

The Effect of Education and Supplementary Food Based on Local Food on the Level of Knowledge, Energy and Protein Sufficiency Levels, and Improvemenin Nutritional Status Among Children with Malnutrition at the Bairo Pite Clinic, Lanud-Dili, East Timor

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ABSTRACT

This research aims to formulate competitive strategies for Permata Hotel Bogor as a local business hotel in response to increasing competition and ongoing digital transformation in the hospitality industry. The research adopts a mixed-method approach with a sequential exploratory design, combining qualitative insights, customer perceptions derived from online reviews, and quantitative strategic analysis. Data were collected through in-depth interviews, Focus Group Discussions (FGDs), observations, and documentation. In addition, customer reviews were analyzed using R Studio through text mining and sentiment analysis to identify key issues, sentiment intensity, and their impact on customer satisfaction. The identified factors were then evaluated using Internal Factor Analysis Summary (IFAS) and External Factor Analysis Summary (EFAS) matrices, followed by a SWOT analysis, and prioritized using the Quantitative Strategic Planning Matrix (QSPM). The findings indicate that strengthening digital marketing and optimizing Online Travel Agent (OTA) channels represent the highest-priority strategy (TAS = 3.07), followed by market diversification (TAS = 2.87) and facility modernization (TAS = 2.68). Overall, this study highlights the importance of adopting a data-driven strategic approach to enhance competitiveness and sustainability in the hospitality industry.

INTRODUCTION

The National Health Sector Nutrition Strategic Plan 2022–2026 document prepared by the Ministry of Health of Timor-Leste states that malnutrition remains a major public health challenge in Timor-Leste, particularly among mothers and children. The high prevalence of underweight among toddlers indicates that inadequate nutritional intake, inappropriate feeding practices, socioeconomic factors, and limited access to health services continue to influence children's nutritional status. Therefore, the Government of Timor-Leste has launched community nutrition intervention programs in the form of increasing MNR (Micronutriente Rahun) micronutrient supplementation, promoting exclusive breastfeeding, providing appropriate complementary foods, and strengthening nutrition services in health facilities as efforts to reduce the prevalence of malnutrition and improve public health quality (Akbar et al., 2021; Putri & Mahmudiono, 2020). The factors contributing to malnutrition can be divided into direct factors, namely inadequate dietary intake and infectious diseases, and indirect factors,

such as low household food security, poor maternal knowledge and parenting practices, inadequate health services, and poor environmental sanitation (UNICEF, 2020).

Malnutrition is a condition characterized by impaired nutritional status, indicated by anthropometric measurements such as the BB/U (Berat Badan menurut Umur or Body Weight-for-Age) index. Based on the classification of nutritional status, children with a weight-for-age Z-score between -3 SD and below -2 SD are categorized as underweight or moderately undernourished. Malnutrition can be classified into three levels: mild protein-energy deficiency, moderate protein-energy deficiency, and severe protein-energy deficiency (Supariasa, 2016).

In 2020, approximately 45.8 million children under five years of age worldwide experienced wasting. This condition mostly occurred in low- and middle-income countries, with Southeast Asia recording the highest prevalence of wasting at 14% (WHO, 2021). Based on data from TLFNS (2020), the prevalence of malnourished children in Timor-Leste reached 32.4%. Based on observations from the Clinical Nutrition Unit report at the Bairo Pite Clinic, Dili, Timor-Leste, data collected from January to June 2025 indicated that many toddlers, particularly those aged 12–24 months, visited the clinic and were categorized as malnourished (with a Z-score ranging from -2 to -3.0 SD), with a total of 61 children identified.

Receiving supplementary food can have a positive impact when the nutritional quality is adequate, provided regularly, and accompanied by nutrition education (Leung et al., 2017). However, supplementary feeding programs may have limitations if they are not sustainable or create dependency among families (Keith-Jennings et al., 2019). Several effects may arise from supplementary food provision among undernourished toddlers, including positive and negative effects (Visser et al., 2018). Positive effects include improved nutritional status, increased body weight, reduced risk of malnutrition, increased nutrient intake, optimal growth and development, and improved immunity, resulting in reduced susceptibility to illnesses such as diarrhea and acute respiratory infections (ARI) (Shao et al., 2021; van Neerven, 2025). Negative effects of local food-based supplementary feeding (Pemberian Makanan Tambahan or PMT) at the Bairo Pite Dili Clinic may include dependency, where families rely solely on supplementary food without improving daily dietary practices, as well as digestive problems caused by inadequate hygiene and food preparation methods, which may lead to diarrhea, infections, or allergic reactions (Morales et al., 2023).

Providing local food-based supplementary food for undernourished children refers to the provision of complete meals for toddlers using locally available food ingredients that are rich in animal protein sources (Fetriyuna et al., 2023; Nur, 2025). These meals may combine two types of protein sources, such as chicken eggs and beef, to provide adequate protein intake and essential amino acids required for growth and development (Mazzocchi et al., 2026).

