



Community Empowerment of Posyandu Cadres through Local Food-Based Complementary Feeding Innovation for Stunting Prevention

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ABSTRACT

Stunting management requires strong cross-sectoral collaboration; therefore, this research is considered urgent, with the aim of accelerating stunting prevention efforts through a concrete synergy between academics, the government (Health Office), Posyandu cadres, and target communities. The main strategy of this synergy focuses on introducing innovation in complementary feeding (MP-ASI) recipes based on local food wisdom to sustainably improve children's nutritional quality. The implementation method combines interactive two-way education with hands-on demonstrations of MP-ASI preparation innovations designed to be practical, affordable, and nutrient-dense for households. This program synergy produced highly positive evaluation results; there was a significant increase in participants' average nutrition knowledge score from 65.35 to 80.71. The proportion of participants with good knowledge increased from 30.0% to 87.5%, while the proportion in the poor knowledge category decreased from 20.0% to 0.0%. The high level of community participation and cadres' enthusiasm in cooking practices demonstrates that local MP-ASI recipe innovations, when driven by multi-stakeholder synergy, serve as a highly effective strategy to strengthen Posyandu capacity and address stunting at the grassroots level.



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ABSTRAK

Penanganan stunting membutuhkan kolaborasi lintas sektor yang kuat sehingga penelitian ini dianggap sangat urgen untuk mempercepat upaya pencegahan stunting melalui sinergi nyata antara akademisi, pemerintah (Dinas Kesehatan), kader Posyandu, dan masyarakat sasaran, dengan strategi utama berupa pengenalan inovasi resep Makanan Pendamping ASI (MP-ASI) berbasis kearifan pangan lokal guna meningkatkan kualitas gizi anak secara berkelanjutan; metode pelaksanaan memadukan edukasi interaktif dua arah dengan demonstrasi langsung pengolahan MP-ASI yang dirancang praktis, ekonomis, dan padat gizi bagi rumah tangga, dan hasil evaluasi menunjukkan dampak yang sangat positif ditandai dengan peningkatan signifikan rata-rata skor pengetahuan gizi peserta dari 65,35 menjadi 80,71, kenaikan kategori pengetahuan baik dari 30,0% menjadi 87,5%, serta penurunan kategori kurang dari 20,0% menjadi 0,0%, sementara tingginya partisipasi masyarakat dan antusiasme kader dalam praktik memasak membuktikan bahwa inovasi resep MP-ASI lokal yang didorong oleh sinergi multi-pihak merupakan strategi yang sangat efektif untuk memperkuat kapasitas Posyandu dan menanggulangi stunting di tingkat akar rumput.

Kata Kunci: Pencegahan Stunting; Makanan Pendamping ASI (MP-ASI); Pangan Lokal; Pendidikan Gizi; Kader Posyandu

1. Introduction

According to the World Health Organization (WHO), an estimated 149 million children under five years of age were affected by stunting globally in 2024 [1]. In Indonesia, based on the results of the 2024 Indonesian Nutritional Status Survey (SSGI), the national stunting prevalence showed a downward trend, from 21.5% in 2023 to 19.8% in 2024. However, this figure remains above the globally established threshold, and Indonesia faces challenges in achieving the target of accelerating stunting reduction to 18.8% by 2025 [2],[3].

Malnutrition is known to be closely linked to decreased cognitive development in children. This is demonstrated by lower scores on various intelligence assessment instruments, such as the Wechsler Intelligence Scale and Raven's Colored Progressive Matrices. This decline in cognitive abilities is associated with impaired growth and brain function, particularly during the first 1,000 days of life, a critical phase for a child's neurological and cognitive development [4],[5],[6].

Stunting remains a public health issue of significant concern in Indonesia, including in Riau Province. Based on data from the 2023 Indonesian Health Survey (SKI), the prevalence of stunting in Siak Regency has been successfully reduced to 10.40%, a drastic decrease from 22.00% the previous year [2]. Although this figure has exceeded the national target, the crucial challenge now is to maintain this positive trend and prevent new cases. This stunted growth condition poses a serious threat to cognitive and motor development and the risk of metabolic disease in adulthood [7],[8]. Therefore, preventive measures require specific, ongoing interventions during the First 1,000 Days of Life (HPK) [9],[10].

