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

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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

long-term health outcomes, with inappropriate feeding practices contributing to growth faltering, developmental delays, and increased mortality risk (Stein et al., 2020; Victora et al., 2021)

Current evidence reveals substantial gaps in optimal complementary feeding practices globally. Worldwide, approximately half of all children are not provided the minimum meal frequency(Tebeje et al., 2024) , 29.4% achieve minimum dietary diversity, and just 16% receive a minimum acceptable diet (World Health Organization, 2021). These challenges are particularly pronounced in Eastern and Southern Africa, where dietary diversity remains critically low, with only 21% of children achieving minimum standards (Victora et al., 2021). Kenya's situation reflects both progress and persistent challenges. The country outperforms regional averages in continued breastfeeding (75%) and timely food introduction (80%), with better MDD (36%) and MAD (22%) rates than 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 like Siaya County, which reports higher stunting (19% against national 18%) and alarming malnutrition concentrations (with 42% reporting from Alego Usonga of all malnutrition cases in Siaya County) (KNBS & ICF, 2023).

Evidence shows that caregiver knowledge significantly influences feeding practices Abeshu et al. (2022), yet the relationship between knowledge, actual practices, and nutritional outcomes remains unclear. While nutritional awareness is important, socio-economic factors, including household income, food insecurity, and cultural and traditional beliefs for instance gendered feeding practices, often determine feeding behaviors more than knowledge alone (Anyati et al., 2025; Cheruiyot, 2024; Khamis et al., 2019; Semahegn et al., 2014). For instance, in rural Kenya, only 34% of caregivers with high knowledge adhered to dietary diversity guidelines due to economic constraints (Kimani-Murage et al., 2021).

MATERIALS AND METHODS

Study Design

This study applied the explanatory sequential mixed-methods design..

Study Area

The study was conducted in Siaya County, Western Kenya, bordering Lake Victoria. The study was specifically conducted in two Community Health Units (CHUs) - Hono and Bar Agulu in Alego Usonga Sub-County. Alego Usonga Sub-County was purposively selected due to its high malnutrition burden, accounting for up to 42% of all malnutrition cases screened within Siaya County according to the County Department of Health Services (2023).

Population and Sampling

The study population included caregiver-child pairs with children aged 6-23 months residing in the selected CHUs, covering 22 villages with 2,773 documented households and serving approximately 20,700 people with a target group of 435 eligible children (MOH Kenya, DHIS2 2024)

Sample Size

The sample size was determined using Fisher's formula (1998), calculating a minimum required sample of 238 participants based on a stunting prevalence of 19.2% and a 95% confidence level. To account for potential non-response and incomplete data, an adjustment factor of 18.8% was applied, resulting in a final sample size of 282 participants. This specific non-response rate was derived from study-specific considerations, including the sensitivity of topics related to infant feeding practices and nutritional assessment, anticipated participant attrition during multi-stage data collection (dietary recall, anthropometric measurements, and knowledge assessments), and historical non-response patterns observed in similar community-based nutritional surveys conducted in comparable settings (Emon, 2024).

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Inclusion and Exclusion criteria

Primary caregivers of children aged 6-23 months providing written informed consent were included in the study. Children with developmental delays or disabilities, caregivers who declined consent, and children with medical conditions requiring specialized nutritional management were excluded from the study.

Study variables

The primary variables included dietary knowledge across four WHO domains: (1) minimum dietary diversity, (2) minimum meal frequency, (3) minimum acceptable diet, and (4) consumption of iron-rich or iron-fortified foods, in complementary feeding practices, and nutritional status using WHO growth standards. Secondary variables included demographic and socioeconomic factors.

Data Collection Tools and Procedures

Quantitative data was collected using KoBoCollect/Toolbox (2023). [Cited: 21 October 2025]. https://www.kobotoolbox.org/ on Android tablets with pre-tested semi-structured questionnaires capturing demographic, socioeconomic, feeding practices, and caregiver knowledge data. Anthropometric measurements were taken using SECA 334 digital scales, length mats, and WHO-standardized MUAC tapes. Qualitative data was collected through focus group discussions with 8-12 participants using WHO-aligned guides until thematic saturation (Guest et al., 2006) .

Definition of terms

Dietary knowledge defined as understanding of food variety and their importance and timely introduction of complementary feeding.