Supplementary food for undernourished toddlers is provided for eight weeks and administered daily, consisting of one complete meal per day. The provision of local food-based supplementary food is accompanied by nutrition education through counseling sessions supported by leaflet media. The objective of PMT provision is to improve toddlers' nutritional status through locally sourced supplementary foods based on the Isi Piringku dietary guidelines. The meals include carbohydrate sources such as sweet potatoes, pumpkin, cassava, and ripe bananas. Animal protein sources include legumes, chicken eggs, sea fish (ikan kakap merah or red snapper), local chicken, and local beef, although beef is provided occasionally

due to its higher cost. Sources of vitamins and minerals include vegetables and fruits such as moringa leaves, local spinach, cassava leaves, papaya, mango, and avocado.

METHOD

Research Design

This study employed a quasi-experimental design using a pretest–posttest control group approach. The study involved an intervention group that received local food-based supplementary feeding (Pemberian Makanan Tambahan or PMT) accompanied by nutrition education, while the control group received the usual PMT without the additional intervention.

Before the intervention, both groups were administered a pretest to measure baseline conditions. The intervention was then provided according to the predetermined independent variables. After the intervention period, both groups underwent a posttest to evaluate changes and compare the outcomes between the intervention and control groups.

Table 1. research design

Group	<i>Pre- Test</i>	Treatment	<i>Post- Test</i>
Intervention	O1	X	O2
Control	O3	-	O4

Source: Adapted from Quasi-Experimental research design (Sugiyono, 2019)

Information :

O1 : *Pre - test* that is heavy body toddler before intervention

O3 : *Pre - test* that is heavy body toddler before intervention

X : Treat in the form of giving PMT local food based on group intervention

O2 : *Post-test* , namely the toddler's weight after giving local food-based PMT

O4 : *Post - test* , namely heavy toddler's body Which get PMT normal

In this study, the intervention group was given nutrition education using leaflets to mothers and supplementary feeding (PMT) based on local food arranged according to the nutritional needs of toddlers and referring to the guidelines from the Ministry of Health of Timor Leste, 2020. The PMT menu provided consisted of sources of carbohydrates, animal or vegetable protein, and vegetables and fruits with the aim of increasing energy and protein intake in toddlers. In addition, the control group was not given local food-based PMT intervention, but toddlers received regular PMT from a government-funded clinic and still received basic nutrition education from health workers using leaflets. The comparison between the two groups aims to see the effect of PMT provision on changes in toddlers' nutritional status after the intervention period. PMT provision Feeding patterns according to the child's age (12–24 months). Utilization of highly nutritious local foods (pumpkin, moringa leaves, red snapper, corn, sweet potatoes, nuts, bananas, etc.).

How to process local food for toddlers to make it attractive and easy to digest as well as food hygiene and sanitation practices (food hygiene). Observation of home feeding practices (if possible) Assessment of changes in maternal knowledge and behavior after intervention PMT Principle Intervention Using local food ingredients that are easily available and affordable. Contains high energy and protein according to the needs of toddlers. Safe, hygienic, and liked

by children. Frequency and Duration of Administration is given once a day at lunchtime for 6 consecutive days. Each portion is adjusted to the child's needs based on body weight and age, namely 150 kcal / portion .

The education provided to mothers is in the form of interactive lectures and group discussions using leaflet media on preventing malnutrition and healthy menus for toddlers according to the "fill my plate" guidelines. Time and Frequency : 2 meetings were held during the research (week 1 and week 8). Duration of each meeting was $\pm$ 60 minutes. Educational Evaluation: Pre-test and post-test of mothers' knowledge (simple questionnaire).

Location and Time of Research

This research was conducted at the Bairo Pite Lanud Clinic, Dili-Timor Leste on November 12, 2025 – January 12, 2026.

Research Population and Sample

The population in this study were children aged 12-24 months with malnutrition status of BB/PB -2 - (-3SD), namely 120 children.

For study experimental in a way simple can formulated using the Slovin formula as follows:

Information :

n = Number of samples required (minimum sample size),

N = Total population,

e = Tolerable or desired margin of error (e.g., 0.05 for a 5% error rate or 0.1 for 10%)

Calculation =

$$n = \frac{N}{1 + N \cdot e^2}$$

$$n = \frac{120}{1 + 120 \times 0.05 \times 0.05}$$

$$n = \frac{120}{0.3023}$$

$$n = 36.33$$

The result obtained is 36.33 rounded to 36 samples of the intervention group 18 and the control group sample is 18. So the research sample taken in this study is 36 children. The sampling technique in this study is *purposive sampling* , namely determining the sample based on certain considerations, which are considered suitable with the characteristics of the specified sample will be used as a sample.

1. Inclusion criteria
 - a. Mother of children aged 12-24 months
 - b. Malnutrition status
 - c. Parents are willing to participate and sign informed consent.
2. Exclusion criteria
 - a. PMT ingredient allergy

- b. Chronic or metabolic disease
- c. Plan to move house
- d. Having taboos against certain foods due to certain ethnicities and cultures or food *taboos*.