The critical point for stunting prevention is highly dependent on the phase of complementary feeding (MP-ASI). Inappropriate MP-ASI practices are a major trigger for growth faltering [11],[12]. Economic constraints often prevent rural families from providing commercial animal protein. Utilizing local food wisdom has proven to be a

rational solution that not only reduces costs but also increases children's acceptability [13],[14]. Riau Province is rich in local foods, such as high-protein river fish, which have great potential for formulation into nutrient-dense MP-ASI [15].

In Tualang District, Siak Regency, nutrition improvement focuses on optimizing the Integrated Health Post (Posyandu). As the frontline facility, Posyandu cadres are the spearheads of nutrition education [16],[17]. However, conventional outreach methods often hinder the effectiveness of knowledge transfer. A participatory educational approach through cooking demonstrations (cooking classes) has proven far more effective in increasing knowledge retention and practical skills among mothers than one-way outreach [18],[19].

In addition to providing complementary feeding (MP-ASI), stunting prevention is also influenced by the family's level of health literacy. Good health literacy helps parents understand their children's nutritional needs, food safety, and the appropriate use of vitamins and supplements. Conversely, low health literacy can lead to errors in selecting and using children's health products. The concept of health literacy emphasizes an individual's ability to obtain, understand, and use health information to make informed decisions [20],[21].

Although previous studies have reported positive effects of nutrition education, complementary feeding interventions, or Posyandu cadre empowerment programs on child nutrition outcomes, these approaches are often implemented separately. Limited studies have integrated local food-based MP-ASI innovation, participatory cooking practice, Posyandu cadre empowerment, and multi-stakeholder collaboration within a single community-based intervention. In particular, evidence regarding the effectiveness of combining nutrition education and practical MP-ASI preparation using locally available food resources such as patin and snakehead fish remains limited in Tualang District, Siak Regency. Therefore, the novelty of this study lies in the integration of local food-based MP-ASI innovation, Posyandu cadre empowerment, participatory cooking demonstrations, and a pentahelix collaborative approach to strengthen community capacity for stunting prevention.

Recognizing this complexity, stunting interventions require cross-sectoral collaboration, or a pentahelix approach [22],[23]. Synergy between academics (UIN Sultan Syarif Kasim Riau), the local government, and the community in Tualang District is a crucial catalyst. Based on this urgency, this study aims to: (1) Realize cross-sectoral synergy in preventing stunting; (2) Implement innovative local wisdom MP-ASI recipes; and (3) Evaluate the increase in nutritional knowledge of Posyandu cadres and mothers of toddlers before and after the intervention is carried out.

2. Methods

Research Design

This study employed a Participatory Action Research (PAR) approach integrated with a quasi-experimental one-group pretest-posttest design to evaluate the effectiveness of a community-based intervention in improving the knowledge and practical skills of Posyandu cadres and mothers of toddlers regarding locally based complementary feeding (MP-ASI) for stunting prevention.

The PAR approach was selected because it emphasizes collaborative problem-solving involving researchers, health professionals, Posyandu cadres, local government representatives, and community members throughout the planning, implementation, reflection, and evaluation stages. This participatory strategy ensured that the

intervention was developed according to local nutritional needs and available food resources while encouraging active community engagement.

The quasi-experimental one-group pretest-posttest design was employed to measure changes in participants before and after the intervention. Knowledge and practical skills were assessed immediately before the educational activities (pre-test) and repeated after the completion of the intervention (post-test). Since no control group was included, the findings describe changes associated with the intervention rather than establishing definitive causal relationships.