Complementary feeding defined as Giving foods to children 6-23 months old to complement breast-milk when it is unable to supply the child's essential nourishment anymore.

Minimum Acceptable Diet- children 6-23 months old who attained both the MDD and MMF **through consumption of five or more food groups used in this study.**

Minimum meal frequency proportion of children aged 6-23 months who received the minimum number of daily meals

Minimum diet diversity: Children aged 6-23 months who ate a diverse diet from 5 or more of the identified food groups.

Nutrition status- the state of children's health determined by nutrients intakes**.**

RESULTS

Demographics and socio-economics characteristics

The study encompassed 282 caregiver-child pairs, with biological mothers constituting the overwhelming majority of primary caregivers at 92.55%, while biological fathers and other relatives or grandparents represented 2.84% and 4.61% respectively. The child population showed balanced gender distribution with 51.42% female and 48.58% male participants, though age distribution favored older children, with 54.96% aged 13-23 months compared to 45.0% aged 6-12 months. (Table 1).

Caregiver demographics revealed a predominantly young population, with nearly 39.7% aged 14-24 years representing the largest cohort. The majority of the respondents were married (78.0%) On educational attainment 42.9% had secondary education, 42.2% had primary education (, while vocational training, university degrees, and no formal education were 11.0%, 2.1%, and 1.8% respectively. In Occupations, 27.0%, were waged laborers, while were (25.2% were housewives,20.2% were unemployed. (Petty traders and agricultural; laborers were 18.8%, and 8.9% respectively.

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Table 1: Demographic and Socioeconomic Characteristics of Caregivers (n=282)

Characteristic	Category	Frequency (n)	Percent (%)
Relationship to Child	Biological mother	261	92.6
	Biological father	8	2.8
	Others (relatives, Grandparents)	13	4.6
Child's Gender	Male	137	48.6
	Female	145	51.4
Age Distribution (Child)	6-12 months	127	45.0
	13-23	155	55.0
Marital Status	Married	220	78.0
	Single	62	22.0
Age Distribution (caregiver)	14-24 years	112	39.7
	25-30 years	91	32.3
	31-70 years	79	28.0
Occupation	Agricultural labour	25	8.9
	Housewife	71	25.2
	Waged labour	76	27.0
	Petty trade	53	18.8
	Unemployed	57	20.2
Education Level	No education	5	1.78
	Primary school	119	42.2
	Secondary school	121	42.9
	University degree	6	2.1
	Vocational college	31	11.0

Dietary Knowledge

This dietary knowledge assessment reveals a complex knowledge profile with distinct strengths and weaknesses among participants. The study found that most of the respondents had a high knowledge on l hygiene and feeding practices, with over 90% correctly identifying basic food safety protocols like handwashing, appropriate food types such as fruits and vegetables, and the mother's primary feeding role. Knowledge of continued breastfeeding recommendations was high (84%),

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However, caregivers show more moderate competencies in areas requiring practical application (58%). While most understand protein introduction timing and food variety importance, fewer grasp how caregiver preferences and economic constraints create real-world feeding barriers. Most concerning in this study are the knowledge gaps in culturally-sensitive areas, where only 67% understand traditional beliefs' influence on feeding practices and just 57% knew appropriate family pot feeding timing. This pattern suggests participants possess strong theoretical foundations but struggle with contextual integration, indicating that nutrition education programs may need better cultural adaptation and practical implementation guidelines.