Research Tools or Instruments

The tools used in this study were several tools to support the measurement of nutritional status, collection of consumption data, and implementation of interventions, namely:

1. Nutritional Status Measurement Tool
 - a. This tool is used to assess the growth of toddlers, namely
 - b. Digital baby scales to measure toddler weight with an accuracy of 0.1 kg
 - c. Infantometer / Length board To measure the body length of toddlers (sleeping position) with an accuracy of 0.1 cm.
 - d. Microtoise (if the child can already stand) To measure height with an accuracy of 0.1 cm.
 - e. WHO Growth Standard Card / WHO Anthro Software To calculate the Z-score value of PB/U or TB/U.
2. Food Consumption Data Collection Tool

Food consumption data collection tools used to assess food intake, namely:

 - a. 2x24 Hour Recall Form

To record the type and amount of food consumed by toddlers during 2x24 hours, namely 1 working day and 1 holiday, namely Saturday or Sunday.
 - b. Household size photos (URT) to help mothers estimate food portions.
 - c. Food scales are used to weigh food ingredients directly.

Intervention Tools

Used in the implementation of local food-based feeding and providing nutrition education:

- a. Food Ingredients (Local Food-Based PMT) Food ingredients are adapted to the “Isi Piringku” concept and the nutritional needs of toddlers aged 12–24 months, including rice, corn/local tubers, eggs, local fish, tempeh/tofu, nuts, green vegetables, local fruit, and coconut oil/vegetable oil.
- b. Nutrition education leaflet Educational media for mothers about feeding toddlers,
- c. PMT compliance monitoring form To record daily PMT consumption levels

Administrative Tools & Documentation

- a. Informed Consent Sheet
- b. Mother's knowledge questionnaire about nutrition
- c. Pen, clipboard, and data folder
- d. Laptop with SPSS software for data analysis

Method of collecting data

The data measurement process in this study was conducted systematically to obtain accurate and reliable data. The measurement procedure for each variable is as follows:

1. Body Weight Measurement
 - a. Using a digital scale with an accuracy of 0.1 kg
 - b. Children are measured barefoot and wearing minimal clothing.
 - c. The scale is set to zero before use.
 - d. Results are recorded once, repeat if there is a difference >0.1 kg
2. Length/Height Measurement
 - a. Ages 12–24 months are measured using *a length board* (sleeping position if <24 months or not yet able to stand).
 - b. The child is barefoot, his head is against the board, and his knees are pressed straight.
 - c. The measurement is carried out by two officers: one holds the head, one straightens the legs.
 - d. The accuracy of the tool is 0.1 cm .
3. Interpretation of Nutritional Status
 - a. Data is entered into WHO Anthro/AnthroPlus according to age and sex.
 - b. Indicators used: BB/U, PB/U or TB/U, BB/PB or BB/TB.
 - c. Nutritional status is determined based on WHO 2006 standards.
 - d. Malnutrition: Z-Score < –2 SD.

Measuring Mothers' Knowledge about Nutrition

- a. The instrument used was a multiple-choice questionnaire/statement scale that had been tested for content validity by experts.
- b. The questionnaire covers: nutritional needs, local PMT, what's on my plate baduta, hygiene and food safety.
- c. Evaluation:
 - a) Correct answers are scored 1
 - b) Wrong answers are scored 0

Total scores are categorized in the table below.

Table 2. Categories of Mother's Knowledge

Category	% Score
Good	≥ 75%
Enough	56–74%
Not enough	< 56%

Source: Ministry of Health of the Republic of Indonesia, 2019

Energy Consumption Measurement (2×24 Hour Food Recall)

- a. Conducted through direct interviews with mothers/caregivers.
- b. Data collection was carried out before and after the intervention (pre and post).
- c. Recall is done for:
 - a) 1 working day (weekday)
 - b) 1 day weekend to avoid consumption variation bias
- d. Recall steps:

- a. Respondents listed all the food/drinks consumed by their child in the last 24 hours.
- b. Researchers asked about ingredients, quantities, cooking methods, and frequency, using:
 - a) Household size table (URT)
 - b) Portion photo
 - c) Data is converted into energy (kcal) using the Food Composition List (DKBM)/Local Food Composition Table of Timor Leste (if available).
 - d) Energy sufficiency compared to AKG for toddlers (%),
1. Protein Consumption Measurement (2×24 Hour Food Recall)
 - a. Conducted through direct interviews with mothers/caregivers,
 - b. Data collection was carried out before and after the intervention (pre and post).
 - c. Recall is done for:
 - a) 1 working day (weekday)
 - b) 1 day weekend to avoid consumption variation bias,
 - d. Recall steps:
 - a) Respondents listed all the food/drinks consumed by their child in the last 24 hours.
 - b) Researchers asked about ingredients, quantities, cooking methods, and frequency , using:
 - a. Household size table (URT)
 - b. Portion photo
 - c) Data is converted into energy (kcal) using the Food Composition List (DKBM)/Timor Leste Local Food Composition Table (if available).
 - d) Protein adequacy compared to AKG for toddlers (%).

