



Local Food-Based Supplementary Feeding Education and Mothers' Nutrition Knowledge for Underweight Children

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Abstract

Background: Maternal knowledge is an important component of appropriate feeding practices for children with undernutrition. In geographically remote settings, nutrition education that uses familiar and accessible local foods may improve the relevance of supplementary feeding messages. **Objective:** To evaluate the effect of local food-based supplementary feeding education on mothers' knowledge regarding nutrition for underweight children in the working area of Leksula Public Health Center, Maluku, Indonesia. **Methods:** A quasi-experimental pretest-posttest study with a control group was conducted in October 2025. Thirty mothers of underweight children were selected purposively from a population of 42 and allocated to intervention (n=15) and control (n=15) groups. The intervention consisted of one approximately 60-minute educational session using a leaflet and a structured educational plan focused on local food-based supplementary feeding. Knowledge was measured using a 20-item multiple-choice questionnaire (score 0-20). Because the data were non-normally distributed, within-group changes were analyzed using the Wilcoxon signed-rank test and between-group differences using the Mann-Whitney U test. **Results:** In the control group, the proportion of mothers with high knowledge increased slightly from 66.7% at pretest to 73.3% at posttest, with no significant within-group change ($p=0.317$). In the intervention group, high knowledge increased from 40.0% at pretest to 80.0% at posttest, while moderate knowledge decreased from 60.0% to 20.0%; the within-group change was significant ($p=0.030$). Baseline knowledge did not differ significantly between groups ($p=0.070$), whereas posttest knowledge was significantly higher in the intervention group ($p<0.001$). **Conclusion:** A single local food-based supplementary feeding education session significantly improved mothers' knowledge compared with the control condition. The intervention may be useful as a culturally relevant nutrition-education strategy in primary health care, although larger and longer-term studies are needed.

Keywords: maternal knowledge; supplementary feeding; local food; undernutrition; toddlers; nutrition education

1. Introduction

Undernutrition remains a major concern in child health, particularly during the first years of life when nutritional requirements are high and inadequate dietary intake can contribute to growth faltering. Globally, undernutrition continues to account for a substantial proportion of morbidity and mortality among children under five years of age (World Health Organization [WHO], 2024). Appropriate feeding during infancy and early childhood is therefore central to meeting energy and nutrient requirements. WHO recommends the introduction of nutritionally adequate and safe complementary foods at approximately six months of age, with progressive adjustment of food variety, consistency, and feeding frequency according to the child's age and developmental needs (WHO, 2023a).

Feeding practices are shaped by multiple maternal, household, socioeconomic, and informational factors. Maternal knowledge, attitudes, self-efficacy, education, household income, access to information, and social support have all been associated with complementary-feeding practices (Yuan et al., 2023). A recent scoping review similarly identified persistent gaps between maternal knowledge, attitudes, and actual complementary-feeding practices across different settings, indicating that knowledge is relevant but does not by itself determine how children are fed (Dwijayanti et al., 2024). This distinction is particularly relevant when evaluating nutrition-education interventions because improvements in knowledge should not be interpreted as evidence of subsequent behavioral or anthropometric improvement unless those outcomes are directly measured.

The Indonesian context presents additional challenges. An analysis of 4,804 children aged 6–23 months from the Indonesia Demographic and Health Survey found that only 54.3% met minimum dietary diversity and 37.6% met the minimum acceptable diet criterion. Children living in eastern regions of Indonesia were less likely to achieve minimum dietary diversity and a minimum acceptable diet than children in Java and Bali (Sebayang et al., 2022). These regional differences support the need for nutrition interventions that consider local food environments rather than relying solely on standardized messages developed without attention to geographical and dietary context. In the Leksula Public Health Center working area in Maluku, locally available foods such as fish, sago, cassava, sweet potato, legumes, coconut, and local vegetables provide practical options for contextualizing nutrition-education messages.

