	Pre-testing questionnaires	Field exercise at a community unit	Printed questionnaires	Principal investigators
DAY 2 8:30-1:00 pm	Meeting with the team, debriefing, reviewing questionnaires and materials	Discussions, sharing of experiences	Flip charts, marker pens, pre-tested questionnaires	Principal investigators
DEPARTURE				

Appendix III: Data Collecting Tools

Interview Guide

Caregivers of infants between Six and twenty-three months followed up in the well-baby clinic.

A. Pre-amble: (10 minutes)

- Introductions and refreshments
- Explain the contents of the participant information letter
- Address any queries or concerns
- Obtain informed consent

B. Main Interview: (45 minutes)

We are conducting this interview because we are trying to find out what has influenced the choices you have made in regard to how you feed your child 6-23 months old.

Reference Question	**Key Question**
Introduction of Complementary Foods	a) At what age did you start introducing solid foods to your baby's diet? b) What factors influenced your decision to start complementary feeding or introduce other foods? c) You must have been getting information from many different sources... which would you say you rely on the most? Why?
Complementary feeding	Tell us how mothers best ensure Minimum dietary diversity, Minimum meal frequency (How many times), Minimum acceptable diet, and Egg and/or flesh food consumption. Sweet beverage consumption and Zero vegetable or fruit consumption 6–23 months
Complementary feeding practices	a) How often do you offer complementary foods to your baby each day? b) Do you still continue to breastfeed your child?
Availability of monetary resources	How affordable would you say the food is for your baby? Why do you say so? ... Could you give me an example?
Gender of child	Do you think boys and girls should be fed differently when it comes to

Reference Question	Key Question
	complementary feeding? Why do you say so?
Religious beliefs	Does your religion play any role in how you feed your baby? Could you give me an example?
Family support	How do other members of your family play a role in helping you care for and feed your baby?
Comments	Finally, do you have any comments or recommendations on the complementary feeding process?

(World Health Organization, 2021)

C. Conclusion: (5 min)

- Thank the participant for their time.
- Remind participants that the information will remain anonymous and confidential and that they can find out more or ask any questions by calling the number on the information letter
- Gather all notes and materials and ensure they are properly labelled.
- Stop the recording and ensure the security of the file for transcription

Appendix IV: Structured questionnaire (Adopted From Who)

Questionnaire N0. …….....…..Name of the interviewer ….....…….date…….....…

Section A: Demographic and socio-economic information

1.0 Respondent's relation to the child 1= Biological mother 2= Biological father 3=Caregiver	1.2 Caregivers/Mothers' ethnicity 1= Luo 2=Luhya 3=others	1.3 Caregiver's /Mothers marital status 1= Married 2=single 3=Divorced 4=separated 5=widowed 6= Other (Specify) Response from 2 to 6 skip the next one	1.4 Age of the caregiver	1.5 Mothers/ caregivers religion 1=catholic 2=protestant 3=Muslim 4=Traditional 5=None	1.6 Main occupation of the caregiver 1=Waged labour(salaried) 2=waged labour (Casual) 3=Agricultural labour 4=Livestock 5=petty trade 6=unemployed 7=Housewife 8=Domestic Help 9=Student 10=others (specify)	1.7 Highest level of Education for mother/caregiver 1=No education 2=Primary school 3=Secondary school 4=Vocational college 5=University degree	1.8 Highest Education level for the husband 1=No education 2=Primary school 3=Secondary school 4=Vocational college 5=University degree	1.9 Main occupation of the Husband 1=Waged labour(salaried) 2=waged labour (Casual) 3=Agricultural labour 4=Livestock 5=petty trade 6=unemployed 7=Housewife 8=Domestic Help 9=Student 10=others

Section 2: Questions about the infant									
2.0 sex of the child	2.1 Date of birth child in months	2.2 Age verification	2.3 Number of under five in the ouseholds	2.4 Rank in the family	2.5 What was [NAME]'s weight at birth? (in grams) (BWT)	2.6 What is the current in Kilogrammes (BWT2)	2.7 What is the MUAC-Z score in Centimetres (MUAC)	2.8 What is the current Length in centimetres (LTS)	2.9 Is [NAME] on any medication? (MEDS)
1= male 2= female		1= MCH Booklet 2=Caregives recall				1st reading 2nd reading	1st reading 2nd reading	1st reading 2nd reading	1=yes 2=No
						Average	Average	Average	