$O_1 \rightarrow X \rightarrow O_2$

where:

- O_1 = Pre-test
- X = Nutrition education, MP-ASI demonstration, and local food-based MP-ASI practice
- O_2 = Post-test

Research Location and Time

The study population consisted of 125 active Posyandu cadres and mothers of toddlers registered in Posyandu activities in Tualang District. Using purposive sampling, 40 participants were selected, comprising 20 Posyandu cadres and 20 mothers of children aged 6–24 months. Participants were selected because they were directly involved in complementary feeding practices and routinely participated in Posyandu services.

The inclusion criteria were: Active Posyandu cadre with at least one year of experience or mother with a child aged 6–24 months. Willingness to participate in all intervention sessions. Completion of both pre-test and post-test assessments. Provision of written informed consent. Exclusion criteria included withdrawal during the intervention, incomplete questionnaires, or absence from practical sessions. Because purposive sampling is a non-probability sampling technique, the findings should be interpreted cautiously and cannot be generalized to all Posyandu cadres or mothers of toddlers in Indonesia.

The intervention combined nutrition education, practical demonstrations, and independent cooking practice conducted through six sequential stages presented in **Table 1**.

Table 1. Stages of the Community-Based MP-ASI Intervention

Stage	Activity	Duration	Description
I	Preparation and coordination	1 week	Coordination with Health Office, Puskesmas, village officials, and Posyandu cadres
II	Pre-test	30 min	Baseline assessment of participants' knowledge and practical skills
III	Nutrition education	60 min	Education on stunting, first 1,000 days of life, balanced nutrition, complementary feeding, and local food utilization
IV	Cooking demonstration	90 min	Demonstration of local MP-ASI preparation by nutrition educators
V	Independent cooking practice	120 min	Participants prepared MP-ASI recipes independently under facilitator supervision
VI	Reflection and post-test	45 min	Discussion, practical evaluation, and post-test assessment

Development of Local Food-Based MP-ASI Innovation

A major innovation of this program was the development of complementary feeding recipes utilizing affordable and nutritionally rich local food resources (**Table 2**). Freshwater fish, particularly patin (*Pangasius hypophthalmus*) and snakehead fish (*Channa striata*), were selected as the primary protein sources because they are widely available in Tualang District and contain high-quality protein essential for child growth. These ingredients were combined with vegetables and carbohydrate sources to produce balanced complementary foods appropriate for children aged 6–24 months. During the intervention, participants learned ingredient selection, hygienic preparation, cooking techniques, appropriate food texture, portion size, and safe food storage.

Table 2. Examples of Local Food-Based MP-ASI Recipes

Recipe	Main Ingredients	Quantity	Preparation Method	Estimated Nutritional Value
Patin Fish Porridge	Patin fish, rice, carrot, spinach	Fish 40 g, rice 30 g, carrot 20 g, spinach 15 g	Boiled and blended until smooth	Energy 156 kcal; Protein 12.4 g
Snakehead Fish Puree	Snakehead fish, pumpkin, potato	Fish 40 g, pumpkin 30 g, potato 25 g	Steamed and mashed	Energy 149 kcal; Protein 13.1 g
Patin Vegetable Soup	Patin fish, broccoli, carrot	Fish 40 g, broccoli 20 g, carrot 20 g	Boiled until soft	Energy 138 kcal; Protein 11.6 g

Note: Estimated nutritional values were calculated using the Indonesian Food Composition Table (TKPI)

Data were collected using a structured knowledge questionnaire and a practical skills observation checklist. The knowledge questionnaire consisted of 20 items assessing participants' understanding of stunting prevention, complementary feeding, balanced nutrition, local food utilization, and food safety (**Table 3**). Practical skills were evaluated using a 10-item observation checklist covering food preparation, hygiene, cooking techniques, nutritional balance, food texture, presentation, and serving practices (**Table 4**).