Knowledge assessment using Bloom's Taxonomy

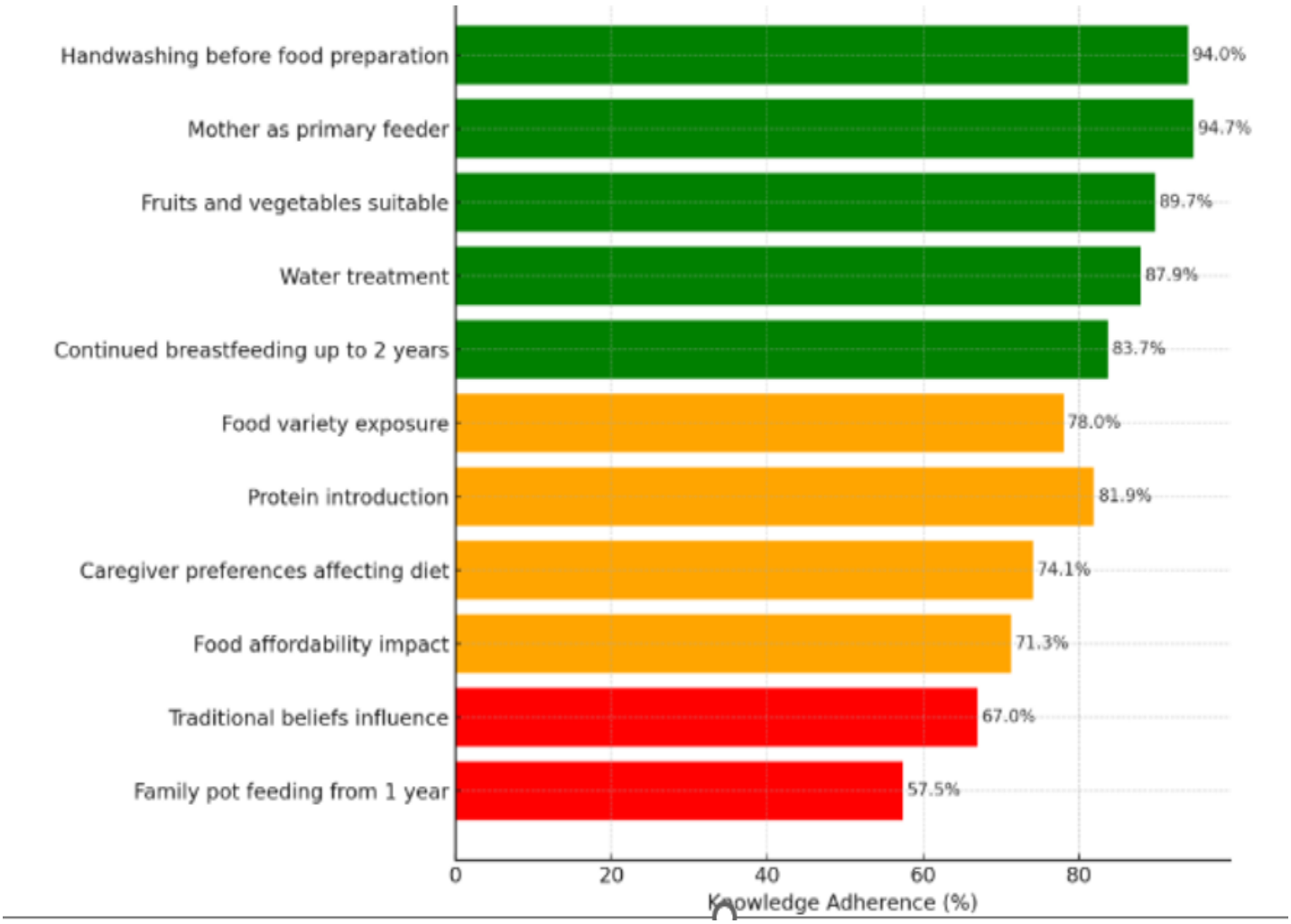

Figure 1: Knowledge Assessment based on Bloom's Taxonomy,

Complementary Feeding Practices

This study reveals a gap between the timely initiation of complementary feeding and its nutritional adequacy. While 70.2% of the children were introduced to complementary foods at 6-8 months and 77.3% continued breastfeeding-the quality and frequency of meals are deficient. Only 5% of children received the minimum number of daily meals (MMF), and 36.5% consumed a minimum diverse diet (MDD) from five or more food groups. On the other hand, only 4.6% achieved a minimum acceptable diet (MAD).

