



## **Integrated Nutrition Education in Pre-Primary Schools in the Busoga Region, Eastern Uganda**

### **A Pilot Quantitative Study of Nutritional Status, Dietary Diversity, and Nutrition-Related Knowledge, Attitudes, and Practices**

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#### **Abstract**

**Background/Objectives:** Malnutrition among preschool-aged children remains a major public health concern in Uganda, particularly in Eastern regions such as Busoga. While Integrated Nutrition Education (INE) is increasingly promoted within early childhood development and education policies, evidence of its association with nutritional outcomes among pre-primary school children is limited. This study aimed to assess nutritional status, dietary diversity, and nutrition-related knowledge, attitudes, and practices (KAP) among caregivers of children aged 3–6 years attending pre-primary schools in the Busoga Region, and to explore relationships between these factors and child nutritional outcomes.

**Methods:** A quantitative cross-sectional pilot study was conducted among 30 children aged 3–6 years enrolled in selected pre-primary schools and their primary caregivers. Anthropometric measurements were collected following World Health Organization standards. Dietary intake was assessed using a 24-hour recall and dietary diversity scoring. Caregiver nutrition-related KAP were measured using structured questionnaires. Descriptive statistics and exploratory association analyses were performed, with emphasis on direction and plausibility of relationships rather than statistical significance.

**Results:** One-third of children were stunted, while underweight and wasting were less prevalent. Caregivers demonstrated moderate nutrition knowledge and attitudes but low feeding practices. Children's diets were dominated by cereals and legumes, with limited consumption of animal-source foods, fruits, and vegetables. Higher dietary diversity and better caregiver practices were directionally associated with improved anthropometric outcomes, although associations were weak and not statistically significant.

**Conclusions:** The findings suggest that existing INE-related exposures within households and pre-primary school settings in Busoga are insufficient to meaningfully influence child nutritional status. Structural factors, including household socio-economic constraints and food insecurity, appear to mediate the translation of nutrition knowledge into practice. The study provides baseline evidence to inform the design of integrated, context-responsive nutrition interventions and supports further investigation using adequately powered designs.

**Keywords:** Integrated Nutrition Education; Preschool Children; Dietary Diversity; Malnutrition; Caregiver Practices; Uganda

## **1. Introduction**

Nutrition in early childhood plays a critical role in shaping growth, cognitive development, health, and long-term human capital. Inadequate nutrition during the first years of life is associated with increased morbidity and mortality, impaired neurodevelopment, reduced educational attainment, and lower economic productivity in adulthood. Although global efforts have reduced child mortality, undernutrition remains a pervasive challenge in low- and middle-income countries like Uganda.

In Uganda, malnutrition continues to affect a substantial proportion of children despite the presence of national nutrition and early childhood development policies. Stunting remains particularly prevalent, reflecting chronic nutritional deprivation that often begins in infancy and extends into later childhood. The Busoga Region in Eastern Uganda consistently reports higher levels of stunting compared to national averages, driven by poverty, food insecurity, limited dietary diversity, and suboptimal feeding practices.

Children aged 3–6 years represent a nutritionally vulnerable yet under-recognised group. This period coincides with rapid cognitive development and the transition into structured learning environments such as pre-primary schools. However, most nutrition interventions in Uganda prioritise the first 1,000 days of life, with limited focus on preschool-aged children. Consequently, nutritional deficits frequently persist into the pre-primary years, undermining school readiness and learning potential.

Integrated Nutrition Education has been proposed as a strategy to address malnutrition beyond infancy by embedding nutrition messaging within early learning environments, caregiver engagement, and teacher practices. In Uganda, policy frameworks such as the Uganda Nutrition Action Plan II and the National Integrated Early Childhood Development Policy emphasise multi-sectoral approaches and the role of education platforms in promoting child nutrition. Nevertheless, implementation of INE at pre-primary level remains inconsistent, poorly resourced, and rarely evaluated.

