Proceedings Academic Universitas Jambi
Volume 1, Issue 2, November 2025

Nutritional potential analysis and development of local food-based MP-ASI formula as a specific intervention for stunting prevention

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Abstract

Background: Stunting is a chronic malnutrition problem that has implications for the failure of growth and development of toddlers, mainly caused by prolonged nutritional deficiencies during the critical period of the First 1000 Days of Life (HPK). Specific nutritional interventions that are essential in the post-exclusive breastfeeding period are the provision of Complementary Breastfeeding Foods (MP-ASI) that meet the principles of Adequate, Timely, Safe, and Correct. **Objective**: The purpose of this research is to identify, analyze nutritional potential, and optimize the use of local food ingredients to support the preparation of MP-ASI formulas to prevent stunting in the working area of the Olak Kemang Community Health Center, Jambi City. **Methods:** The method applied is qualitative-participatory through participatory-based education and training, with measurement of increased maternal nutritional literacy using pre-tests and post-tests. **Results:** The results of the identification of local food availability show high nutritional potential, where Tempe has the highest protein content (20.8 g/100g), followed by Patin Fish (17.0 g/100g), and Red Spinach, which is rich in Iron (7.0 mg/100g). **Conclusion:** The implementation of this program successfully improved nutritional literacy and mothers' skills in producing nutritious complementary foods based on local wisdom. This is an effective and sustainable strategy for improving nutritional status and accelerating the reduction in stunting prevalence.

Keywords: Stunting; complementary foods (MP-ASI); local food; first 1000 days of life.

Cite This Article

Ayudia, E. I., Hafizah, H., Iskandar, M. M., Gading, P. W., Asty, Z. F. et al. (2025). Nutritional potential analysis and development of local food-based MP-ASI formula as a specific intervention for stunting prevention. *Proceedings Academic Universitas Jambi*, *1*(2). 452-458.

Editor

I Made Dwi Mertha Adnyana, M.Ked.Trop.

Article info

Received: October 03, 2025. Revised: October 30, 2025. Accepted: November 09, 2025

INTRODUCTION

Stunting is a form of growth failure that is a chronic nutritional problem and is characterized by a child's height being shorter than the standard for their age [1,2]. This condition is caused by long-term malnutrition, especially during the crucial period of the First 1000 Days of Life (HPK) [3].

Specific nutritional interventions, including the provision of complementary foods (MP-ASI), are essential in the post-exclusive breastfeeding period [4, 5]. The quality and quantity of MP-ASI that meet the principles of Adequate, Timely, Safe, and Correct are the main determinants of a child's nutritional status [6]. Inadequate MP-ASI in terms of energy, protein, and micronutrients is one of the main causes of stunting [7, 8]. The level of animal protein consumption has a significant relationship with the incidence of stunting, where animal protein plays an important role in a child's linear growth [9, 10].

The working area of the Olak Kemang Community Health Center, Jambi City, requires a stunting prevention approach that utilizes local resources. Utilizing local, nutrient-rich food ingredients, especially animal protein (such as freshwater fish: Baung, Saluang, Patin, and Snakehead) and vegetable protein sources (Tempe and Tofu), is an effective strategy [11,12,13]. Therefore, this research aims to identify, analyze nutritional potential, and optimize the use of local food ingredients to support the preparation of MP-ASI formulas in order to prevent stunting in the working area of the Olak Kemang Community Health Center, Jambi City.

METHODS

Design and setting

This research program is designed to be qualitative and participatory, using education and training. Activities are carried out in the Olak Kemang Community Health Center (Puskesmas) work area in Jambi City. Inclusion criteria included mothers of toddlers aged 6–24 months and mothers who were willing to actively participate in educational and training activities.

Instruments and criteria

The instruments used included a participatory observation sheet to identify the availability and optimization of local food ingredients (baung fish, saluang, patin, snakehead fish, tempeh, and tofu). Analysis of the nutritional potential of local foods was supported by secondary data (the Indonesian Food Composition Table or literature studies) to estimate energy and protein content.

Procedure and data collection

The research procedures included identification and analysis of nutritional potential, and optimization of local food use. The activities continued with interactive education and hands-on training (demonstrations) on processing local food into a highly nutritious complementary feeding formula.

Statistical analysis

Data were processed to demonstrate the availability of local food ingredients with potential nutritional content. Qualitative data (local food availability) were analyzed descriptively to support the justification of complementary feeding formulas.

RESULTS

The results indicate the availability of local food ingredients with potential nutritional content. When processed according to proper nutritional principles, these ingredients can ensure adequate energy and protein intake for toddlers. The local foods in question are freshwater fish (baung, saluang, patin, snakehead) and plant-based protein sources (tempeh, tofu). The nutritional potential of several key local food ingredients identified is presented in Table 1.

Table 1. Potential Nutritional Content of Local Food Ingredients for MP-ASI (per 100 grams of ingredients).