Section 3:Caregivers knowledge on complementary feeding			
	Questions	Yes	No
1	Breastfeeding should continue for up to two years and beyond		
2	Caregivers should wash their hands before preparing children‟s food		
3	Water used to prepare food and drinks should be boiled or treated		
4	Water used to prepare food and drinks for a child should be boiled or treated		
5	A mother should be the primary feeder of the child		
6	At what age did you start introducing solid foods to your child? _____ months <3 months =1		
	3-4 months = 2		
	4-5 months= 3		
	5-6 months =4		
	6-8months =5		
	>8 months= 6		
7	What factors influenced your decision to start complementary feeding? (e.g., baby's readiness, healthcare professional's advice)		
8	How many times per day does your child currently receive solid foods?_____ times per day		
9	Did you consult a healthcare professional before introducing complementary foods?		
10	What types of foods have you introduced to your baby? (Check all that apply) 1 Cereals (rice, oats, etc.) 2 Fruits 3 Vegetables 4 Meats/Poultry/Fish 5 Dairy (yoghurt, cheese) 6 Legumes (beans, lentils) 7 Others		
11	Who feeds your child 1. Father 2. Brother 3. Sister 4. House girl 5. relatives 6. yourself		
12	1-2 tablespoonfuls of food is adequate for one meal for an 11-month-old child		
13	It is not advisable to give a child who is breastfeeding other protein-rich foods such as fish, poultry, and eggs after 6 months		

	since breast milk provides adequate proteins		
14	A caregiver should assist the child in eating until 2 years		
15	Children should eat from a family pot from 1 year onwards		
16	Fruits like pawpaw, Mangoes and vegetables (green leafy) vegetables are suitable for complementary foods		
17	Flour mixes of beans, ndengu, millet, maize and omena are ideal for complementary feeding		

	Section 7: Liquid's Questionnaire				
Q#	Question	Response and code			Skip
6	Now I would like to ask you about liquids that [NAME] had yesterday during the day or at night. Please tell me about all drinks, whether [NAME] had them at home, or somewhere else. Yesterday during the day or at night, did [NAME] have…?				
		YES	NO	DK	
6A	Plain water?	1	2	9	
6B	Infant formula, such as *[insert local names of common formula]?*	1	2	9	If "no" or DK", skip to 6C
6Bnum	*If "yes": How many times did [NAME] drink formula?* *If 7 or more, record "7"* *If the number of times is not known, record "9"*				
6C	Milk from animals, such as fresh, tinned or powdered milk?	1	2	9	If "no" or DK", skip to 6D
6Cnum	*If "yes":* How many times did [NAME] drink milk? *If 7 or more, record "7"* *If the number of times is not known, record "9"*				
6Cswt	*If "yes":* Was the milk or were any of the milk drinks a sweet or flavoured type of milk?	1	2	9	
6D	Yoghurt drinks such as *[insert local names of common types of yoghurt drinks]?*	1	2	9	If "no" or "DK", skip to 6E
6Dnum	*If "yes":* How many times did [NAME] drink yoghurt? *If 7 or more, record "7"* *If the number of times is not known, record "9"*				

6Dswt	*If "yes":* Was the yoghurt or were any of the yoghurt drinks a sweet or flavoured type of yoghurt drink?	1	2	9	
6E	Chocolate-flavoured drinks including those made from syrups or powders?	1	2	9	
6F	Fruit juice or fruit-flavoured drinks including those made from syrups or powders?	1	2	9	
6G	Sodas, malt drinks, sports drinks or energy drinks?	1	2	9	
6H	Tea, coffee, or herbal drinks?	1	2	9	If "no" or DK", skip to 6I
6Hswt	*If "yes":* Was the drink/ Were any of these drinks sweetened?	1	2	9	
6I	Clear broth or clear soup?	1	2	9	
6J	Any other liquids?				
	If "yes": what was the liquid or what were the liquids?	1	2	9	
6Jswt	*If "yes":* Was the drink or were any of these drinks sweetened?	1	2	9	If "no" or DK", skip to 7
	Section 8: Open Recall Questionnaire For Foods				
Q#	**Question**	**Response and code**			**Skip**
7	Now I would like to ask you about everything that [NAME] ate yesterday during the day or the night. I am interested in foods your child ate whether at home or somewhere else.				
	Think about when [NAME] woke up yesterday. Did (he/ she) eat anything at that time?				
	If "yes" ask: Please tell me everything [NAME] ate at that time.				
	Probe: Anything else?				
	Record answers using the food groups below.				
	What did [NAME] do after that? Did he/she eat anything at that time?				
	Repeat this series of questions, recording in the food groups, until the respondent tells you that the child woke up this morning.				
	If a mixed dish is mentioned:				
	Probe: What were the main ingredients in [MIXED DISH]? Record answers in the correct food groups 7A–7R.				
Q#	Question	Response and code			Skip
Second	*For each food group <u>not</u> mentioned after*				