The use of locally available foods is consistent with current recommendations for infant and young-child feeding. WHO emphasizes dietary diversity and nutrient-dense foods, including animal-source foods, fruits and vegetables, pulses, nuts, and seeds, while recognizing the role of suitable locally available foods in complementary feeding (WHO, 2023a). In resource-constrained and geographically isolated settings, familiar ingredients may also make educational messages easier to relate to household food preparation. In the present study, local food-based supplementary feeding refers to education about the use and preparation of locally available foods to complement the child's usual diet; the intervention did not involve the provision of supplementary food to participating children. This distinction separates an educational intervention from supplementary-feeding programs that directly provide additional food.

Evidence supports nutrition education as a strategy for improving caregiver knowledge and feeding-related practices, although effects on child growth are less consistent. A systematic review of maternal nutrition-education programs reported improvements across several knowledge, dietary, and complementary-feeding outcomes, while reductions in chronic undernutrition were observed mainly in interventions that incorporated additional components beyond education alone (Murimi et al., 2021). More recent evidence also indicates that educational interventions can improve maternal knowledge and feeding practices, while effects on children's anthropometric Z-scores remain inconclusive (Rao et al., 2025). These findings support evaluating maternal knowledge as a proximal educational outcome while avoiding assumptions that short-term knowledge gains necessarily translate into improved dietary intake, weight gain, or nutritional recovery.

Despite the broader evidence on maternal nutrition education, evidence on locally contextualized education using foods familiar to households in remote island communities of Maluku remains limited. The relevance of such contextualization warrants examination because food availability, dietary patterns, and access to nutrition information may differ from those in more urbanized parts of Indonesia. This study therefore aimed to evaluate short-term changes in nutrition knowledge following local food-based supplementary feeding education among mothers of underweight children in the working area of Leksula Public Health Center, Maluku, Indonesia.

2. Materials and Methods

2.1 Study design and setting

This study used a quasi-experimental pretest-posttest design with a control group. It was conducted in the working area of Leksula Public Health Center, South Buru Regency, Maluku Province, Indonesia, in October 2025.

2.2 Population and participants

The study population comprised 42 mothers who had children under five with underweight status in the Leksula Public Health Center working area. A total of 30 mothers were included using purposive sampling and divided into an intervention group ($n=15$) and a control group ($n=15$). Eligibility criteria included having a child under five with underweight status (reported in the thesis as weight-for-age below -2 SD based on growth monitoring or anthropometry), residence in the Leksula Public Health Center working area, willingness to participate and sign informed consent, and attendance during the educational activity. Selected participants who did not complete the educational activity were excluded.

Intervention

The intervention group received one structured education session on local food-based supplementary feeding. The session lasted approximately 60 minutes and used a leaflet and a structured educational session plan. The material addressed supplementary feeding and the use of locally available foods as nutritious complementary foods for children with undernutrition. The study materials included examples of local-food preparation. The

control group did not receive the structured educational intervention during the study assessment period; the study flow diagram in the thesis indicates that a leaflet was distributed to the control group.

2.3 Outcome measure

Maternal knowledge about supplementary feeding was assessed using a 20-item multiple-choice questionnaire with four answer options. Correct responses were scored 1 and incorrect responses 0, producing a total score from 0 to 20. The questionnaire covered the definition and purpose of supplementary feeding, appropriate age, local-food utilization, food texture, benefits, frequency, portions, nutrient content, and consequences of inadequate nutritious supplementary feeding. The source study categorized knowledge as high (14-20), moderate (7-13), or low (0-6).

Data collection procedure

Participants completed the knowledge questionnaire before the intervention. Mothers in the intervention group then participated in the structured local food-based supplementary feeding education session. Posttest knowledge was assessed using the same questionnaire after the educational activity. The control group completed pretest and posttest assessments without receiving the structured educational session during the assessment period.