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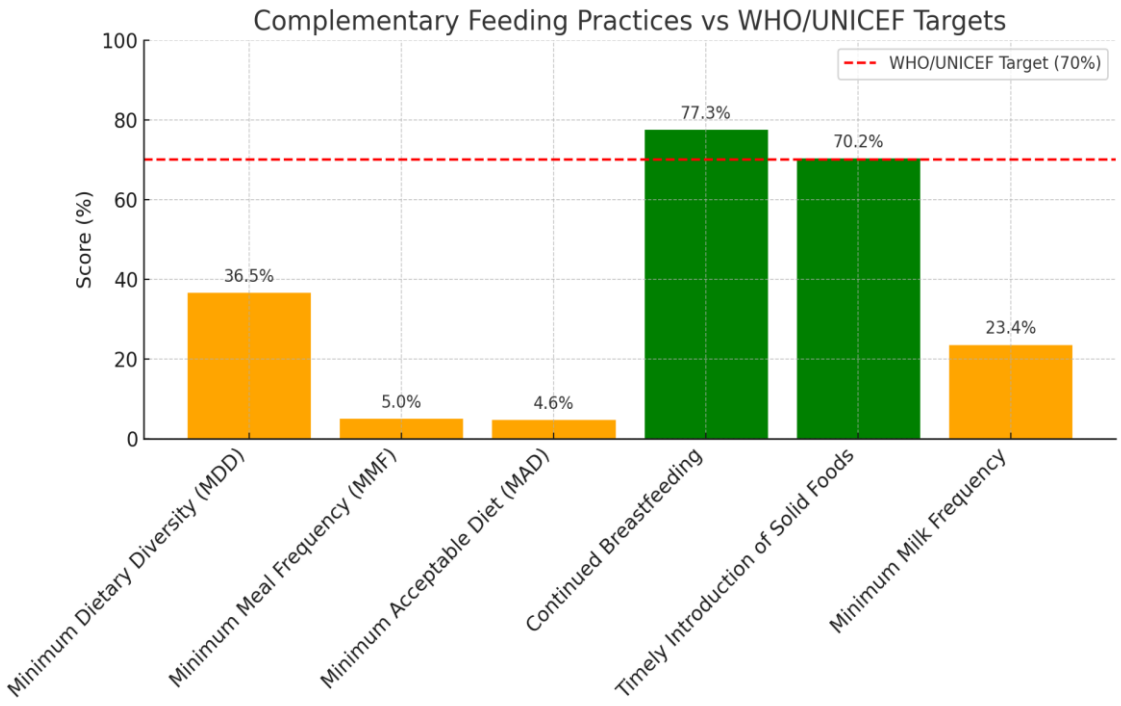

Figure 2: Compliance gaps with feeding frequency and acceptable diet standards

Food consumption pattern: 24-hour recall

Dietary patterns were heavily reliant on staples like grains (93.3%), with critically low consumption of nutrient-rich eggs (36.5%) and dairy (10.6%). This demonstrates that while caregivers understand when to start feeding, profound challenges exist in providing frequent, diverse, and nutrient-dense meals, explaining the high rates of malnutrition in this population.

Food consumption pattern: 24-hour recall

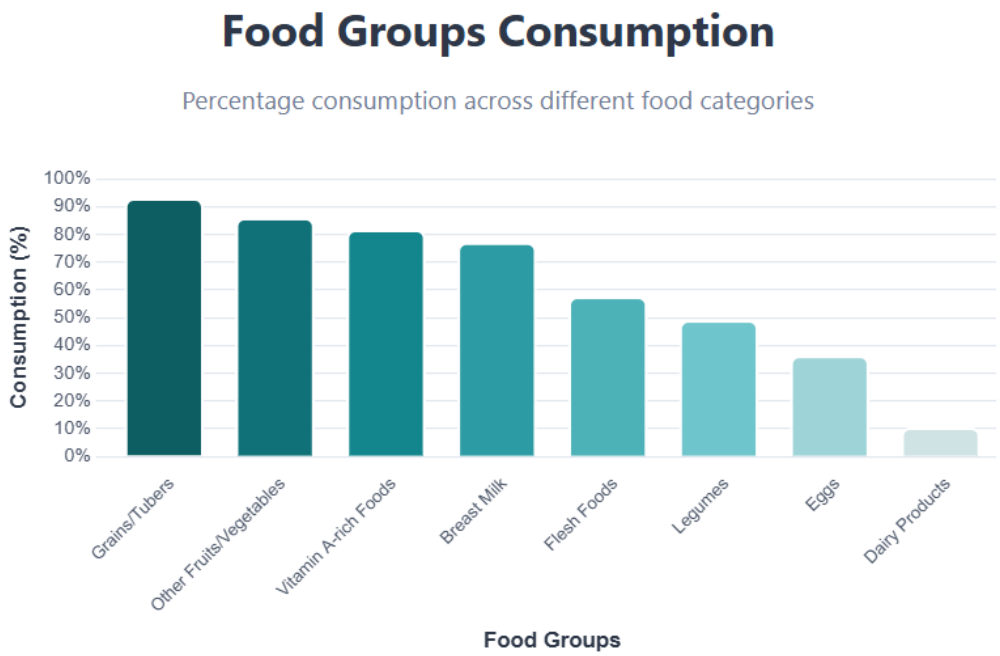

Figure 3: Food consumption pattern: 24-hour recall

Nutritional Status by Child Sex.