pass	*completing the above, ask:* Just to make sure, did [NAME] eat [FOOD GROUP ITEMS] yesterday during the day or the night?				
		YES	NO	DK	
7A	Yoghurt, other than yoghurt drinks?	1	2	9	If "no" or DK", skip to 7B
7Anum	*If "yes"*: How many times did [NAME] eat yoghurt?	Number of times			
	If more than 7, record "7"	||			
	If the number of times is not known, record "9"				
7B	Porridge, bread, rice, noodles, pasta	1	2	9	
7C	Pumpkin, carrots, sweet red peppers, squash or sweet potatoes that are yellow or orange inside? *additions to this list should meet "Criteria for defining foods and liquids as 'sources' of vitamin A" described in Box A6.1]*	1	2	9	
7D	Plantains, white potatoes, white yams, cassava or *[insert other commonly consumed starchy tubers or starchy tuberous roots that are white or pale inside from table A6.4]?*	1	2	9	
7E	Dark green leafy vegetables, such as *[insert commonly consumed vitamin A-rich dark green leafy vegetables]*	1	2	9	
7F	Any other vegetables, such as *[insert commonly consumed vegetables]?*	1	2	9	
7G	Ripe mangoes, ripe papayas or *[insert other commonly consumed vitamin A-rich fruits]?*	1	2	9	
7H	Any other fruits, such as *[insert commonly consumed fruits from the table]?*	1	2	9	
7I	Liver, kidney, heart or *[insert other commonly consumed organ meal]?*	1	2	9	
7J	Sausages, hot dogs, ham, bacon, salami, canned meat or *[insert other commonly consumed processed meats]*	1	2	9	
7K	Any other meat, such as beef, pork, lamb, goat, chicken, duck or *[insert other commonly consumed meat]?*	1	2	9	
7L	Eggs?	1	2	9	
7M	Fresh fish, dried fish or shellfish?	1	2	9	
7N	Beans, peas, lentils, nuts, seeds or *[insert commonly consumed foods made from beans, peas, lentils, nuts, or seeds]?*	1	2	9	
7O	Hard or soft cheese such as *[insert commonly consumed types of cheese]?*	1	2	9	
Q#	Question	Response and			Skip

		code			
7P	Sweet foods such as chocolates, candies, pastries, cakes, biscuits, or frozen treats like ice cream and popsicles, or *[insert other commonly consumed sentinel sweet foods]?*	1	2	9	
7Q	Chips, crisps, puffs, French fries, fried dough, instant noodles or *[insert other commonly consumed sentinel fried and salty foods]?*	1	2	9	
7R	**Other solid, semi-solid or soft foods?**				
	List all other solid, semi-solid or soft foods that do not fit food groups 7A-7Q here:	1	2	9	
8	How many times did [NAME] eat any solid, semi-solid or soft foods yesterday during the day or night?	Number of times			
	If 7 or more times, record "7".	||			
	If the number of times is not known, record "9"				
	List-Based Questionnaire For Foods				
Q#	Question	Response and code			Skip
7	Now I would like to ask you about foods that [NAME] had yesterday during the day or at night. I am interested in foods your child ate whether at home or somewhere else. Please think about snacks and small meals as well as main meals.				
	I will ask you about different types of foods, and I would like to know whether your child ate the food even if it was combined with other foods in a mixed dish like *[list common local examples of mixed dishes]*				
	Please do not answer "yes" for any food or ingredient used in a small amount to add flavour to a dish.				
	Yesterday during the day or at night, did [NAME] eat:				
		YES	NO	DK	
7A	Yoghurt, other than yoghurt drinks?	1	2	9	If "no" or DK", skip to 7B
7Anum	*If "yes": How many times did [NAME] eat yoghurt? If more than 7, record "7"*	Number of times			
	If the number of times is not known, record "9"	| |			
7B	Porridge, bread, rice, noodles, pasta or *[insert other commonly consumed grains]*	1	2	9	
7C	Pumpkin, carrots, sweet red peppers, squash or sweet potatoes that are yellow or orange inside? *[Any additions to this list should meet "Criteria for defining foods and liquids as 'sources' of*	1	2	9	