2.4 Statistical analysis

Categorical data were summarized using frequencies and percentages. Normality testing reported non-normal distributions for pretest and posttest knowledge in both groups (all $p < 0.001$). Consequently, the Wilcoxon signed-rank test was used to evaluate within-group pretest-posttest changes, and the Mann-Whitney U test was used to compare the intervention and control groups. Statistical significance was set at $p < 0.05$. SPSS output reported as $p = 0.000$ is presented as $p < 0.001$.

2.5 Ethical considerations

This study was approved by the Research Ethics Committee of STIKES Pasapua Ambon, Ambon, Indonesia (No.031/KEPK-STIKESPA/EC/2025). Written informed consent was obtained from all respondents prior to data collection. Participation was voluntary, and anonymity and confidentiality were maintained throughout the study.

3. Results

Table 1. Selected baseline characteristics of participants (n=30)

Characteristic	Control n (%)	Intervention n (%)
Maternal age		
Maternal age 22-29 years	3 (20.0)	6 (40.0)
Maternal age 30-39 years	9 (60.0)	6 (40.0)
Maternal age 39-45 years	3 (20.0)	3 (20.0)
Child age		
Child age 1-3 years	13 (86.7)	10 (66.7)
Child age 4-5 years	2 (13.3)	5 (33.3)

As shown in Table 1, participants in both groups were predominantly within the adult age range. In the control group, most mothers were aged 30–39 years (60.0%), whereas the intervention group had equal proportions of mothers aged 22–29 years and 30–39 years (40.0% each). Regarding child age, most children were aged 1–3 years in both the control (86.7%) and intervention (66.7%) groups. Overall, the participants were predominantly mothers of younger children aged 1–3 years.

Table 2. Distribution of maternal knowledge before and after the study (n=30)

Knowledge level	Control pre n (%)	Control post n (%)	Intervention pre n (%)	Intervention post n (%)
High	10 (66.7)	11 (73.3)	6 (40.0)	12 (80.0)
Moderate	5 (33.3)	4 (26.7)	9 (60.0)	3 (20.0)
Low	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)

As presented in Table 2, maternal knowledge in the control group remained relatively stable, with the proportion of mothers classified as having high knowledge increasing slightly from 66.7% at pretest to 73.3% at

posttest. In contrast, the intervention group demonstrated a marked improvement following the educational intervention. The proportion of mothers with high knowledge increased from 40.0% at pretest to 80.0% at posttest, while those with moderate knowledge decreased from 60.0% to 20.0%. No participants in either group were classified as having low knowledge at either measurement.

Table 3. Within-group and between-group comparisons of maternal knowledge

Comparison	Statistical test	p-value	Interpretation
Control: pretest vs posttest	Wilcoxon signed-rank	0.317	Not significant
Intervention: pretest vs posttest	Wilcoxon signed-rank	0.030	Significant
Control vs intervention: pretest	Mann-Whitney U	0.070	Not significant
Control vs intervention: posttest	Mann-Whitney U	<0.001	Significant

As shown in Table 3, there was no significant change in maternal knowledge between pretest and posttest in the control group ($p = 0.317$). In contrast, the intervention group demonstrated a significant improvement in knowledge following the local food-based supplementary feeding education ($p = 0.030$). Between-group analysis showed no significant difference in knowledge at baseline ($p = 0.070$), indicating that the groups did not differ significantly before the intervention. However, a significant difference was observed at posttest ($p < 0.001$), with the intervention group demonstrating better knowledge outcomes. These findings indicate that the educational intervention was associated with a significant improvement in maternal knowledge.

4. Discussion

This quasi-experimental study found that mothers who received local food-based supplementary feeding education showed a greater short-term improvement in nutrition knowledge than those in the control condition. The intervention group demonstrated a substantial shift toward the high-knowledge category and a statistically significant pretest-posttest change, whereas knowledge in the control group remained relatively stable. Although baseline knowledge did not differ significantly between groups and a significant between-group difference was observed at posttest, the findings should be interpreted cautiously because group allocation was nonrandomized. The results therefore support an association between exposure to the educational intervention and improved short-term maternal knowledge rather than establishing a definitive causal effect.