Measurement of PMT Consumption Level

The level of energy and protein consumption is calculated by comparing the amount of energy and protein intake of respondents with the Nutritional Adequacy Intake (AKG) according to age group, then expressed as a percentage (%). The calculation is carried out using the following formula:

$$\text{Energy Consumption Rate (\%)} = \frac{\text{Angka Kecukupan Energi}}{\text{AKG}} \times 100\%$$

Table 3. Energy and Protein Consumption Levels

Percentage (%)	Category
<70	Heavy deficit
70-79	Moderate deficit
80-89	Mild Deficit
90-119	Normal
>120	More

Source: Ministry of Health of the Republic of Indonesia, 2019

Processing Data

The data obtained through this research is data regarding the effect of giving PMT on weight gain in malnourished toddlers. The data processing techniques used were editing,

coding, scoring (assessment), *entering* (data entry), tabulating (tabulation) (Ariani, 2014), using *Microsoft Excel 2010*. and the *IBM SPSS Statistics* computer program version 25.

Analysis Data

a. Normality Test

A normality test was conducted to determine the data distribution of the research variables before bivariate analysis. The Shapiro–Wilk test was used because the sample size was less than 50 respondents. Based on the results of the normality test, a significance value (p-value) of <0.05 was obtained for the variables studied. Thus, it can be concluded that the data were not normally distributed. Because the data did not meet the assumption of normality, the subsequent bivariate analysis used non-parametric statistical tests, namely the Wilcoxon Signed Rank Test for before-and-after comparisons within the same group, and the Mann–Whitney test for comparisons between groups.

b. Univariate analysis

Univariate analysis is an analysis conducted on each variable from the research results by looking for the distribution and percentage of the research results. This analysis only presents the distribution and percentage of each variable (Notoatmodjo, 2010). This univariate analysis is used to describe the characteristics of respondents, the level of maternal knowledge about nutrition, nutrition education, nutritional status of BADUTA. Data are presented in the form of averages (means), standard deviations, minimum values, and maximums.

c. Bivariate analysis

The analysis aims to determine the effect of providing local food-based PMT supplementary food on the level of protein energy consumption and body weight in malnourished toddlers aged 12-24 months in Bairo Pite Clinic, Dili Air Force Base, Timor Leste. Normality test results were used to determine the type of statistical test used in the bivariate analysis. A p-value ≤ 0.05 indicated that the data were not normally distributed and were analyzed using non-parametric tests (Wilcoxon or Mann–Whitney) using SPSS.

RESULTS AND DISCUSSION

The “Findings” Respondent Characteristics

Table 4. Respondent characteristics

Characteristics	Local Food-Based PMT		Regular PMT		<i>P-value</i>
	Mean ±SD		Mean ±SD		
Mother's Age (Years)	31.2 ±4.4		30.8 ±5.0		1,000 ¹⁾
Parental Income (USD/month)	150 ±80		140 ±70		1,000 ¹⁾
Access to Health Services					
Distance (km)	4.8 ±2.3		5.4 ±2.7		0.421 ¹⁾
Time (minutes)	29 ±13		35 ±16		0.318 ¹⁾

Characteristics	Local PMT Intervention		Regular PMT		<i>P-value</i>
	n	%	n	%	
Mother's Education					

Didn't finish elementary school	0	0.0	0	0.0	0.241 ²⁾
Elementary School / Equivalent	1	5.6	0	66.7	
Junior High School / Equivalent	0	0.0	2	11.1	
High School A / Equivalent	15	83.3	16	88.9	
Diploma I – III	2	11.1	0	0.00	
S1/D4	0	0.00	0	0.00	
Mother's Job					1,000 ²⁾
civil servant	1	5.6	1	5.6	
housewife	17	94.4	17	94.4	

² Chi – Square Test → Fisher's Exact Test

Source: Primary data processed, 2025-2026

Table 4. shows that most respondents between the local food-based PMT group and the regular PMT group showed no statistically significant difference. The average maternal age in the local food-based PMT group was 31.2 ± 4.4 years, while in the regular PMT group it was 30.8 ± 5.0 years. The statistical test results showed a p value of 1.000 ($p > 0.05$), which means there was no significant difference between the two groups in terms of maternal age. This indicates that the distribution of maternal age in both groups is relatively homogeneous.

Based on socioeconomic aspects, the average parental income in the local food-based PMT group was 150 ± 80 USD per month, while in the regular PMT group it was 140 ± 70 USD per month. The analysis results showed a p value = 1,000 ($p > 0.05$), so it can be concluded that there was no significant difference in income levels between the two groups. In the variable of access to health services, the average distance to health facilities in the local food-based PMT group was 4.8 ± 2.3 km, while in the regular PMT group it was 5.4 ± 2.7 km. The statistical test results showed a p value = 0.421 ($p > 0.05$), which means there was no significant difference between the two groups. Similarly, for the travel time variable to health facilities, the local food-based PMT group had an average time of 29 ± 13 minutes, while the regular PMT group had an average time of 35 ± 16 minutes, with a p value of 0.318 ($p > 0.05$).