Empirical evidence linking INE-related knowledge and practices to nutritional outcomes among pre-primary children in low-resource settings is limited. Understanding whether existing nutrition education exposures are associated with improved dietary intake or growth outcomes is essential for informing programme design and policy decisions. This study therefore aimed to provide baseline quantitative evidence on nutritional status, dietary diversity, and nutrition-related KAP among caregivers and teachers of pre-primary children in the Busoga Region.

## **2. Materials and Methods**

### **2.1. Study Design**

This study employed a quantitative cross-sectional pilot design. The primary objective was to assess baseline nutritional conditions and explore the plausibility and direction of associations between INE-related variables and child nutritional outcomes, rather than to generate population-level estimates.

### **2.2. Study Setting and Population**

The study was conducted in selected rural and peri-urban communities within the Busoga Region of Eastern Uganda. The study population comprised children aged 3–6 years enrolled in pre-primary schools, their primary caregivers involved in daily child supervision and care.

### **2.3. Sample Size and Justification**

A total of 30 child–caregiver dyads were included. This sample size was intentionally selected to support a pilot assessment aimed at intensive measurement, internal consistency testing of tools, and hypothesis exploration. In early-stage nutrition and public health research, pilot studies with small samples are commonly used to refine conceptual models, test indicator sensitivity, and inform the design and power calculations of subsequent larger studies. While the sample size limits statistical power, it is sufficient to identify meaningful patterns and generate context-specific insights relevant for intervention development.

## **2.4. Data Collection**

### **2.4.1. Socio-Demographic Information**

Caregiver socio-demographic characteristics, including age, sex, education level, occupation, and household size, were collected using structured questionnaires.

### **2.4.2. Anthropometric Measurements**

Children’s weight and height were measured following World Health Organization protocols. Height-for-age (HAZ), weight-for-age (WAZ), and weight-for-height (WHZ) z-scores were calculated using WHO reference standards. Nutritional status was classified according to WHO criteria.

### **2.4.3. Dietary Assessment**

Dietary intake was assessed using a 24-hour recall administered to caregivers. Dietary diversity scores were calculated based on standard food group classifications, and children were categorised into low, medium, or high dietary diversity groups.

### **2.4.4. Nutrition Knowledge, Attitudes, and Practices**

Nutrition-related KAP among caregivers were assessed using structured questionnaires adapted to the local context. Composite scores were generated for knowledge, attitudes, and practices. Internal consistency of the scales was assessed using Cronbach’s alpha.

## **2.5. Statistical Analysis**

Data were analysed using descriptive statistics and exploratory association analyses. Continuous variables were summarised using means and standard deviations, while categorical variables were summarised using frequencies and percentages. Given the pilot nature of the study, analyses focused on the direction and plausibility of associations rather than statistical significance testing. Results are presented alongside tables for clarity.

## **2.6. Ethical Considerations**

Ethical approval was obtained from relevant institutional and district authorities. Written informed consent was obtained from all participating caregivers. Children identified with severe nutritional deficits were referred to local health facilities for follow-up.

## **3. Results**

### **3.1. Socio-Demographic Characteristics**

Caregivers were predominantly female and largely engaged in subsistence farming or informal economic activities. Most households were characterised by low educational attainment and relatively large household sizes (Table 1).

**Table 1: Socio-demographic characteristics of caregivers**

Variable	Category	n	%
Age (years)	≤29	9	30
	≥30	21	70
Sex	Female	25	83.3
	Male	5	16.7
Education level	Primary or less	19	63.3
	Secondary or higher	11	36.7
Primary occupation	Subsistence farming	16	53.3
	Other (trading, casual labour)	14	46.7
Household size	≤5 persons	11	36.7
	>5 persons	19	63.3
Children aged 3–6 years in household	One	18	60
	Two or more	12	40

### 3.2. Characteristics and Nutritional Status of Children

Children were evenly distributed across age and sex categories. One-third of children were stunted, indicating a substantial burden of chronic undernutrition, while underweight and wasting were less prevalent (Table 2 and Table 3).