The observed improvement is consistent with evidence that structured nutrition education can strengthen caregivers' understanding of complementary feeding. In an Indonesian intervention study, Rachmah et al. (2023) reported improvements in maternal knowledge and several behavioral constructs related to nutritious complementary feeding following a structured educational program. A systematic review by Jardí et al. (2021) similarly found that maternal nutrition-education interventions were associated with improvements in nutrition knowledge, food consumption, and complementary-feeding practices, although the magnitude and consistency of outcomes varied considerably across interventions. These findings suggest that structured delivery of information can improve cognitive outcomes related to child feeding, while the subsequent translation of knowledge into sustained practices depends on factors beyond education alone.

The local-food component provides an additional contextual dimension to the intervention. Rather than presenting nutrition recommendations in abstract terms, the educational material incorporated foods familiar to households in Maluku, including fish, sago, cassava, sweet potato, coconut, legumes, and local vegetables. This approach is compatible with current guidance emphasizing nutritionally adequate and diverse complementary foods during the period when milk alone no longer meets a child's nutritional requirements (World Health Organization [WHO], 2023). The relevance of contextualized feeding messages is particularly pertinent in Indonesia because complementary-feeding practices vary according to socioeconomic and geographic circumstances. Analysis of 4,804 Indonesian children aged 6–23 months found that only 54.3% met minimum dietary diversity and 37.6% met minimum acceptable diet criteria; achievement of these indicators was also lower in eastern regions than in Java and Bali (Nurokhmah et al., 2022).

Using locally familiar foods may make educational content easier for mothers to relate to household meal preparation, but familiarity alone should not be interpreted as evidence that recommended foods are consistently available, affordable, or consumed in adequate quantities. Maternal feeding decisions occur within a broader context of household resources, food availability, cultural preferences, family influence, and access to nutrition

information. A recent scoping review found persistent discrepancies between maternal knowledge, attitudes, and actual complementary-feeding practices across different settings, indicating that adequate knowledge does not necessarily translate directly into recommended feeding behavior (Dwijayanti et al., 2024). The present study did not measure household food availability or dietary intake, so it cannot determine whether mothers subsequently incorporated the locally based recommendations into their children's diets (Jusmawati & Hasrida, 2024; Marina, 2024; Muldaniyah & Asli, 2025; Reviana et al., 2024).

The findings should also be distinguished from evidence concerning the actual provision of supplementary foods. The intervention evaluated in this study consisted of education about local food-based supplementary feeding, not the distribution of supplementary food to participating children. Consequently, the observed change reflects maternal knowledge following education rather than the nutritional effectiveness of a supplementary-feeding program. This distinction is relevant because interventions that combine nutrition education with food provision, agricultural components, supplementation, or intensive behavioral support may influence child outcomes through mechanisms that were absent from the present intervention. In their systematic review, Jardí et al. (2021) found that nutrition-education programs generally produced improvements in knowledge and dietary practices, whereas reductions in chronic undernutrition were more evident in interventions incorporating additional strategies such as supplementation or agricultural components.

The present results are therefore most appropriately interpreted at the level of the outcome that was actually measured: maternal knowledge. Improved questionnaire scores shortly after education cannot establish subsequent improvement in meal frequency, dietary diversity, nutrient intake, food preparation, weight gain, or child nutritional status (Maleki et al., 2025; Rakotomanana et al., 2020). Dwijayanti et al. (2024) identified a continuing gap between what mothers know about complementary feeding and what is implemented in practice, reinforcing the need to distinguish cognitive outcomes from behavioral outcomes. This distinction is particularly relevant for children with underweight status, for whom nutritional recovery may depend on dietary adequacy as well as infection, household food security, caregiving conditions, and access to appropriate health services.