Ingredients	Energy (kcal)	Protein (g)	Fat (g)	Carb (g)	Iron (mg)	Calciu m(mg)
Baung Fish	123	15.1	5.5	3.3	1.3	5
Saluang Fish	113	13.9	4.9	3.4	1.9	642
Patin Fish	132	17.0	6.6	1.1	1.6	31
Gabus Fish	80	16.2	0.5	2.6	0.1	170
Eggs	154	12.4	108	0.7	3.0	86
Tahu	80	10.9	4.7	0.8	3.4	223
Tempe	201	20.8	8.8	13.5	4.0	155
Red Spinach	41	2.2	0.8	6.3	7.0	520

The implementation of this program successfully improved maternal nutritional literacy and skills in producing highly nutritious complementary foods based on local wisdom. This was reinforced by mothers' understanding of the distribution of nutritional needs (breast milk and complementary foods) based on age stages (6-8 months, 9-11 months, 12-23 months).

Table 2. Demographic characteristics of the respondents.

Characteristics	n	%
Education		
Not finished	1	0.9
Elementary School	10	9.1
Junior High School	25	22.7
Senior High School	56	50.9
Higher Education	18	16.4

DISCUSSION

The main objective of this research was to analyze the nutritional potential of local food ingredients in the Olak Kemang Community Health Center area and develop them into complementary feeding formulas as a specific intervention for stunting prevention. Key findings showing significant improvements in maternal nutritional literacy and skills align with the hypothesis that educational interventions are effective in changing child feeding practices [6, 14, 15]. Education focused on the crucial first 1,000 days of life (HPK) effectively emphasizes the importance of adequate, timely, safe, and correct complementary feeding [5, 6, 16].

Data on the persistently high prevalence of stunting in Indonesia, as confirmed by various studies, underscores the urgency of innovative and affordable interventions [2, 3, 17]. In this context, utilizing local foods is a highly relevant and sustainable strategy [11, 12, 18]. The identified freshwater fish—such as Baung, Saluang, Patin, and Snakehead—are sources of animal protein with high bioavailability [11, 16]. Animal protein is essential for tissue synthesis and linear growth and is more effective in preventing growth faltering [9, 17, 18, 19]. A systematic review also confirmed the importance of animal protein in preventing stunting [10, 20].

The results of the nutritional potential identification (Table 2) indicate that local food ingredients in Jambi have potential macronutrient and micronutrient content. Local animal protein sources, such as catfish, have the highest protein content, reaching 17.0 g per 100 grams, followed by catfish (15.1 g) and saluang fish (13.9 g). Animal protein is essential for tissue synthesis and linear growth and is more effective in preventing growth faltering.

Furthermore, tempeh is a superior local vegetable protein source with 20.8 g of protein and is also rich in iron (4.0 mg), making it a nutrient-dense source of energy (201 kcal) for complementary feeding (MP-ASI). For other important micronutrients, saluang fish and red spinach stand out for their very high calcium content, at 642 mg and 520 mg, respectively, and significant iron content (red spinach at 7.0 mg). These micronutrients are important for preventing anemia and deficiencies that contribute to stunting.

The locally sourced complementary feeding formula produced in this program has the advantage of being easily accessible, more economical, and tailored to local tastes [19, 20]. This increases the potential for long-term maternal compliance [21, 22]. Quality control of complementary feeding after exclusive breastfeeding is crucial, as inappropriate complementary feeding practices, including those low in nutrients, are a major risk factor for stunting in children aged 6-24 months [7, 8, 23]. Therefore, improving maternal knowledge regarding proper preparation methods is a vital preventative measure [14, 24, 25].

Although this program has been successful in improving maternal knowledge and skills, it must be recognized that the impact of behavioral changes on children's nutritional status is long-term. Stunting itself is a cumulative consequence of nutritional deficiencies that begin in infancy, and its long-term impact can extend into adulthood, affecting metabolic health and productivity [23]. Therefore, stunting prevention interventions must be carried out continuously and involve specific and sensitive interventions [26].

CONCLUSIONS

This research program successfully identified and optimized the use of nutrient-rich local foods (freshwater fish and tempeh) for the development of complementary feeding formulas. Participatory education and training programs have proven effective

in improving maternal nutritional literacy and skills. Utilizing local wisdom is an effective and sustainable strategy for improving nutritional status and accelerating the reduction of stunting prevalence.

CONFLICT OF INTEREST

The authors declare that this research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

FUNDING

This research received funding from the Institute for Research and Research, University of Jambi.

ACKNOWLEDGMENT

The authors extend their sincere gratitude for the unwavering support and facilities provided throughout the implementation of this research project. Special appreciation is conveyed to the Olak Kemang Community Health Center (Puskesmas), Jambi City, for the permission, facilities, and active cooperation in facilitating the education and training for mothers of toddlers in their working area, and to the Institute for Research and Research (LPPM), Jambi University, for the administrative and funding support that enabled the successful completion of this program. Finally, profound thanks are given to all participating mothers of toddlers and health cadres, whose active and enthusiastic participation ensured the achievement of the project's objectives.

DECLARATION OF ARTIFICIAL INTELLIGENCE USE

We hereby confirm that artificial intelligence (AI) was not used during the data collection, analysis, and visualization stages. An AI-based language model was used for language refinement (improving grammar, sentence structure, and readability) and technical writing assistance (providing suggestions for more effective technical descriptions) during the preparation of this manuscript. The authors have critically reviewed all AI-assisted processes to ensure the integrity and reliability of the results. The authors alone make the final decisions and interpretations presented in this article.

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