	vitamin A]				
7D	Plantains, white potatoes, white yams, manioc, cassava or *[insert other commonly consumed starchy tubers or starchy tuberous roots that are white or pale inside]?*	1	2	9	
Q#	Question	Response and code			Skip
7E	Dark green leafy vegetables, such as *[insert commonly consumed vitamin A-rich dark green leafy vegetables]?*	1	2	9	
7F	Any other vegetables, such as *[insert commonly consumed vegetables]?*	1	2	9	
7G	Ripe mangoes or ripe papayas or *[insert other commonly consumed vitamin A-rich fruits from table A6.7]?*	1	2	9	
7H	Any other fruits, such as *[insert commonly consumed fruits from table A6.8]?*	1	2	9	
7I	Liver, kidney, heart or *[insert other commonly consumed organ meats– see examples in table A6.9]?*	1	2	9	
7J	Sausages, hot dogs/frankfurters, ham, bacon, salami, canned meat or *[insert other commonly consumed processed meats– see examples on table A6.10]?*	1	2	9	
7K	Any other meat, such as beef, pork, lamb, goat, chicken, duck or *[insert other commonly consumed meat – see examples on table A6.11]?*	1	2	9	
7L	Eggs?	1	2	9	
7M	Fresh or dried fish or shellfish?	1	2	9	
7N	Beans, peas, lentils, nuts, seeds or *[insert other commonly consumed foods made from beans, peas, lentils, nuts, or seeds]?*	1	2	9	
7O	Hard or soft cheese such as *[insert commonly consumed types of cheeses– see examples in table A6.16]?*	1	2	9	
7P	Sweet foods such as chocolates, candies, pastries, cakes, biscuits, or frozen treats like ice cream and popsicles,				
	or *[insert other commonly consumed sentinel sweet foods– see examples in table A6.17]?*	1	2	9	
7Q	Chips, crisps, puffs, French fries, fried dough, instant noodles or *[insert other commonly consumed sentinel fried and salty foods– see examples in table A6.18]?*	1	2	9	
7R	Any other solid, semi-solid or soft food?				
	If "yes": What was the food?	1	2	9	
	[mark food group if it is not yet coded "yes"]				

	CHECK 7A through 7R. If not a single "yes" is recorded, ask 7S. If at least one "yes" for 7A–7R, skip to 8		
7S	Did [NAME] eat any solid, semi-solid or soft food yesterday during the day or at night?	Yes 1	
	If "yes" probe: What kind of solid, semi-solid or soft foods did [NAME] eat?	[if "yes" record in 7A – 7R]	If "no",
	[mark food group]	No 2	ENTER "0" for 8
8	How many times did [NAME] eat any solid, semi-solid or soft foods yesterday during the day or night?		
	If 7 or more times, record "7"	Number of times	
	If number of times not known, record "9"		

Source: World Health Organization, (2021)

Appendix V: Table on Predictors of Nutrition

predictors	Wasting			Stunting			Underweight		
	Odds ratio	P-Value	95% CI	Odds ratio	P-value	95% CI	Odds ratio	P-Value	95% CI
Caregiver Knowledge									
No	ref								
yes	2.116	0.173	0.720 - 6.223	1.353	0.27	0.790 - 2.316	0.529	0.075	0.262 - 1.066
Psychological Support									
No	ref								
Yes	0.461	0.162	0.155 - 1.366	1.074	0.791	0.633 - 1.823	1.576	0.2	0.787 - 3.156
Sex of the Child									
Female	ref								
Male	13.394	0.013	1.728 - 103.835	2.145	0.005	1.261 - 3.650	0.168	<0.1	0.068 - 0.4187
Time of Introducing Solid Food									
2 to 3	ref								
3 to 4	0.229	0.185	0.026 - 2.021	1.686	0.162	0.811-3.506	0.528	0.228	0.187 - 1.492
4 to 5	0.273	0.242	0.031 - 2.401	2.419	0.018	1.165 - 5.023	0.812	0.656	0.324 - 2.035
5 to 6	0.536	0.615	0.0473 - 6.083	4.659	0.001	1.928-11.258	0.411	0.127	0.131 - 1.287
6 and above	0.291	0.392	0.017 - 4.916	1.478	0.496	0.480 - 4.557	0.986	0.984	0.238 - 4.087
Water Used Should be Boiled									
No	ref								
Yes	1.229	0.793	0.263 - 5.744	0.863	0.721	0.384 - 1.939	0.859	0.77	0.310 - 2.381
Water Used Should be Boiled (Alternative Entry)									
No	ref								
Yes	0.426	0.417	0.054 - 3.345	1.110945	0.772	0.545-2.263	0.105	0.457	0.507 - 4.522