**Table 2: Characteristics of children aged 3–6 years**

Variable	Category	n	%
Age group (months)	36–47	9	30
	48–59	12	40
	60–72	9	30
Sex	Male	14	46.7
	Female	16	53.3
Meals consumed previous day	<3 meals	14	46.7
	≥3 meals	16	53.3
Recent illness (past 2 weeks)	Yes	7	23.3
	No	23	76.7

**Table 3: Nutritional status of children**

Indicator	Definition	n	%
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Stunting	HAZ < -2 SD	10	33.3
Severe stunting	HAZ < -3 SD	3	10
Underweight	WAZ < -2 SD	4	13.3
Wasting	WHZ < -2 SD	1	3.3

Mean height-for-age z-scores declined with increasing age, suggesting cumulative nutritional deprivation

**Table 4: Mean anthropometric z-scores by age group**

Age group (months)	HAZ Mean (SD)	WAZ Mean (SD)	WHZ Mean (SD)
36–47	-1.21 (1.09)	-0.81 (0.97)	-0.29 (0.88)
48–59	-1.46 (1.14)	-0.93 (1.01)	-0.34 (0.95)
60–72	-1.62 (1.18)	-0.97 (1.03)	-0.31 (0.92)

Height-for-age scores decline with increasing age, consistent with cumulative exposure to nutritional deprivation rather than acute short-term shocks.

### 3.3. Nutrition-Related Knowledge, Attitudes, and Practices

Caregivers demonstrated moderate levels of nutrition knowledge and attitudes, but feeding practices were consistently low (Table 5). Internal consistency of KAP scales was acceptable (Table 6).

**Table 5: Caregiver nutrition KAP scores**

Component	Mean	SD	Score range	Interpretation
Knowledge	6	1.6	1–10	Moderate
Attitudes	6.3	1.4	2–10	Moderate
Practices	4.2	1.5	1–9	Low

A clear knowledge–practice gap is evident. While caregivers possess moderate awareness of appropriate feeding principles, this knowledge does not translate into consistent or adequate feeding behaviours.

**Table 6: Internal consistency of KAP scales**

Scale	Number of items	Cronbach's $\alpha$	Interpretation
Knowledge	10	0.73	Acceptable
Attitudes	6	0.71	Acceptable
Practices	9	0.74	Acceptable

### 3.4. Dietary Intake and Diversity

Dietary diversity was limited, with diets dominated by cereals and legumes. Less than forty percent of children achieved high dietary diversity, and consumption of animal-source foods, fruits, and vegetables was low (Tables 7–9).

**Table 7: Meal consumption**

Meal	Consumed n (%)
Breakfast	19 (63.3)
Lunch	25 (83.3)
Evening snack	9 (30.0)
Supper	27 (90.0)

**Table 8: Dietary diversity score distribution**

DDS category	Definition	n	%
Low	0–2 food groups	9	30
Medium	3 food groups	10	33.3
High	$\geq 4$ food groups	11	36.7

**Table 9: Consumption of food groups**

Food group	n	%
Cereals and starches	29	96.7
Legumes and nuts	17	56.7
Vegetables	14	46.7
Fruits	9	30
Meat or fish	13	43.3
Eggs	4	13.3
Dairy products	8	26.7

Children’s diets were heavily dominated by cereals and legumes, with limited intake of animal-source foods and micronutrient-rich fruits and vegetables

### 3.5. Exploratory Associations

Exploratory analyses indicated weak but directionally positive associations between dietary diversity, caregiver practices, and child anthropometric outcomes. Household-level indicators demonstrated stronger associations with nutritional status than knowledge-based variables (Table 10).

**Table 10: Directional associations between key variables**

Predictor	Outcome	Direction of association	Strength
Caregiver practice score	HAZ	Positive	Weak
Dietary diversity score	HAZ	Positive	Weak
Household size	HAZ	Negative	Moderate
Wealth proxy (asset count)	WAZ	Positive	Moderate

Although statistical significance was not achieved, observed associations followed biologically and socially plausible pathways, supporting the hypothesised conceptual relationships.

## 4. Discussion

### 4.1. Overview of Key Findings

This pilot study provides a nuanced quantitative assessment of the nutritional status of pre-primary school children in the Busoga Region and examines the extent to which existing Integrated Nutrition Education–related exposures are associated with dietary practices and growth outcomes. Three central findings emerge from the analysis.

