

THE EFFECT OF MATERNAL NUTRITION EDUCATION AND PURPLE SWEET POTATO SUPPLEMENTARY FEEDING ON THE NUTRITIONAL STATUS OF CHILDREN AGED 12-36 MONTHS

Siti Aminah^{1*}, Fauzia Laili², Siswi Wulandari³, Alfika A.Z.⁴

^{1,3,4} Bachelor of Midwifery Study Program, Faculty of Health Sciences, Universitas Kadiri, Kediri, Indonesia

² Midwifery Professional Education Study Program, Faculty of Health Sciences, Universitas Kadiri, Kediri, Indonesia

*Corresponding author: sitiaminah@unik-kediri.ac.id

ABSTRACT

Nutrition education strengthens maternal feeding capacity, but its impact on growth may be limited without food support. Objective: To assess the effect of maternal nutrition education, a booklet, and purple sweet potato supplementary feeding for 14 days on weight-for-height z-scores and maternal knowledge. This quasi-experimental pretest-posttest control group study involved 60 mother-child pairs, with 30 participants in each group. Paired t-tests, independent t-tests of change scores, and ANCOVA were applied. Simulated results showed an increase in weight-for-height z-score of 0.31 SD in the intervention group and 0.04 SD in controls; the between-group difference was 0.27 SD (95% CI 0.17-0.37; $p < 0.001$; $d = 1.38$). Maternal knowledge increased by 4.60 and 0.50 points, respectively; the difference was 4.10 points (95% CI 3.45-4.75; $p < 0.001$; $d = 3.31$). Mean adherence was 90.7%. After adjustment, the intervention remained associated with a higher day-14 z-score ($B = 0.25$; 95% CI 0.13-0.37; $p < 0.001$). The intervention may improve early acute nutritional response and maternal knowledge. These findings require verification with actual field data and longer follow-up.

Keywords : Children Under Five, Nutrition Education, Purple Sweet Potato, Supplementary Feeding, Weight-For-Height

1. INTRODUCTION

Child nutrition problems remain a public health priority because they are related to survival, cognitive development, school readiness, and productivity in adulthood. Posyandu (integrated health posts) hold a strategic position for integrating growth monitoring, family education, early detection of nutrition problems, and primary care-based follow-up. Anthropometric assessment needs to use uniform standards so that changes can be interpreted appropriately (Kementerian Kesehatan Republik Indonesia, 2020).

Toddlers aged 12–36 months are in a transition phase toward the family diet. WHO (2023) emphasizes that the complementary feeding period coincides with a high risk of growth faltering and nutrient deficiencies. Children need age-appropriate foods that provide sufficient energy, protein, fat, and micronutrients, accompanied by dietary diversity, adequate meal frequency, hygiene, and responsive feeding.

Nutrition education can improve mothers' knowledge and skills, but knowledge does not always translate into practice when families face limited food, time, purchasing power, household support, or food refusal by the child. Conversely, supplementary feeding can directly increase intake, but its benefits may not be sustained if it is understood as a substitute for main meals. Multicomponent interventions are more consistent with the UNICEF framework because they target diet and care simultaneously (UNICEF, 2021).

Purple sweet potato is a local food that is easy to prepare and provides energy from carbohydrates, fiber, and phenolic compounds and anthocyanins. However, the benefits of a supplementary feeding menu are determined not only by the main ingredient, but also by portion size, energy density, the addition of protein and fat sources, processing safety, palatability, and the amount actually consumed. Local food-

based programs have the potential to improve acceptance and sustainability when the menu can be replicated by families.

This study aims to analyze the effect of a maternal nutrition education package, a booklet, and purple sweet potato supplementary feeding for 14 days on changes in the weight-for-height (WFH) z-score of children aged 12–36 months and on maternal nutrition knowledge, compared with routine Posyandu services. The 14-day duration is positioned as an evaluation of the early weight response, not as a basis for concluding changes in height or long-term stunting prevention.

2. METHODS

This quantitative study used a quasi-experimental pretest-posttest design with a control group. The study was conducted at the Posyandu of Tamanan Urban Village (Kelurahan Tamanan). The target population was mothers/caregivers and children aged 12–36 months registered or active at the Posyandu. The sample comprised 60 mother-child pairs, consisting of 30 in the intervention group and 30 controls, selected purposively until the quota was met. Group assignment was nonrandom, using separate schedules/posts to reduce information contamination.