Appendix VI: Knowledge Categorization

Categorization is based as follows

Very High: Practices with >85% adherence or agreement.

High: Practices with 70–85% adherence or agreement.

Moderate: Practices with 50–69% adherence or agreement.

Low: Practices with <50% adherence or agreement.

Reference: Kenya National Bureau of Statistics (KNBS). (2022).

Appendix VII: KUREC Clearance Letter

KABARAK UNIVERSITY RESEARCH ETHICS COMMITTEE

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

Tel: 254-51-343234/5
Fax: 254-051-343529
www.kabarak.ac.ke

OUR REF: KABU01/KUREC/001/04/04/24 Date: 12th April, 2024

AYOMA KAMBONA OSCAR
GMND/M/0351/04/22
Kabarak University

Dear Oscar,

RE: KNOWLEDGE, COMPLEMENTARY FEEDING PRACTICES AND NUTRITION STATUS OF CHILDREN 6--23 MONTHS OLD IN SIAYA COUNTY, KENYA.

This is to inform you that ***KUREC*** has reviewed and approved your above research proposal. Your application approval number is ***KUREC-040424.*** The approval period is ***12/04/2024 – 23/04/ 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 affect 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.
ix. Submission of an executive summary report within 90 days upon completion of the study to ***KUREC***

Sincerely,

KABARAK UNIVERSITY INSTITUTIONAL RESEARCH ETHICS COMMITTEE
12 APR 2024
APPROVED
P.O. PRIVATE BAG 20157 KABARAK

Prof. Jackson Kitetu PhD.
KUREC-Chairman

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

Appendix VIII: NACOSTI Research Permit

REPUBLIC OF KENYA

NATIONAL COMMISSION FOR SCIENCE,TECHNOLOGY & INNOVATION

Ref No: **804631**

Date of Issue: **03/May/2024**

RESEARCH LICENSE

This is to Certify that Mr.. Oscar Kambona Ayoma of Kabarak University, has been licensed to conduct research as per the provision of the Science, Technology and Innovation Act, 2013 (Rev.2014) in Siaya on the topic: Knowledge, Complementary Practices and Nutrition Status of Children 6-23months Old in Siaya County, Kenya for the period ending : 03/May/2025.

License No: **NACOSTI/P/24/34978**

804631

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 IX: Authorization Let**ter** from Health Department -Siaya

REPUBLIC OF KENYA

COUNTY GOVERNMENT OF SIAYA

Department of Health

Correspondence should be addressed to:
The County Government of Siaya
Email: siayachd@gmail.com
In reply please quote:

County Health Headquarters
Adjacent to JCC Church
P.O. Box 597 – 40600
SIAYA

REF: CGS/CHD/RESEARCH/VOL.VI(18)

14th May, 2024

Sub-County Medical Officers of Health
Alego Usonga

CLEARANCE TO CONDUCT A STUDY ON KNOWLEDGE, COMPLEMENTARY FEEDING PRACTICES, AND NUTRITION STATUS OF CHILDREN 6-23 MONTHS OLD IN SIAYA COUNTY, KENYA

Mr. Oscar Kambona is pursuing a degree of Master of Science in Human Nutrition and Dietetics at Kabarak University. He has received authorization from both the Kabarak University Research Ethics Committee, reference, KUREC -KABUO1/KUREC/001/04/04/24, and NACOSTI - License No: NACOSTI/P/24/34978) to conduct the above-referenced research in County.

The primary objective of the study is to assess the knowledge and practices related to complementary feeding among caregivers and evaluate the nutritional status of children aged 6-23 months in Alego Usonga sub-county, Siaya County.