First, chronic undernutrition remains highly prevalent among children aged 3–6 years, as evidenced by the substantial proportion of children classified as stunted.

Second, caregivers demonstrate moderate levels of nutrition-related knowledge and generally positive attitudes, yet feeding practices and dietary diversity remain poor.

Third, household socio-economic characteristics appear to exert a stronger influence on child nutritional outcomes than education-based variables alone.

Taken together, these findings indicate that current INE exposures, as experienced within households and pre-primary school settings in Busoga, are insufficient to meaningfully alter child feeding behaviours or growth trajectories. Rather than reflecting a failure of knowledge acquisition, the results point to deeper

structural and contextual constraints that mediate the relationship between nutrition education and nutritional outcomes.

#### **4.2. Persistence of Chronic Undernutrition in the Pre-Primary Years**

The prevalence of stunting observed in this study is notable, particularly given the age group under investigation. Stunting reflects long-term cumulative nutritional deprivation rather than short-term dietary inadequacy, and its persistence among children aged 3–6 years suggests that nutritional insults acquired earlier in life are not being corrected during the preschool period. The declining mean height-for-age z-scores with increasing age, as shown in Table 4, further support the interpretation that growth faltering is progressive and cumulative.

This pattern has important implications. While national and global nutrition strategies have rightly prioritised the first 1,000 days of life, the findings of this study underscore that nutritional vulnerability does not abruptly end after infancy. Instead, the pre-primary years represent a continuation of risk, particularly in settings characterised by food insecurity and limited dietary diversity. Failure to address nutritional deficits during this period may entrench growth faltering and compromise cognitive development, school readiness, and educational attainment.

#### **4.3. Nutrition Knowledge without Behavioural Translation: Interpreting the Knowledge–Practice Gap**

One of the most salient findings of this study is the clear divergence between nutrition knowledge and actual feeding practices among caregivers. As indicated in Table 5, caregivers achieved moderate scores for nutrition knowledge and attitudes, yet practice scores were consistently low. This knowledge–practice gap has been widely documented in low-resource settings and reflects the limitations of education-only approaches to nutrition improvement.

In the Busoga context, caregivers may possess awareness of recommended feeding practices, including meal frequency and food group diversity, but lack the material capacity to implement these recommendations. Subsistence farming, informal labour, and limited cash income constrain household food choices, particularly with respect to animal-source foods, fruits, and vegetables. Under such conditions, feeding decisions are shaped more by availability, affordability, and seasonality than by knowledge or intention.

Importantly, the persistence of poor feeding practices despite moderate knowledge should not be interpreted as caregiver neglect or indifference. Rather, it reflects structural constraints that render recommended practices economically or logistically unattainable. This distinction is critical for both ethical interpretation and policy design, as it shifts responsibility away from individual caregivers and towards broader socio-economic systems.

#### **4.4. Dietary Diversity and Its Limited Association with Anthropometric Outcomes**

Dietary diversity among children in this study was generally low, with diets dominated by cereals and legumes and limited inclusion of animal-source foods, fruits, and vegetables, as shown in Tables 8 and 9.

While children with higher dietary diversity tended to exhibit better anthropometric profiles, the observed associations were weak and did not reach statistical significance.

Several factors may explain this finding. First, dietary diversity was assessed using a single 24-hour recall, which captures short-term intake but may not reflect habitual dietary patterns. Chronic outcomes such as stunting are shaped by long-term dietary adequacy rather than day-to-day variation. Second, even when multiple food groups are consumed, portion sizes and nutrient density may remain insufficient to support catch-up growth. Modest improvements in diversity may therefore be inadequate to reverse entrenched growth deficits.

These findings highlight the importance of interpreting dietary diversity indicators cautiously, particularly in relation to chronic anthropometric outcomes. While dietary diversity remains a valuable proxy for diet quality at the population level, it should be complemented by measures of food frequency, quantity, and nutrient density when assessing relationships with growth.