Inclusion criteria were children aged 12–36 months, residing in Tamanan, and mothers willing to participate in the education, pre-post measurements, and consumption monitoring. Children who were severely ill or hospitalized at baseline, had conditions clearly affecting growth, or were participating in another intensive supplementary feeding program were excluded from the study.

The intervention group received structured nutrition education for 30–45 minutes on day 0, reinforcement on day 7, a booklet, and one serving of purple sweet potato supplementary feeding per day for 14 days. The materials covered nutritional needs, portion sizes and meal frequency, menu variation, animal-source protein,

responsive feeding, hygiene, and growth monitoring. Supplementary feeding consumption was recorded daily and verified by cadres/researchers at least twice. The control group received routine Posyandu services without the study's supplementary feeding package.

Body weight was measured using a calibrated digital scale with a precision of 0.1 kg, and height using a stadiometer with a precision of 0.1 cm. WFH z-scores were calculated based on the Child Anthropometric Standards. Maternal knowledge was measured using 15 multiple-choice questions (score 0–15). Adherence was calculated as the percentage of days on which at least 75% of the supplementary feeding portion was consumed. Covariates included age, sex, maternal education, and illness history.

Numerical data were presented as means and standard deviations, while categorical data were presented as frequencies and percentages. Normality was tested with Shapiro-Wilk and homogeneity with Levene. Within-group changes were analyzed using paired t-tests, while delta differences were analyzed using independent t-tests. ANCOVA was used to analyze day-14 WFH z-scores with group as the factor, and baseline values and covariates as controls. Results were reported as p-values, 95% confidence intervals, and effect sizes; $p < 0.05$ was considered significant.

The study requires ethical approval and informed consent. Ethical approval number: [to be filled in after issuance]. In this version of the manuscript, all result figures are simulations for analysis planning and must be replaced with actual field data before journal submission.

3. RESULTS

A total of 60 mother-child pairs completed the day-0 and day-14 measurements. The baseline characteristics of the two groups were relatively comparable; there were no significant

differences in child age, sex, maternal education, illness history, baseline WFH z-score, or baseline knowledge score (all $p > 0.05$). The delta WFH z-score and knowledge were normally distributed and had homogeneous variances.

In the intervention group, the WFH z-score increased from -1.62 ± 0.71 to -1.31 ± 0.69 , with a delta of 0.31 ± 0.24 SD ($p < 0.001$). In the control group, the z-score changed from -1.55 ± 0.68 to -1.51 ± 0.68 , with a delta of 0.04 ± 0.15 SD ($p = 0.183$). The between-group difference in delta was 0.27 SD (95% CI 0.17–0.37; $p < 0.001$) with a large effect size (Cohen's $d = 1.38$).

Maternal knowledge scores in the intervention group increased from 8.10 ± 1.79 to 12.70 ± 1.39 (delta 4.60 ± 1.53 ; $p < 0.001$), while in the control group they increased from 8.30 ± 1.62 to 8.80 ± 1.71 (delta 0.50 ± 0.86 ; $p = 0.004$). The difference in delta was 4.10 points (95% CI 3.45–4.75; $p < 0.001$; $d = 3.31$).

Mean adherence to supplementary feeding consumption was $90.7 \pm 8.6\%$; 26 children (86.7%) had adherence of at least 80%. After controlling for baseline z-score, age, sex, and illness history, the intervention group still had a higher day-14 WFH z-score than the control group ($B = 0.25$; 95% CI 0.13–0.37; $p < 0.001$). The model had an adjusted R-squared of 0.72.

Table 1. Baseline characteristics of the groups

Variable	Intervention	Control	p
Age (months)	24.1 ± 6.7	23.5 ± 6.4	0.724

Male	16 (53.3%)	15 (50.0%)	0.796
Illness in past 2 weeks	7 (23.3%)	8 (26.7%)	0.766
Baseline WFH z-score	-1.62 ± 0.71	-1.55 ± 0.68	0.699
Baseline knowledge	8.10 ± 1.79	8.30 ± 1.62	0.652

Table 2. Changes in primary outcomes

Outcome	Intervention delta	Control delta	p
WFH score z-	0.31 ± 0.24	0.04 ± 0.15	<0.001
Knowledge	4.60 ± 1.53	0.50 ± 0.86	<0.001

Table 3. ANCOVA of day-14 WFH z-score

Predictor	B	95% CI	p
Intervention group	0.25	0.13-0.37	<0.001
Baseline z-score	0.89	0.75-1.03	<0.001
Age	0.002	-0.004-0.008	0.512
Male	-0.03	-0.15-0.09	0.621
Illness history	-0.10	-0.24-0.04	0.158

4. DISCUSSION

The simulation results show that the nutrition education package, booklet, and purple sweet potato supplementary feeding produced a greater increase in WFH z-score than routine services. This finding is consistent with the UNICEF framework, which positions diet and care as direct determinants of nutritional status. Education strengthens caregivers' capacity, while supplementary feeding directly increases food exposure; the combination of the two is theoretically stronger than a single approach (UNICEF, 2021).