The specific objectives of the study include:

1. Determine complementary feeding practices of caregivers with children 6 to 23 months old in Siaya County.
2. Assess the knowledge on complementary feeding of caregivers with children 6 to 23 months of age in Siaya.
3. Assess the nutrition status of children aged 6 to 23 months in Siaya.
4. Establish the relationship between the caregiver's knowledge on CF, complementary feeding practices, and the nutritional status of children 6 to 23 months old in Siaya.

This is to notify you that the research has been approved by the office undersigned. The investigator is further instructed to remain within the confines of the study protocol and report the progress of the study to the undersigned office regularly.

A globally competitive, healthy and productive County

Please note that the authorization to conduct this study will automatically expire on May 14, 2025. Kindly accord him all the necessary assistance that he may need during the study period.

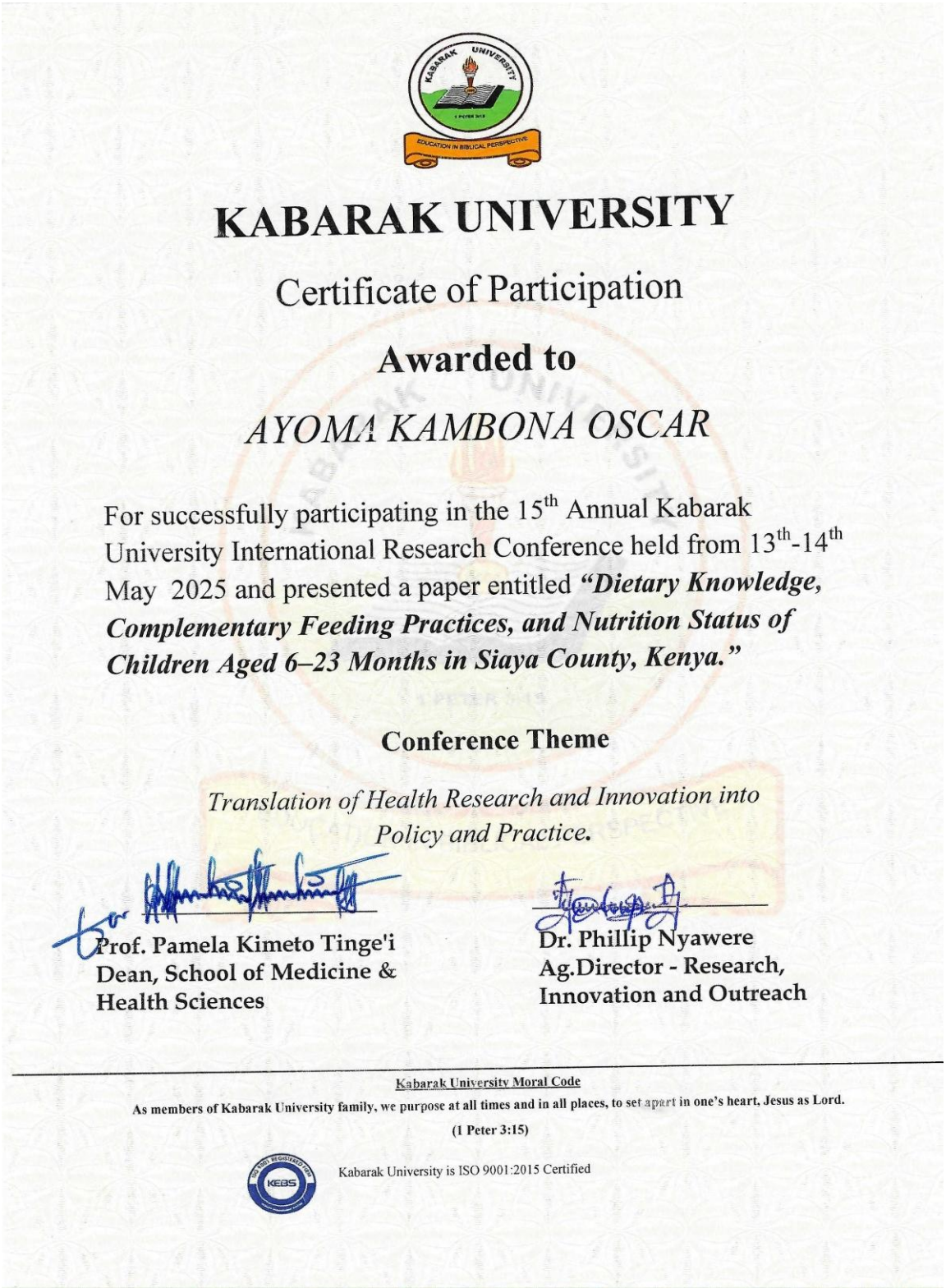
Thank You.