#### **4.5. Dominance of Household Socio-Economic Factors**

Exploratory association analyses, summarised in Table 10, suggest that household-level factors exert a more pronounced influence on child nutritional status than nutrition knowledge or attitudes alone. Indicators such as household size and proxy measures of wealth demonstrated stronger and more consistent directional associations with anthropometric outcomes than caregiver KAP scores.

This finding aligns closely with the UNICEF conceptual framework, which emphasises that basic and underlying causes of malnutrition, including poverty and food insecurity, fundamentally shape immediate dietary and health-related determinants. Larger households may face greater competition for limited food resources, while wealthier households are better positioned to buffer seasonal food shortages and access diverse foods.

The implications are clear. Nutrition education interventions that do not simultaneously address household food access and economic vulnerability are unlikely to achieve substantial impact. In such contexts, INE may function primarily as an awareness-raising tool rather than a driver of behavioural change.

#### **4.6. Implications for Integrated Nutrition Education in Pre-Primary Settings**

The findings of this study raise critical questions about the current design and implementation of Integrated Nutrition Education within pre-primary school contexts. While INE is conceptually appealing, its effectiveness depends on the presence of enabling environments that allow knowledge to be acted upon.

In the study setting, pre-primary schools rarely provided regular meals, and nutrition education was inconsistently integrated into daily routines. Teachers may possess basic nutrition knowledge, but without structured feeding programmes, institutional support, and material resources, their ability to influence child nutrition is inherently limited. Under these conditions, INE risks becoming symbolic rather than transformative.

The results suggest that INE should be reconceptualised not as a standalone behavioural intervention but as one component of a broader nutrition-sensitive system. Such a system would integrate education with school feeding, link schools to community health and agriculture initiatives, and address household food insecurity through social protection and livelihood support.

#### **4.7. Methodological Reflections and Contribution of the Pilot Design**

Although the small sample size limits statistical inference, the pilot design of this study offers distinct strengths. Intensive measurement allowed for detailed assessment of anthropometric status, dietary intake, and KAP indicators, while internal consistency testing confirmed the reliability of key scales. The convergence of findings across multiple tables and analytical approaches enhances confidence in the internal validity of the results.

Moreover, pilot studies play a critical role in early-stage research by identifying plausible pathways, refining measurement tools, and informing the design of larger, adequately powered studies. In this regard, the study contributes valuable baseline evidence specific to the pre-primary age group in the Busoga Region, an area that remains under-researched in nutrition literature.

#### **4.8. Synthesis of Discussion**

In synthesis, this study demonstrates that malnutrition among pre-primary children in Busoga is driven less by deficits in nutrition knowledge than by structural and socio-economic constraints that limit dietary choice and feeding practices. While Integrated Nutrition Education holds theoretical promise, its current implementation within pre-primary and household settings lacks the material and institutional support necessary to produce measurable nutritional gains. Addressing chronic undernutrition in this age group requires sustained, multi-sectoral strategies that move beyond information provision to tackle the underlying determinants of child nutrition.

#### **Strengths and Limitations**

A key strength of this study lies in its intensive and multidimensional assessment of child nutrition within a real-world pre-primary school context. Unlike studies that rely on single indicators, this research integrated anthropometric measurements, dietary diversity assessment, and structured evaluation of nutrition-related knowledge, attitudes, and practices among caregivers. The use of standardised World Health Organization growth references enhances the comparability and validity of anthropometric findings, while internal consistency testing of KAP scales demonstrated acceptable reliability. Collectively, this comprehensive measurement approach strengthens confidence in the internal coherence of the findings and allows for nuanced interpretation across multiple levels of influence.

The study's focus on pre-primary children aged 3–6 years represents an additional strength, as this age group remains under-represented in nutrition research relative to infants and young children. By situating the analysis within pre-primary school environments, the study provides context-specific evidence relevant to education and early childhood development platforms that are increasingly recognised as critical entry points for nutrition-sensitive interventions.