Judging from the level of maternal education in the local PMT intervention group and the regular PMT group, there was no statistically significant difference ($p = 0.241$) ($p > 0.05$). In the local PMT intervention group, the majority of mothers had a high school education level of 15 (83.3%), followed by Diploma I–III (2) (11.1%), and elementary school (5.6%). There were no respondents with less than elementary school education or S1/D4 education in this group. Meanwhile, in the regular PMT group from the clinic, the majority of mothers also had a high school education of 16 (88.9%), and a small number had a junior high school education of 2 (11.1%). There were no respondents with less than elementary school education, Diploma or S1/D4 education in this group.

In terms of maternal occupation, the majority of respondents in both groups were housewives, with 17 respondents (94.4%) each. One respondent worked as a civil servant in each group (5.6%). The analysis showed a p-value of 1.000 ($p > 0.05$), indicating no significant difference in maternal occupation between the intervention and comparison groups. Overall, all baseline characteristics variables had p-values > 0.05 , thus concluding that both study groups had relatively homogeneous characteristics before the intervention. This indicates that any

differences in results found in the main study variables are more likely due to the effects of the intervention, rather than differences in the respondents' initial characteristics.

With low family income, toddlers' nutritional needs cannot be met, resulting in malnutrition in toddlers. Low family economic status will influence the choice of food consumed, so that it is usually less varied and small in quantity, especially in food ingredients that function for child growth, such as sources of protein, vitamins and minerals, thus increasing the risk of malnutrition.

The Effect of Nutrition Education Using Leaflets and Local Food-Based Supplements on the Level of Mothers' Knowledge of Malnourished Children at the Bairo Pite Clinic, Dili, Timor Leste

Table 5. The effect of providing nutrition education using leaflets and local food-based supplementary food media on the level of knowledge of mothers of malnourished children at the Bairo Pite Lanud Clinic, Dili, Timor Leste)

Level of Knowledge	Locally Based PMT	Regular PMT	P- value
	Mean $\pm$ SD	Mean $\pm$ SD	
Before	52.22 $\pm$ 11.27	49.17 $\pm$ 13.95	0.452 ⁴⁾
After	88.89 $\pm$ 8.83	61.39 $\pm$ 17.47	0.000 ²⁾
Delta	36.67 $\pm$ 11.24	12.22 $\pm$ 13.95	0.000 ⁴⁾
P- value	0.000 ³⁾	0.002 ³⁾	

³⁾ Wilcoxon Signed Ranks Test

⁴⁾ Mann Whitney U Test

Source: Primary data processed, 2025-2026

Based on table 5, it shows that the average level of knowledge before the intervention in the local food-based PMT group was 52.22 ± 11.27 , while in the regular PMT group it was 49.17 ± 13.95 . The results of the statistical test showed a p value = 0.452 ($p > 0.05$), which means there was no significant difference between the two groups at the initial conditions of the study. This shows that the level of knowledge of respondents before the intervention was relatively homogeneous. After the intervention was given, the average level of knowledge in the local food-based PMT group increased to 88.89 ± 8.83 , while in the regular PMT group it became 61.39 ± 17.47 . The results of the analysis showed a p value = 0.000 ($p < 0.05$), which means there was a significant difference between the two groups after the intervention was carried out. Judging from the difference in increase (delta), the local food-based PMT group experienced an average increase of 36.67 ± 11.24 , while the regular PMT group only experienced an average increase of 12.22 ± 13.95 . This difference in increase was also statistically significant with a p value of 0.000 ($p < 0.05$). Within-group analysis (pre–post) showed that both the local food-based PMT group and the regular PMT group experienced a significant increase in knowledge levels. In the local food-based PMT group, the p value was 0.000 ($p < 0.05$), while in the regular PMT group, the p value was 0.002 ($p < 0.05$).

Theoretically, knowledge is a cognitive domain that is strongly influenced by the educational process and the provision of structured information. Notoadmojdo (2014) stated that health education provided systematically and repeatedly can increase individual understanding, which then becomes the basis for changes in attitudes and behavior. Leaflets as a health education tool have the advantage of conveying messages visually and in writing,

making it easier for respondents to understand the information provided. The delivery of clear, simple, and contextual information related to local food increases the absorption of information and the relevance of the material to respondents' daily lives.

Furthermore, providing supplementary feeding based on local foods serves not only as a nutritional intervention but also as a practical learning tool (learning by doing). Mothers not only receive theoretical information but also see and understand concrete examples of implementing nutritious, locally sourced menus. This combined approach of education and practice strengthens knowledge retention.

Although the control group also showed a significant increase ($p = 0.002$), the magnitude of the increase was not as high as the intervention group. This could be caused by external factors such as exposure to information from health workers, social interactions between respondents, social media, or the effect of repeated measurements (testing effect). However, the significant difference between groups after the intervention ($p < 0.001$) confirms that the combination of nutrition education and the provision of local food-based supplementary feeding provides a more optimal effect. Thus, the intervention provided has proven effective in increasing maternal knowledge, which is the first step in changing child feeding behavior and improving nutritional status.