Kennedy Oruenjo, *MCHD, MPH, BCHD, Dip (EHS)*
County Director of Public Health

Copy to:

- The CECM – Health
- The Chief Officer of Health
- The Ag. County Director of Medical Services

Appendix X: Evidence of Conference Participation



KABARAK UNIVERSITY

Certificate of Participation

Awarded to

AYOMA KAMBONA OSCAR

For successfully participating in the 15th Annual Kabarak University International Research Conference held from 13th-14th May 2025 and presented a paper entitled ***"Dietary Knowledge, Complementary Feeding Practices, and Nutrition Status of Children Aged 6–23 Months in Siaya County, 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 XI: List of Publication

INTERNATIONAL JOURNAL OF RESEARCH AND SCIENTIFIC INNOVATION (IJRSI)
ISSN No. 2321-2705 | DOI: 10.51244/IJRSI |Volume XII Issue X October 2025

Dietary Knowledge, Complementary Feeding Practices and Nutrition Status of Children 6–23 Months Old in Siaya County, Kenya

Ayoma Kambona Oscar[1*], Moses Mogesi[1], Peter Chege[2]

[1]Department of Human Nutrition and Dietetics, Kabarak University

[2]Department of Food, Nutrition and Dietetics, School of Health Sciences, Kenyatta University

***Corresponding Author**

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ABSTRACT

Malnutrition remains a critical public health challenge in Kenya, particularly among children aged 6–23 months during the complementary feeding period. Siaya County reports stunting rates (19.2%) exceeding the national average (18.2%), with Alego Usonga Sub-County contributing 42% of the total county malnutrition cases, indicating urgent need for evidence-based interventions. The aim of the study was to assess dietary knowledge, complementary feeding practices, and nutritional status among children aged 6-23 months in Siaya County, Kenya. Three specific objectives target caregiver knowledge assessment, practice determination, and nutritional status evaluation with associated predictors. An explanatory sequential mixed-methods design was employed, collecting cross-sectional data from 282 caregiver-child pairs through semi-structured questionnaires and focus group discussions. Anthropometric measurements were analyzed using ENA for SMART (2015) software and compared against WHO growth standards. Statistical analysis was conducted using SPSS Version 26, with chi-square tests examining associations and logistic regression identifying predictors at $p<0.05$ significance level. The study found that while 70.2% of caregivers initiated complementary foods at the recommended age (6-8 months), significant practice gaps persisted: only 36.5% achieved minimum dietary diversity (MDD), 5.0 % met minimum meal frequency (MMF), and 4.6% achieved minimum acceptable diet (MAD). Malnutrition prevalence included stunting (29.08%), underweight (13.1%), and wasting (4.96%). Girls experienced significantly higher stunting rates than boys (36.55% vs 21.17%, $p<0.05$). Maternal education level showed significant association with MDD achievement ($p=0.03$), while male sex significantly increased odds of wasting (OR=13.4, $p=0.013$) and stunting (OR=2.15, $p=0.005$). Early solid food introduction at 4-6 months substantially increased stunting risk (OR=2.42-4.66, $p<0.05$). Despite adequate knowledge of feeding timing, caregivers demonstrated poor implementation of dietary diversity and meal frequency practices. Interventions on complementary feeding need to prioritize maternal education, address gender-specific feeding vulnerabilities, and strengthen community-based nutrition programs.

Keywords: Complementary feeding; Malnutrition; Dietary diversity; Nutritional status; Children 6-23 months; Stunting; Predictors.

INTRODUCTION

Malnutrition among children aged 6–23 months represents a critical global health challenge, with approximately 22.3% of children under five having stunted growth worldwide (WHO, 2021). Sub-Saharan Africa bears a disproportionate burden, contributing 43% of global malnutrition cases (Bain et a., 2013). In Kenya, while some progress has been made with national stunting rates at 18.2% regional disparities persist, particularly in Siaya County where stunting rates reach 19.2% (KNBS & ICF, 2023).

The 6–23-month period represents a critical window for child development, coinciding with the introduction of complementary foods alongside continued breastfeeding (PAHO, 2020). This transition period markedly impacts