The data revealed a significant gender disparity in nutritional status, with female children experiencing substantially higher rates of malnutrition across all measured indicators. Female children showed higher stunting rates, with 36.56% affected (8.28% severe, 28.28% moderate) compared to 21.17% of males (3.65% severe, 17.52% moderate). Wasting patterns had similar trends, affecting 8.97% of females versus only 0.73% of males. Underweight prevalence shows the most pronounced disparity, with 21.38% of female children affected compared to just 4.38% of males. All differences achieve statistical significance ($p<0.05$), indicating systematic gender-based nutritional inequities rather than random variation. These findings suggest possible differential feeding practices, resource allocation, or care-seeking behaviors that systematically disadvantage female children, highlighting the need for gender-sensitive nutritional interventions.

Table 2: Nutritional Status by Child Sex.

Sex	**Stunting Status (%)**			**Wasting Status (%)**			**Underweight Status (%)**		
	Severe	Moderate	Normal	Severe	Moderate	Normal	Severe	Moderate	Normal
Female (n=145)	8.28	28.28	63.45	3.45	5.52	91.03	0	21.38	78.62
Male (n=137)	3.65	17.52	78.83	0	0.73	99.27	0	4.38	94.89
p-value	**0.015**			**0.004**			**<0.001**		

Associations Knowledge-Practice Relationships with Dietary Diversity Outcomes

The statistical analyses reveal critical determinants of child feeding practices and nutritional outcomes with clear socioeconomic patterns. Caregiver education exhibits a striking dose-response relationship with minimum dietary diversity (MDD) compliance, ranging from 20% among mothers with no formal education to 100% among university graduates ($p=0.03$). This educational gradient is reinforced by significant associations between food knowledge/preferences and MDD ($p=0.03$), while strong adherence to traditional beliefs negatively impacts dietary diversity ($p=0.018$). Food affordability preferences significantly influence both MDD ($p=0.038$) and minimum acceptable diet (MAD) ($p=0.04$), indicating that informed economic choices can lead to better nutritional outcomes. Feeding frequency patterns demonstrate measurable impacts on nutritional status, with higher meal frequency reducing wasting risk ($p=0.048$) and increased milk feeding frequency lowering stunting ($p=0.022$) and underweight rates ($p=0.031$). Psycho-social factors emerge as the most significant predictor of dietary diversity ($p=0.006$), while demographic factors showed no significant associations with feeding outcomes.

Table 3: Associations Knowledge-Practice Relationships with Dietary Diversity Outcomes

	Variable	**Outcome Measure**	**p-value**	**Effect Size (OR/β)**	**95% CI**
Associations with Dietary Diversity	Caregiver education	MDD	0.03	1.45	(1.04-2.03)
	Food knowledge/preferences	MDD	0.03	1.38	(1.03-1.85)
	Traditional beliefs impact	MDD	0.018	0.72	(0.55-0.94)
	Food affordability preferences	MDD	0.038	1.32	(1.02-1.71)
	Food affordability preferences	MAD	0.04	1.29	(1.01-1.65)
	Psychosocial factors	MDD	0.006	1.58	(1.14-2.19)
Feeding Practices and Nutritional Status	Meal frequency	Wasting	0.048	0.78	(0.61-0.99)
	Milk feeding frequency	Stunting	0.022	0.65	(0.45-0.94)
	Milk feeding frequency	Underweight	0.031	0.71	(0.52-0.97)
Caregivers' Education and MDD Compliance	**Education Level**	**MDD Compliance Rate**	**p-value**		
	University degree	100.00%	0.030		
	Secondary school	65.29%			
	Primary school	63.03%			
	No education	20.00%			

MDD: Minimum Meal Diversity

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Multivariable Analysis of Independent Risk Factors for Child Malnutrition