This shows that increasing knowledge using leaflet media accompanied by direct feeding to malnourished children in this study is more effective because not only do they get food but respondents also get nutritional education related to efforts to prevent malnutrition using leaflet media. In the group that received PMT from the government, most of them were at a sufficient level of knowledge because the group that received PMT from the government was rarely given nutritional education from health workers or cadres due to the lack of health workers in the clinic and the number of targets who received PMT exceeded 100 people and the food distribution system used a *door to door system* so it was difficult for health workers to share information with them, the food distribution was directly distributed by cadres but there was no access to the respondent's house so that family or relatives waited to take food on the public road.

Based on information obtained from health workers and nutritionists that during the nutrition intervention program in the form of lunch, nutrition education was rarely carried out due to a lack of promoters using local food ingredients due to local food potential, inadequate natural resources in terms of agriculture causing relatively higher prices in the market so that it greatly affects obtaining local food ingredients every day so that the alternative is imported food ingredients. The results of this study are in line with the research of Fitriani et al, (2020) which reported that direct nutrition education to mothers of toddlers has a significant effect on increasing knowledge regarding fulfilling children's nutrition. A greater increase in knowledge in the intervention group in this study was counseling using leaflets accompanied by practices regarding the use of local food around them.

The Effect of Nutrition Education and Provision of Local Food-Based Supplements on Energy Adequacy Levels in Undernourished Toddlers at the Bairo Pite Clinic, Timor Leste Air Force Base

Table 6. The Effect of Providing Nutrition Education and Providing Local Food-Based Supplements on Energy Adequacy Levels in Undernourished Toddlers at the Bairo Pite Clinic, Timor Leste Air Force Base

Energy Adequacy Level	Locally Based PMT	Regular PMT	P-value
	Mean±SD	Mean±SD	
Intake Before	936 ±107.89	937.22 ±86.04	0.874 ⁴⁾
Needs the Day Before	1300 ±0.00	1300 ±0.00	1,000 ²⁾
Adequacy Before	73.48 ±10.28	87.35 ±7.30	0.000 ⁴⁾
Post Intake	1278.06 ±51.56	1076.33 ±91.84	0.000 ²⁾
Needs for the Day After	1300 ±0.00	1300 ±0.00	1,000 ²⁾
Sufficiency After	98.31 ±0.93	82.79 ±1.93	0.000 ⁴⁾
Intake Delta	342.06 ±135.83	139.11 ±86.26	0.000 ⁴⁾
Delta of Adequacy	31.81±20.63	7.73±13.72	0.001 ⁴⁾
P-value	0.000 ³⁾	0.000 ³⁾	

³⁾ *Wilcoxon Signed Ranks Test*

⁴⁾ *Mann-Whitney U Test.*

Source: Primary data processed, 2025-2026

Based on table 6, it shows that the average analysis of energy intake before the intervention in the local food-based PMT group was 936 ± 107.89 kcal, while in the regular PMT group it was 937.22 ± 86.04 kcal. The results of the statistical test showed a p value = 0.874 ($p > 0.05$), which means there was no significant difference in initial energy intake between the two groups. Also seen from the results of the energy adequacy level before the intervention, it showed that there was a significant difference between the two groups, namely the local food-based PMT group had an average energy adequacy of $73.48 \pm 10.28\%$, while the regular PMT group was $87.35 \pm 7.30\%$, with a p value = 0.000 ($p < 0.05$). This shows that before the intervention, the energy sufficiency level of the regular PMT group was higher than the local PMT group, but after the intervention the results showed that the average energy intake in the local food-based PMT group increased to 1278.06 ± 51.56 kcal, while in the regular PMT group it became 1076.33 ± 91.84 kcal. The results showed that descriptively there was a greater increase in the intervention group as seen from the results of the inter-group test showing that the p value = 0.000 ($p > 0.05$). The energy sufficiency level after the intervention showed a significant difference between the two groups. The local food-based PMT group achieved an average sufficiency of $98.31 \pm 0.93\%$, while the regular PMT group was $82.79 \pm 1.93\%$, with a p value = 0.000 ($p < 0.05$). This shows that after the intervention, the local food-based PMT group achieved a more optimal level of energy sufficiency.

Based on the change (delta), the increase in energy intake in the local food-based PMT group was 342.06 ± 135.83 kcal, while in the regular PMT group it was 139.11 ± 86.26 kcal, with a significant difference ($p = 0.000$; $p < 0.05$). Based on the delta of energy sufficiency level, the local food-based PMT group experienced an increase of $31.81 \pm 20.63\%$, while the regular PMT group was $7.73 \pm 13.72\%$, with a p value of 0.001 ($p < 0.05$). So it can be concluded that overall, the local food-based PMT intervention proved to be more effective in increasing energy intake and sufficiency levels than the regular PMT. Although at the beginning of the study there were differences in energy sufficiency levels, after the intervention

the local PMT group was able to achieve almost 100% energy sufficiency, while the regular PMT group was still below the optimal standard.