The 0.27 SD difference in delta WFH z-score is not only statistically significant, but is also accompanied by a confidence interval that points entirely toward benefit. WFH is more responsive over a 14-day

period than height-for-age (HAZ) because body weight is influenced by short-term energy balance. However, rapid changes can be affected by hydration, clothing, time of measurement, illness, or gastrointestinal contents. Therefore, standardization of instruments and procedures is crucial to the validity of the effect.

Descriptively, the proportion of normal nutritional status increased more in the intervention group. Although easy to understand from a programmatic perspective, category shifts must be interpreted carefully because children who only slightly cross the -2 SD threshold will change category. The continuous z-score value remains the primary outcome because it is more sensitive and does not lose information.

Purple sweet potato has the potential to increase the energy density of the menu through its carbohydrate content, and it contains fiber and anthocyanins. However, growth effects cannot be attributed to anthocyanins alone. Tissue formation requires high-quality protein, fat, iron, zinc, vitamin A, and other micronutrients. Purple sweet potato should be positioned as a local food base combined with protein and fat sources, not as a single complete food.

The knowledge increase of 4.10 points higher than the control group indicates the effectiveness of structured education and the booklet as learning reinforcement. This result is in line with Rachmah et al. (2023), who showed the benefits of education based on the Theory of Planned Behavior, and Sharma et al. (2020), who reported that culturally appropriate education delivered through health services can improve feeding practices. Makwela et al. (2024) also found benefits of community-based complementary feeding education programs on nutritional status.

Knowledge is a proximal outcome and does not yet prove a change in practice. Mothers may understand the recommendations but be constrained by food prices, cooking time, family support, or

child refusal. Future studies need to measure minimum dietary diversity, minimum meal frequency, responsive feeding, animal-source protein consumption, and energy-protein intake so that the knowledge-behavior-intake-growth pathway can be tested.

The mean adherence of 90.7% indicates high program exposure. Daily monitoring may also have acted as a behavioral reinforcer through recording, cadre support, and accountability. Nevertheless, mothers' records are vulnerable to social desirability bias. Menu refusal and mild acute respiratory infection (ARI) in some children show that palatability and morbidity can modify the effect. Dose-response analysis can be performed as a sensitivity analysis, but adherence should not be controlled for indiscriminately because it can be a mediator of the intervention.

ANCOVA showed that the group effect persisted after baseline and covariates were controlled. Baseline adjustment is important in nonrandom designs, but it does not eliminate residual confounding such as food security, income, baseline diet, sanitation, or maternal motivation. If groups are assigned by Posyandu, intra-cluster correlation should also be considered in the analysis.

The 14-day duration only supports inference about the early weight response. This period is inadequate for concluding linear growth, stunting prevention, child development, or behavioral sustainability. Follow-up at day 30 and month 3 is needed to assess whether the changes persist after supplementary feeding is discontinued. Future research should also document the nutrient composition per portion, cost, food waste, food safety, and families' ability to replicate the menu.

The strengths of the study include a control group, pre-post measurements, reporting of confidence intervals and effect sizes, adherence monitoring, and baseline adjustment. Its limitations are nonrandom

allocation, a small sample from one urban village, a short duration, the absence of direct intake measurement, the potential for a Hawthorne effect, and the fact that the outcome data in this manuscript are still simulated. Therefore, all estimates must be verified with actual data before publication.

5. CONCLUSION

In the simulated data, the maternal nutrition education package, booklet, and 14-day purple sweet potato supplementary feeding produced greater increases in WFH z-score and maternal knowledge than routine services. The effect on WFH remained significant after controlling for baseline and child characteristics, while adherence to supplementary feeding consumption was high.

The intervention has the potential to be used as a Posyandu-based early response model, provided that the recipe, portion, protein content, food safety, counseling, and monitoring are standardized. The results cannot be used to conclude long-term stunting prevention. All simulated figures must be replaced with actual field data, and further research needs to use a longer duration, intake measurement, and a multisite or cluster design.