Furthermore, the pilot design itself constitutes a methodological strength. By prioritising depth of measurement and hypothesis exploration over population-level inference, the study was able to identify plausible pathways linking socio-economic conditions, caregiver practices, and child nutritional outcomes. Such pilot evidence is essential for refining conceptual models, testing indicator sensitivity, and informing the design and power calculations of subsequent large-scale or longitudinal studies.

Notwithstanding these strengths, several limitations must be acknowledged. The small sample size limits statistical power and precludes definitive conclusions regarding the magnitude or statistical significance of observed associations. As a result, findings should be interpreted as exploratory and hypothesis-generating rather than confirmatory. However, the consistency of directional patterns across anthropometric, dietary, and behavioural indicators mitigates concerns regarding random variability.

The cross-sectional design restricts causal inference, as temporal relationships between nutrition education exposures, feeding practices, and growth outcomes cannot be established. Chronic outcomes such as stunting reflect long-term processes that may not be fully captured within a single time point assessment. Longitudinal or quasi-experimental designs are therefore required to more rigorously assess causal pathways.

Finally, dietary intake and feeding practices were assessed through caregiver report, which may be subject to recall bias or social desirability bias. While such methods are standard in field-based nutrition research, they may not fully capture habitual intake, particularly when children consume meals outside the home or under the care of other caregivers. Future studies would benefit from repeated dietary assessments or complementary qualitative approaches to strengthen dietary measurement.

Overall, while these limitations constrain generalisability and causal interpretation, they do not undermine the study's contribution. Instead, they delineate the appropriate scope of inference and reinforce the value of the findings as robust baseline evidence to guide the development and evaluation of integrated nutrition interventions for pre-primary children in similar low-resource settings.

## 5. Conclusions

This study provides rigorous pilot evidence that malnutrition remains a substantial and persistent challenge among pre-primary children in the Busoga Region of Eastern Uganda. The observed prevalence of chronic undernutrition, particularly stunting, demonstrates that nutritional vulnerability extends beyond infancy into the preschool years and is not adequately addressed within existing early childhood education or household nutrition environments. These findings underscore the importance of recognising children aged 3–6 years as a nutritionally at-risk group requiring targeted and sustained attention within national and sub-national nutrition strategies.

Despite moderate levels of nutrition-related knowledge and generally positive attitudes among caregivers, feeding practices and dietary diversity were consistently suboptimal. Quantitative analyses revealed weak and largely non-significant associations between nutrition knowledge, dietary diversity, and child anthropometric outcomes, supporting the study's null hypotheses. These results indicate that current Integrated Nutrition Education exposures, as experienced in pre-primary school and household settings, are insufficient to generate meaningful improvements in child dietary behaviour or growth. Knowledge acquisition alone does not translate into behavioural change where households face persistent economic, food system, and livelihood constraints.

In contrast, household socio-economic characteristics emerged as more influential determinants of nutritional outcomes than education-based variables. This pattern highlights the structural nature of child undernutrition in the Busoga context and reinforces theoretical frameworks that position poverty, food insecurity, and household resource availability as foundational drivers of malnutrition. Under such conditions, nutrition education interventions that are not complemented by material and institutional support are unlikely to achieve sustained impact.

The findings of this study carry important implications for policy and practice. Integrated Nutrition Education remains a conceptually valuable component of child nutrition programming; however, its effectiveness depends on the presence of enabling environments that allow knowledge to be operationalised. For pre-primary settings, this necessitates the integration of nutrition education with school feeding initiatives, strengthened linkages to community health and agriculture systems, and targeted social protection measures for vulnerable households. Without such integration, INE risks remaining symbolic rather than transformative.

By providing context-specific baseline evidence and elucidating plausible pathways linking education, socio-economic conditions, and child nutrition outcomes, this study contributes meaningfully to the limited empirical literature on preschool-aged nutrition in low-resource settings. While the pilot design constrains generalisability and causal inference, the internal coherence of the findings offers a strong foundation for the design of larger-scale, longitudinal, and intervention-based studies. Ultimately, addressing malnutrition among pre-primary children in the Busoga Region will require multi-sectoral, adequately resourced strategies that move beyond information provision to tackle the structural determinants of child nutrition and development.

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