This confirms that providing local food-based supplementary foods plays an important role in increasing energy sufficiency, especially accompanied by nutritional education aimed at increasing respondents' understanding of the importance of adequate energy intake. Because in the Bairo Pite Lanud Clinic area, many mothers do not yet know the importance of processing local food ingredients such as pumpkin, moringa leaves, tempeh, tofu, green beans, and fish to make supplementary foods for children under two years old because they perceive that these foods are not suitable for children for fear of diarrhea or allergies. According to Almatsier (2016), children's energy sufficiency is greatly influenced by daily consumption patterns determined by mothers as family food managers. Adequate nutritional education can improve mothers' ability to choose the type and amount of food that suits their children's energy needs.

This research aligns with Handinsyah and Tambunan (2019), who stated that nutrition education interventions can increase energy intake through changes in family eating behavior. In the context of this study, the use of local foods as an energy source also contributes to increased energy consumption because these foods are readily available and align with local dietary habits. Therefore, nutrition education combined with the use of local foods is an effective strategy for improving children's nutritional adequacy.

The Effect of Nutrition Education and Provision of Local Food-Based Supplements on Protein Adequacy Levels in Undernourished Toddlers at the Bairo Pite Clinic, Timor Leste Air Force Base

Table 7. The Effect of Providing Nutrition Education and Providing Local Food-Based Supplements on Protein Adequacy Levels in Undernourished Toddlers at the Bairo Pite Clinic, Timor Leste Air Force Base

Protein Consumption Level	Locally Based PMT	Regular PMT	P-value
	Mean±SD	Mean±SD	
Intake Before	13.94 ±2.42	12.74 ±2.34	0.0594 ⁴⁾
Pre-requisites	20.00 ±0.00	20.00 ±0.00	1,0002 ⁴⁾
Adequacy Before	73.48 ±10.28	87.35 ±7.30	0.0004 ⁴⁾
Post Intake	20.26 ±1.05	16.73 ±0.90	0.0002 ⁴⁾
After Needs	20.00 ±0.00	20.00 ±0.00	1,0002 ⁴⁾
Sufficiency After	102.13 ±4.35	106.00 ±6.20	0.0004 ⁴⁾
Intake Delta	6.32 ±3.23	4.03 ±2.24	0.0034 ⁴⁾
Delta of Adequacy	31.81±20.63	7.73±13.72	0.0014 ⁴⁾
P-value	0.000 ³⁾	0.000 ³⁾	

³⁾ *Wilcoxon Signed Ranks Test*

⁴⁾ *Mann-Whitney U Test,*

Source: Primary data processed, 2025-2026

Table 7 shows that the average protein intake before the intervention in the local food-based PMT group was 13.94 ± 2.42 grams, while in the regular PMT group it was 12.74 ± 2.34 grams. The Mann–Whitney test results showed a p value = 0.059 (p > 0.05), so it can be concluded that there was no significant difference between the two groups at the initial conditions of the study. After the intervention, the average protein intake in the local food-

based PMT group increased to 20.26 ± 1.05 grams, while in the regular PMT group it was 16.73 ± 0.90 grams. The results of the analysis showed a significant difference between the two groups ($p = 0.000$; $p < 0.05$). Analysis within groups using the Wilcoxon Signed Ranks Test showed that both groups experienced a significant increase in protein intake and adequacy ($p < 0.05$).

The results of the study above strengthen that the use of local food as a source of protein when combined with nutritional education can be an effective strategy in increasing protein sufficiency in children, because in the Bairo Pite Lanud Clinic area many mothers do not know the importance of processing local food ingredients such as pumpkin, moringa leaves, tempeh, tofu, green beans, fish for making additional food for children under two years old because they perceive that these foods are not suitable for children afraid of diarrhea or allergies. Differences in consumption patterns before and after education and provision of additional food based on local food can be seen from the results of the 24-hour *Food Recall* that before being given intervention in the form of providing education using leaflets and providing additional food based on local food, children tend to be given food in the form of empty porridge or porridge with sausage, even though around the house there are pumpkin plants and moringa leaves that are easy to get. This is due to the lack of information about the use of local food around it. After being given nutritional education focusing on the diversity of food and nutrients from 3 important groups that are guided by the contents of my plate and direct food interventions to children so that parents see directly the process and its effectiveness so that parents use this as a reference for the future not to give empty porridge to their children because parents already know the benefits of existing food ingredients.

The local food-based approach is also in line with the community nutrition intervention strategy recommended by UNICEF, 2020, which emphasizes program sustainability through the utilization of local resources. The use of local food not only increases accessibility and affordability but also strengthens long-term household food security. From a sustainability perspective, the combined intervention program of education and supplementary feeding based on local food has proven more effective than a single educational approach. Education improves cognitive capacity, while food interventions provide tangible changes in consumption patterns. The integration of the two creates a synergistic effect in improving nutritional status. Overall, this study strengthens the evidence that education-based interventions and the utilization of local food are effective and contextual strategies in increasing protein adequacy in undernourished children under five, particularly at the Bairo Pite Clinic, Dili Air Force Base, Timor Leste.