Table 3. Domains of the Knowledge Questionnaire

Domain	Number of Items	Example Indicator
Stunting prevention	5	Causes, risk factors, prevention
Complementary feeding (MP-ASI)	5	Appropriate age, feeding frequency
Balanced nutrition	4	Food groups and nutrient adequacy
Local food utilization	3	Selection of local protein sources
Food safety	3	Hygiene and food storage

Table 4. Practical Skills Observation Checklist

Assessment Aspect	Indicator
Ingredient selection	Appropriate local food ingredients
Personal hygiene	Hand washing before preparation
Cooking technique	Correct preparation methods
Food texture	Appropriate for child's age
Nutritional balance	Balanced composition of food groups
Portion size	Appropriate serving size
Food presentation	Attractive and acceptable presentation
Food safety	Safe food handling and storage

Equipment cleanliness	Clean utensils during preparation
Serving practice	Proper serving procedures

Prior to the main study, the questionnaire and observation checklist were pilot-tested on 30 respondents with characteristics similar to the target population. These pilot participants were not included in the final study sample. Instrument validity was assessed using the Pearson Product Moment correlation, while reliability was evaluated using Cronbach's Alpha. All questionnaire items satisfied the validity criterion ($r\text{-count} > r\text{-table} = 0.361$). The knowledge questionnaire achieved a Cronbach's Alpha coefficient of 0.761, whereas the observation checklist achieved 0.845, indicating satisfactory internal consistency (**Table 5**).

Table 5. Validity and Reliability of the Research Instruments

Instrument	Number of Items	Validity Test	Cronbach's Alpha	Interpretation
Knowledge questionnaire	20	Pearson Product Moment	0.761	Reliable
Practical skills checklist	10	Pearson Product Moment	0.845	Highly reliable

Data Analysis

Descriptive statistics were used to summarize respondent characteristics and changes in knowledge and practical skills before and after the intervention (Table 6). Continuous variables were presented as means and standard deviations, while categorical variables were reported as frequencies and percentages. The normality of the data distribution was assessed using the Shapiro-Wilk test. Variables with normal distributions were analyzed using the paired-sample *t*-test, whereas the Wilcoxon signed-rank test was used for non-normally distributed variables. Statistical significance was established at $p < 0.05$. All statistical analyses were performed using IBM SPSS Statistics.

Table 6. Summary of Statistical Analysis

Variable	Data Type	Descriptive Statistics	Inferential Statistics
Knowledge score	Continuous	Mean $\pm$ SD	Shapiro-Wilk, Paired <i>t</i> -test/Wilcoxon
Practical skills score	Continuous	Mean $\pm$ SD	Shapiro-Wilk, Paired <i>t</i> -test/Wilcoxon
Knowledge category	Categorical	Frequency (%)	Descriptive
Skills category	Categorical	Frequency (%)	Descriptive

3. Results and Discussion

The intervention was implemented through a collaboration between UIN Suska Riau, the local Health Office, and the Tualang Community Health Center. The program focused on nutrition education and practical training on complementary feeding (MP-ASI) using locally available food sources such as patin and snakehead fish. The intervention aimed to improve participants' knowledge and skills related to stunting prevention, balanced nutrition, and safe food preparation practices.

A total of 40 respondents participated in both the pre-test and post-test assessments. The mean knowledge score increased from 65.35 before the intervention to

80.71 after the intervention, indicating an improvement in participants' understanding of complementary feeding and stunting prevention.

Table 7. Changes in Knowledge Scores Before and After the Intervention

Variable	n	Pre-test (Mean $\pm$ SD)	Post-test (Mean $\pm$ SD)	Mean Difference	Statistical Test	p-value
Knowledge Score	40	65.35 $\pm$ 8.62	80.71 $\pm$ 7.54	15.36	Paired Sample t-test	<0.001

Table 7 shows that the mean knowledge score increased from 65.35 $\pm$ 8.62 before the intervention to 80.71 $\pm$ 7.54 after the intervention, representing a mean increase of 15.36 points. A paired sample t-test demonstrated that this improvement was statistically significant ($p < 0.001$), indicating that the community empowerment intervention effectively improved participants' knowledge regarding local food-based complementary feeding for stunting prevention. This finding is consistent with previous studies showing that structured education can improve the knowledge of Posyandu cadres regarding stunting prevention and child nutrition [24],[25].