The multivariable analysis reveals complex gender-specific malnutrition patterns and critical timing effects for complementary feeding (Table 4). Male children demonstrate paradoxical risk profiles. They show protection against underweight (OR=0.63, 95% CI: 0.43-0.94) but face dramatically elevated wasting risk (OR=13.39, 95% CI: 1.73-103.83) and more than doubled stunting risk (OR=2.15, 95% CI: 1.26-3.65) compared to females. This suggests distinct nutritional vulnerabilities by gender requiring targeted interventions. Solid food introduction timing emerges as a critical determinant of stunting, with delayed introduction showing dose-dependent risk increases. Children receiving solids at 4-5 months have 2.4 times higher stunting odds (95% CI: 1.17-5.02) compared to those introduced at 3-4 months, while those starting at 5-6 months face 4.7 times higher risk (95% CI: 1.93-11.26). Notably, factors previously significant in univariate analyses-including caregiver knowledge, psychosocial support, water boiling practices, and milk feeding frequency-lost significance in the multivariable model, indicating that child sex and feeding timing are the primary independent predictors of malnutrition outcomes.

Table 4: Multivariable Analysis - Predictors of Malnutrition

Factor	Underweight OR (95% CI)	Wasting OR (95% CI)	Stunting OR (95% CI)
Child Sex (Male vs Female)	0.63[0.43-0.94]	13.39 [1.73-103.83]	2.15 [1.26-3.65]
Solid Food Timing			
4-5 months vs 3-4 months	1.06 [0.66-1.69]	0.92 [0.32-2.63]	2.42 [1.17-5.02]
5-6 months vs 3-4 months	0.95 [0.55-1.63]	1.18 [0.39-3.58]	4.66 [1.93-11.26]
≥6 months vs 3-4 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]

DISCUSSION

The findings from this study reflect broader patterns observed across Sub-Saharan Africa, where the persistent gap between nutritional knowledge and feeding practices continues to undermine child health outcomes despite significant policy investments (Bolarinwa et al., 2022; Silva et al., 2023). This study's documentation of 95% non-compliance with minimum meal frequency standards and 95.39% failure to achieve minimum acceptable diet criteria mirrors regional challenges, where only two of twelve Sub-Saharan African countries with available data are on track to achieve the 2025 global nutrition target of reducing stunting by 40% (Global Nutrition Report 2022). In Kenya specifically, while impressive gains have been made in exclusive breastfeeding rates, progress in complementary feeding practices has lagged substantially, as evidenced by national statistics showing 18% of children under five years remain stunted, (National Bureau of Statistics Nairobi, 2023). The Siaya findings are particularly concerning when viewed against Kenya's recent progress in reducing acute malnutrition, where approximately 847,000 children under five faced acute malnutrition in 2024, representing a 14.5% reduction from 2023 levels (UNICEF Kenya Annual Report, 2024) This improvement in acute conditions makes the persistent structural barriers to optimal complementary feeding in Siaya even more significant, suggesting that while emergency interventions may be succeeding, fundamental feeding practice improvements remain difficult to achieve.

The pronounced gender disparities observed in Siaya County, where female children experienced 36.55% stunting rates compared to 21.17% in males, alongside 21.38% underweight prevalence versus 4.38% in males, reflect deeply embedded cultural and structural inequities that extend beyond the immediate study area (Oranga et,al., 2018; Birhanu et al., 2024). These patterns align with documented gender-based feeding practices across western Kenya, where research has shown that mothers perceive nutrition problems as embedded within broader gender and family relations, particularly in contexts of marital conflict, male labor migration, and household impoverishment (And & Health Transition Review, 1991). The paradoxical finding that male children showed protection against underweight but increased vulnerability to wasting and stunting suggests complex biological and cultural interactions that require nuanced understanding ((Thurstans et al., 2022). Recent socioeconomic disparity analyses from Kenya's demographic and health surveys spanning 2014-2022 have confirmed that gender continues to play a significant role in child malnutrition patterns, with household income, parental

education, dietary knowledge levels and access to healthcare creating differential impacts by sex (Sahiledengle et al., 2023; Sunder Raj & Ahmad Sheikh, 2024).

However, the near-universal reliance on staple grains (93.3%) and critically low consumption of nutrient-rich foods like eggs (36.5%) and dairy (10.6%) illustrates how economic constraints force families into nutritionally inadequate dietary patterns. Recent analyses of household behavior and vulnerability to acute malnutrition in Kenya have confirmed that differential household capacities to adapt to external shocks help explain why some families remain more vulnerable despite similar knowledge levels, emphasizing that economic resilience rather than nutritional awareness often determines feeding outcomes (Wanjohi et al., 2023).