The Effect of Nutrition Education and Provision of Local Food-Based Supplements on the Nutritional Status of Undernourished Toddlers at the Bairo Pite Clinic, Timor Leste Air Force Base

Table 8. The Effect of Providing Nutrition Education and Providing Local Food-Based Supplements on the Nutritional Status of Undernourished Toddlers at the Bairo Pite Clinic, Timor Leste Air Force Base

Nutritional Status (BW/U)	Locally Based PMT	Regular PMT	P- value
	Mean $\pm$ SD	Mean $\pm$ SD	
Before	-2.67 ± 0.23	-2.63 ± 0.23	0.590 ⁴⁾
After	-0.93 ± 1.06	-1.55 ± 0.93	0.026 ⁴⁾
Delta	0.78 ± 0.428	0.28 ± 0.575	0.025 ⁴⁾
P- value	0.001 ³⁾	0.001 ³⁾	

³⁾ Wilcoxon Signed Ranks Test

⁴⁾ Mann-Whitney U Test,

Source: Primary data processed, 2025-2026

Based on table 8, it shows that there was no significant difference in the initial weight for age (BW/A) between the local food-based PMT group and the regular PMT group (-2.67 ± 0.23 vs. -2.63 ± 0.23 ; $p = 0.590$), which indicates comparable initial nutritional status conditions. After the intervention, the local food-based PMT group showed a significantly higher improvement in BW/A than the regular PMT group (-0.93 ± 1.06 vs. -1.55 ± 0.93 ; $p = 0.026$). The average change in the delta of nutritional status BW/A in the intervention group was also greater than the control group (0.78 ± 0.43 with 0.28 ± 0.58 ; $p = 0.025$). The results of the inter-group analysis showed a significant increase in both groups ($p = 0.001$); However, seen from the magnitude of the increase, it was higher in the local food-based PMT group, which indicates the effectiveness of the intervention in improving children's nutritional status.

The difference in the results above is due to the macro and micro nutrient content that is more appropriate to the needs of children in the local food formulation when this study was conducted. In addition, the use of local food ingredients can increase consumption acceptance and sustainability of the intervention because it is more accessible and in accordance with children's eating habits in general. This can indicate that the intervention is not only statistically significant but also has appropriate clinical meaning. In the group that received regular PMT provided by the Clinic funded by the central government, there was no significant difference due to the lack of maternal knowledge so that the food given to children by the staff was not entirely given to the child but was consumed together with the family. Based on direct observation during the study, it was seen that the menu provided was varied according to the menu standard even though it did not entirely use local ingredients, but the distance and location of delivery were far so that sometimes the food arrived at the distribution location, the children had already eaten the food provided by the family as it was.

Conceptually, a child's nutritional status is the result of a balance between nutrient intake and the body's metabolic needs. According to WHO (2021), nutritional status indicators, such as the Z-score, reflect a child's growth condition compared to international reference population standards. Improvements in the Z-score indicate an improvement in growth conditions closer to normal standards. This approach also aligns with the child nutrition determinants framework proposed by UNICEF (2020), which also states that nutritional status is influenced by food intake, parenting practices, and access to food. With food education and support, the interventions in this study addressed these two main determinants.

According to WHO (2021), a child's nutritional status is the result of the accumulation of nutrient intake, health conditions, and parenting patterns over a certain period. Nutrition interventions that focus on improving the quality and quantity of food intake can have a positive impact on a child's nutritional status. The results of the study are in line with Rahayu et al (2021) who stated that family-based nutrition interventions can significantly improve the nutritional status of toddlers. Improvement in nutritional status in this study is a further impact of increased maternal knowledge and children's energy sufficiency. The difference in results between the intervention and control groups indicates that providing nutrition education and providing supplementary foods based on local foods are the main factors contributing to improving children's nutritional status.

CONCLUSION

In conclusion, this study found that nutrition education delivered through leaflet media significantly improved mothers' knowledge regarding the management of malnourished children at the Bairo Pite Lanud Clinic, Dili, Timor-Leste. Furthermore, the combination of nutrition education and local food-based supplementary feeding (Pemberian Makanan Tambahan or PMT) positively affected energy adequacy among malnourished toddlers at the same clinic. Similarly, the intervention significantly improved protein adequacy and the overall nutritional status of malnourished toddlers. Therefore, integrating nutrition education with local food-based supplementary feeding can serve as an important strategy for improving maternal knowledge and nutritional outcomes among malnourished children in this region.

Based on these findings, several recommendations are proposed. For health workers and nutritionists at the Bairo Pite Clinic, regular nutrition education using leaflet media is recommended, along with active involvement of mothers in supplementary feeding programs to improve their understanding and skills in utilizing local food ingredients. For the government and policymakers, sustainable funding support for local food-based supplementary feeding programs and the development of training modules for health workers and community health cadres on local food processing and nutrition education are recommended. For future researchers, similar studies should be conducted with longer intervention periods, larger sample sizes, and follow-up assessments to evaluate the long-term sustainability of intervention effects on children's nutritional status. Further research should also examine the cost-effectiveness of local food-based supplementary feeding programs compared with imported food-based interventions.

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