6. REFERENCES

- Direktorat Jenderal Kesehatan Primer dan Komunitas, Kementerian Kesehatan Republik Indonesia. (2025). Petunjuk teknis pemberian makanan tambahan berbasis pangan lokal bagi ibu hamil kurang energi kronis dan balita gizi kurang.
- Ezmareh, F. M., Khalesi, Z. B., Kenarsari, F. J., & Maroufizadeh, S. (2024). The impact of complementary feeding education for mothers using mobile phone applications on the anthropometric indices of Iranian infants. *Digital Health*, 10. <https://doi.org/10.1177/20552076241272558>

- Kementerian Kesehatan Republik Indonesia. (2020). Peraturan Menteri Kesehatan Republik Indonesia Nomor 2 Tahun 2020 tentang Standar Antropometri Anak.
- Makwela, M. S., Mushaphi, L. F., & Makhado, L. (2024). The effect of a community-based complementary feeding education program on the nutritional status of infants in Polokwane Municipality, Limpopo Province, South Africa. *Children*, 11(12), 1425. <https://doi.org/10.3390/children11121425>
- Rachmah, Q., Astina, J., Atmaka, D. R., & Khairani, L. (2023). The effect of educational intervention based on Theory of Planned Behavior approach on complementary feeding: A randomized controlled trial. *International Journal of Pediatrics*, 2023, 1086919. <https://doi.org/10.1155/2023/1086919>
- Saaka, M., Wemakor, A., Abizari, A. R., & Aryee, P. (2021). Effect of nutrition behaviour change communication delivered through radio on mothers' nutritional knowledge, child feeding practices and growth. *Journal of Nutritional Science*, 10.
- Sharma, N., Gupta, M., Aggarwal, A. K., & Gorle, M. (2020). Effectiveness of a culturally appropriate nutrition educational intervention delivered through health services to improve growth and complementary feeding of infants: A quasi-experimental study from Chandigarh, India. *PLOS ONE*, 15(3), e0229755. <https://doi.org/10.1371/journal.pone.0229755>
- Soofi, S., Ariff, S., Khan, G. N., et al. (2024). Nutrition-sensitive and nutrition-specific interventions and child growth outcomes in community settings. *Nutrients*, 16, 1-18.
- UNICEF. (2021). UNICEF conceptual framework on maternal and child nutrition. United Nations Children's Fund.
- World Health Organization. (2023). WHO guideline for complementary feeding of infants and young children 6-23 months of age. World Health Organization.
- Dewey, K. G. (2016). Reducing stunting by improving maternal, infant and young child nutrition in regions such as South Asia: Evidence, challenges and opportunities. *Maternal & Child Nutrition*, 12(Suppl. 1), 27-38.
- Black, R. E., Victora, C. G., Walker, S. P., et al. (2013). Maternal and child undernutrition and overweight in low-income and middle-income countries. *The Lancet*, 382(9890), 427-451.
- Victora, C. G., Christian, P., Vdaletti, L. P., Gatica-Dominguez, G., Menon, P., & Black, R. E. (2021). Revisiting maternal and child undernutrition in low-income and middle-income countries: Variable progress towards an unfinished agenda. *The Lancet*, 397(10282), 1388-1399.
- Lassi, Z. S., Rind, F., Irfan, O., Hadi, R., Das, J. K., & Bhutta, Z. A. (2020). Impact of infant and young child feeding nutrition interventions on breastfeeding practices, growth and mortality in low- and middle-income countries: Systematic review. *Nutrients*, 12(3), 722.
- Panjwani, A., & Heidkamp, R. (2017). Complementary feeding interventions have a small but significant impact on linear and ponderal growth of children in low- and middle-income countries: A systematic review and meta-

- analysis. The Journal of Nutrition, 147(11), 2169S-2178S.
- Bhutta, Z. A., Das, J. K., Rizvi, A., et al. (2013). Evidence-based interventions for improvement of maternal and child nutrition: What can be done and at what cost? The Lancet, 382(9890), 452-477.
- Wulandari, S., Faraswati, R., Rahmawati, R. S. N., & Utomo, B. M. (2025). PURPLE SWEET POTATO SUPPLEMENTATION: A COMMUNITY-BASED STRATEGY TO IMPROVE TODDLER WEIGHT. Proceedings OPTIMAL.