The remarkable interplay between knowledge, structural barriers, and cultural beliefs identified in Siaya County underscores the need for comprehensive, multisectoral interventions that move beyond traditional nutrition education approaches(Reynolds et al., 2021). While recent government actions have accelerated progress in some areas of infant and young child feeding, the persistent implementation gaps revealed in this study suggest that current approaches inadequately address the intersection of poverty, cultural beliefs, and gender-based care practices that fundamentally shape feeding behaviors (Kenya BFCI guidelines, 2016). Given that Kenya's nutritional landscape presents a complex picture of progress amid persistent challenges. Despite improvements in stunting rates (dropping from 26% in 2014 to 18% in 2022) and slight reductions in overweight (4% to 3%) and underweight (11% to 10%) prevalence, the country reported 942,000 acute malnutrition cases in children aged 6-59 months during the first half of 2022. Only 31% of children aged 6-23 months consume a minimum acceptable diet, while 5% remain wasted(Kenya-Strategy-for-MIYCN-2023-2028; Kenya Demographic and Health Survey (2022).

Kenya demonstrates relative strengths in continued breastfeeding (60%) and timely food introduction (87%), outperforming regional averages. However, critical gaps persist: half of children fail to meet minimum meal frequency standards, 29% consume no vegetables or fruits, and exclusive breastfeeding rates remain low at 57.8% in counties like Siaya. These disparities are particularly pronounced in high-burden areas (UNICEF/WHO/World Bank group, 2023), with Siaya County reporting higher stunting rates (19.2%) and concentrated malnutrition cases, notably 42% from Alego Usonga alone. Such patterns underscore the need for integrated strategies addressing knowledge gaps, economic constraints, gender equity, and community support systems through culturally-adapted programs recognizing structural determinants' primacy over individual knowledge in shaping feeding practices.

CONCLUSION

This study highlights the persistent disconnect between caregivers' nutritional knowledge and actual complementary feeding practices (CFP). While caregivers exhibited sound awareness of appropriate feeding, implementation was hindered by structural barriers such as poverty, food insecurity, and entrenched cultural norms. These findings align with broader literature indicating that socio-economic conditions and gendered caregiving traditions often exert more influence on feeding behaviors than knowledge alone. The study revealed significant non-compliance with WHO feeding standards particularly low dietary diversity and inadequate meal and milk frequency. Girls were disproportionately affected, exhibiting higher rates of stunting and wasting. Interestingly, while boys were somewhat protected from underweight, they were still vulnerable to wasting and stunting, underscoring the complex and inconsistent gender dynamics at play.

These findings affirm the need for multisectoral interventions that go beyond education to address systemic issues such as household income, food access, and gender inequality. The evidence supports the case for community-tailored nutrition strategies that incorporate social protection, access to quality foods, and behavior change support. Addressing these structural determinants is essential for translating nutritional knowledge into improved practices and outcomes. Sustainable progress in child nutrition must be grounded in integrated, context-specific approaches responsive to local realities.

Abbreviations

CFP: Complementary Feeding Practices; CHU: Community Health Unit; MAD: Minimum Acceptable Diet; MDD: Minimum Dietary Diversity; MMF: Minimum Meal Frequency; MIYCN: Maternal and Infant Young Child Nutrition; MUAC: Mid-Upper Arm Circumference; OR: Odds Ratio; WHO: World Health Organization

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Ethics approval and consent to participate

The study maintained strict adherence to international ethical standards, including the Helsinki Declaration (2013), and secured comprehensive approvals from Kabarak University Ethics Review Committee (KUREC), the National Commission for Science, Technology and Innovation (NACOSTI), Siaya County Health Management Team (CHMT), and local administration. Participant protection was ensured through written informed consent from all participants, with verbal explanations provided in the local Dholuo language to ensure comprehension. The study applied voluntary participation with explicit withdrawal rights, while confidentiality was maintained through anonymization codes. Rather than providing monetary incentives, the research offered nutrition education as a community benefit, ensuring ethical reciprocity while avoiding potential coercion in participant recruitment and engagement.

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