Distribution of Participants' Knowledge Categories

To provide a clearer description of changes in participants' knowledge levels, the knowledge scores were further classified into three categories: good, moderate, and poor. The distribution of respondents before and after the intervention is shown in **Table 8**.

Table 8. Distribution of Knowledge Categories Before and After the Intervention

Knowledge Category	Pre-test n (%)	Post-test n (%)
Good	12 (30.0%)	35 (87.5%)
Moderate	20 (50.0%)	5 (12.5%)
Poor	8 (20.0%)	0 (0.0%)
Total	40 (100%)	40 (100%)

The results demonstrate a substantial improvement in participants' knowledge categories following the intervention. Before the intervention, only 30.0% of participants were categorized as having good knowledge, whereas after the intervention this proportion increased to 87.5%. Conversely, the proportion of participants with poor knowledge decreased from 20.0% to 0.0%, indicating that the educational activities successfully improved participants' understanding of appropriate complementary feeding practices for stunting prevention. This finding is comparable with the study by Rachmah et al., which demonstrated that participatory nutrition education combined with hands-on activities, including cooking demonstrations, was effective in improving nutrition knowledge related to complementary feeding among cadres and non-cadres [26].

Changes in Participants' Practical Skills.

In addition to knowledge improvement, participants' practical skills in preparing locally based complementary feeding (MP-ASI) were also evaluated before and after the intervention. Practical skills were assessed using an observation checklist during the cooking practice sessions. The comparison of practical skill scores is presented in **Table 9**.

Table 9. Changes in Practical Skills Before and After the Intervention

Variable	n	Pre-test (Mean $\pm$ SD)	Post-test (Mean $\pm$ SD)	Mean Difference	Statistical Test	p-value
Practical Skills	40	58.20 $\pm$ 9.35	83.45 $\pm$ 6.72	25.25	Paired Sample t- test	<0.001

The mean practical skill score increased from 58.20 $\pm$ 9.35 before the intervention to 83.45 $\pm$ 6.72 after the intervention, with an average improvement of 25.25 points. Statistical analysis using the paired-sample *t*-test demonstrated that the improvement was statistically significant ($p < 0.001$). These findings indicate that the combination of nutrition education, cooking demonstrations, and supervised practice effectively enhanced participants' practical competence in preparing nutritious complementary foods using locally available ingredients.

The greatest improvements were observed in ingredient selection, hygienic food preparation, adjustment of food texture according to children's developmental stages, and balanced menu composition. These improvements suggest that hands-on practice enabled participants to apply the nutritional concepts introduced during the educational sessions more effectively than through theoretical instruction alone. This result is supported by Teng kawan et al., who found that education combined with practical demonstrations of complementary feeding produced better improvements in healthy complementary feeding practices than education alone [27]. Similar findings were reported by Indarwati et al., who observed improvements in both cadre knowledge and practical food-preparation skills following a community empowerment program [28].

The findings of this study demonstrated that the community empowerment intervention was associated with significant improvements in the knowledge and practical skills of Posyandu cadres and mothers regarding locally based complementary feeding (MP-ASI). The significant increase in knowledge and practical skills after the intervention indicates that nutrition education combined with cooking demonstrations and supervised practice may be a useful approach for strengthening caregivers' capacity to provide appropriate complementary feeding for children. These findings are consistent with previous studies reporting that community-based nutrition education can improve caregivers' understanding and complementary feeding. These findings are also consistent with Siswati et al., who reported significant improvements in Posyandu cadres' knowledge following a structured short-course intervention, including knowledge related to infant and young child feeding [25].