The duration and intensity of the intervention may also explain why the findings should be regarded as evidence of short-term knowledge acquisition. The educational intervention consisted of a single approximately 60-minute session. In contrast, some interventions in the literature have used repeated educational contacts and multiple educational modalities. For example, Rachmah et al. (2023) used a multi-session intervention incorporating educational materials, posters, text, and video tutorials rather than a single educational exposure. The present study did not include a longer-term assessment, so whether the improvement observed after the session persisted over subsequent weeks or months remains unknown. Repeated measurements would be needed to distinguish immediate learning from sustained knowledge retention.

The findings nevertheless have practical relevance for nutrition education in primary health care. Nurses, nutritionists, midwives, and community health workers could incorporate locally contextualized feeding messages into existing maternal-child health services, including *posyandu*, counseling, and home visits. Such education should explain how locally available foods can contribute to dietary variety and nutrient density while maintaining the principle that complementary foods are provided alongside continued milk feeding during the appropriate developmental period. WHO guidance emphasizes that complementary feeding generally begins at around six months, when breast milk or formula alone is no longer sufficient to meet nutritional requirements, and identifies this period as particularly relevant to growth faltering and nutrient deficiencies (WHO, 2023). In practice, education would be strengthened by combining information with demonstrations, individualized counseling, and follow-up rather than assuming that a single exposure is sufficient to change household feeding practices.

4.1 Strengths and limitations

The study has several methodological features that support interpretation of the findings. The inclusion of both intervention and control groups and the use of pretest-posttest assessments made it possible to examine changes over the study period rather than relying solely on post-intervention knowledge. The educational material was also contextualized using foods familiar within the local setting, which increases its relevance to the specific population studied.

Several limitations constrain the conclusions that can be drawn. First, the sample comprised only 30 mothers from one public-health-center working area, limiting statistical precision and generalizability to other populations. Second, purposive sampling and nonrandomized group allocation create the possibility of selection bias and residual differences between groups even though baseline knowledge did not differ significantly. A nonsignificant

baseline test does not establish equivalence between nonrandomized groups. Third, knowledge was measured using the same questionnaire before and after the intervention, making testing or recall effects possible. Questionnaire responses may also be affected by socially desirable responding.

The intervention was delivered as a single approximately 60-minute educational session, and the study did not include longer-term follow-up. The findings therefore indicate short-term changes in knowledge rather than sustained knowledge retention. Potential confounding factors, including maternal education, socioeconomic circumstances, household food availability, family support, exposure to other nutrition information, and pre-existing feeding practices, were not controlled. Possible contamination between study groups should also be considered if educational materials were accessible to control participants during the assessment period.

Finally, the study did not assess whether higher maternal knowledge was followed by changes in actual feeding practices, dietary diversity, meal frequency, nutrient or energy intake, or child anthropometric outcomes. Future studies should incorporate longer follow-up periods and measure knowledge retention together with household feeding behavior and dietary intake. For children with underweight status, repeated anthropometric assessment would also be required before conclusions could be drawn regarding weight gain or nutritional recovery. This broader evaluation is consistent with the current evidence base, which distinguishes improvements in caregiver knowledge from effects on dietary and anthropometric outcomes (Jardí et al., 2021; Dwijayanti et al., 2024).

5. Conclusions

Local food-based supplementary feeding education was associated with a short-term improvement in maternal nutrition knowledge among mothers of underweight children in the Leksula Public Health Center working area. Mothers in the intervention group showed a significant pretest-posttest improvement, whereas no significant change was observed in the control group. These findings support the use of locally familiar foods as contextually relevant examples in maternal nutrition education in remote island communities. Given the small sample, nonrandomized group allocation, and short follow-up period, the findings should be interpreted as changes in knowledge rather than evidence of improved feeding practices or child nutritional status. Future studies should assess knowledge retention and examine whether educational gains are followed by changes in feeding practices, dietary intake and diversity, and child anthropometric outcomes.

Conflict of Interest

The authors declare no conflicts of interest.

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