The improvement in participants' knowledge may be explained by the participatory educational approach applied throughout the intervention. Unlike conventional lecture-based education, participants were actively involved in discussions, demonstrations, and practical activities that encouraged them to apply nutritional concepts directly to real-life situations. Active participation allows learners to better understand and retain information because they are directly engaged in the learning process. The combination of educational materials with practical demonstrations therefore enabled participants to develop a better understanding of balanced nutrition, stunting prevention, and the preparation of appropriate complementary foods. This interpretation is supported by Rachmah et al., who specifically emphasized the value of participatory nutrition education combined with hands-on activities in improving complementary feeding-related knowledge [26]

Practical skills also improved substantially following the intervention. This improvement was likely influenced by the opportunity for participants to observe cooking demonstrations and immediately practice preparing complementary foods under facilitator supervision. Through repeated practice and direct feedback, participants became more confident in selecting appropriate ingredients, maintaining food hygiene, adjusting food texture according to children's developmental stages, and preparing balanced menus. These findings support previous reports that practical learning activities are more effective than theoretical education alone in improving caregivers' food preparation skills and encouraging positive behavioral change. Tengkwawan et al. similarly reported that combining education with complementary feeding demonstrations was more effective for promoting healthy complementary feeding practices than education alone [27]. In addition, recent evidence from Indonesia indicates that demonstration-based approaches can improve maternal knowledge and practices related to complementary feeding [29].

Compared with previous community nutrition education programs, the present study demonstrated a meaningful improvement in participants' knowledge and practical skills. Although similar interventions have reported positive outcomes, the relatively greater improvement observed in this study may be related to the integration of participatory learning, cooking demonstrations, and independent practice. This combination allowed participants not only to acquire nutritional knowledge but also to immediately apply that knowledge during food preparation, thereby strengthening both cognitive understanding and practical competence. Interestingly, not all nutrition education interventions produce statistically significant improvements. Willmart et al. reported that interactive presentations and educational videos increased Posyandu cadres' knowledge only slightly and the change was not statistically significant [30]. This difference suggests that the inclusion of simulation, cooking practice, and direct participant engagement in the present intervention may have contributed to the stronger improvement observed in both knowledge and practical skills.

One important strength of this intervention was the utilization of locally available food resources, particularly patin and snakehead fish, as the main ingredients for complementary feeding. These locally available foods are rich in protein and essential nutrients that support children's growth and development while remaining affordable and easily accessible to families. The use of locally available food resources is also consistent with recent community-based stunting prevention programs that emphasize optimizing local food resources and strengthening the capacity of Posyandu cadres [28]. The use of local food resources therefore increases the feasibility and sustainability of complementary feeding practices within the community.

In addition, the intervention contributes to improving health literacy and nutrition literacy among caregivers by encouraging informed decision-making regarding child nutrition, safe food preparation, and appropriate complementary feeding practices. Good health literacy enables caregivers to understand and apply nutrition-related information in daily decision-making [20],[21]. The present findings suggest that participatory and practice-oriented education may provide a more concrete learning experience by linking nutrition information directly to food preparation and feeding practices.

Several limitations should be acknowledged. This study employed a one-group pretest-posttest design without a comparison group; therefore, the observed improvements cannot be attributed solely to the intervention. Furthermore, the use of purposive sampling and a relatively small sample limits the generalizability of the

findings. Since the outcomes were measured immediately after the intervention, the long-term sustainability of improvements in knowledge, practical skills, and complementary feeding practices could not be determined. Future studies involving larger samples, comparison groups, and longer follow-up periods are recommended to provide stronger evidence regarding the effectiveness of community-based complementary feeding interventions.

4. Conclusion

This study demonstrated that the community empowerment intervention was associated with significant improvements in the knowledge and practical skills of Posyandu cadres and mothers regarding locally based complementary feeding (MP-ASI). The combination of nutrition education, cooking demonstrations, and supervised practice may be a useful approach for strengthening caregivers' capacity to prepare appropriate complementary foods using locally available ingredients. However, because this study employed a one-group pretest-posttest design without measuring children's nutritional outcomes, the findings should be interpreted as evidence of short-term improvements in knowledge and skills rather than direct evidence of stunting reduction. Further studies with larger samples, comparison groups, and longer follow-up periods are recommended to evaluate the long-term effectiveness of this intervention.

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Conflict of Interest:

The authors declare no conflict of interest.

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