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FEASIBILITY AND PRELIMINARY RESULTS OF A COMMUNITY-BASED NUTRITION CLINIC FOR MALNOURISHED CHILDREN IN A STUNTING LOCUS AREA OF WEST JAKARTA, INDONESIA

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ABSTRACT

Toddlers are highly vulnerable to undernutrition due to their rapid growth and nutrient requirements. The high prevalence of toddler undernutrition is not limited to rural areas. Duri Kepa, a sub-district in West Jakarta, is an urban area with a high prevalence of malnutrition (23%) and has been designated a stunting locus. A supplementary feeding program for undernourished children has been implemented, but the food provided is not high in calories and protein. Nutrition education has been part of the monthly health program but has not been implemented using structured counseling instruments. Community-based nutrition clinics, in addition to providing high-calorie and protein foods, provide education using a nutrition smart book and standard child development stimulation guidelines, and counseling using a structured counseling form. This study aims to examine the feasibility and preliminary results of community-based nutrition interventions in stunting-prone areas. This study employed a mixed-methods, explanatory sequential design from May to October 2025. The quantitative phase employed a one-group pretest-posttest design to evaluate the preliminary results. The qualitative phase was conducted to explore the feasibility through Focus Group Discussions (FGDs). The study sample comprised 52 toddlers aged 1–5 years with acute or chronic undernutrition. Baseline assessments included weight and height measurements using a digital scale and stadiometer. Maternal nutrition knowledge was assessed using a structured questionnaire, and child development was assessed using the Preschool Developmental Questionnaire (PDQ). Continuous and categorical data were analyzed using paired t-tests and McNemar's test. Qualitative data were analyzed using content analysis. After 30 days of intervention (n=52), there was a significant increase in body weight (10.69±1.8 to 11.03±1.7 kg; p=0.0001; d=0.19), height (84.48±7.4 to 86.08±7.1 cm; p=0.0001; d=0.22), development (7.27±1.9 to 8.38±1.9; p=0.0001; d=0.58), and knowledge (56.42±20.4 to 63.9±22.7; p=0.010; d=0.35) score. The WHZ index had a significant change (-1.27±1.3 to -0.96±1.1; p=0.0001; d=0.26), while changes in WAZ (-2.04±0.9 to -1.91±0.9; p=0.087; d=0.15) and HAZ (-2.08±1.3 to -2.09±1.0; p=0.889; d=0.02) were not significant. The prevalence of wasting decreased from 35% to 15% (p=0.010; g=0.19), low knowledge from 48% to 33% (p=0.021; g=0.15), and developmental delay from 69% to 40% (p=0.001; g=0.29), while underweight (58% to 42%; p=0.180; g=0.10) and stunting (73% to 62%; p=0.100; g=0.16) did not show significant differences. This intervention demonstrated adequate feasibility with a retention rate of 98.1% and a consumption compliance rate of 79%. The findings of this study must be interpreted with caution due to limitations in determining causal implications.

Key words: intervention, stunting, underweight, wasting, sustainability, evaluation, program, implementation

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INTRODUCTION

Toddlers represent a population highly vulnerable to nutritional problems due to their rapid growth and substantial energy and nutrient requirements. According to the Indonesian Nutrition Status Study [1], the national prevalence of stunting was reported at 21.6%, with several regions still exceeding the national average. Nutritional problems among toddlers not only impair physical growth but also hinder cognitive, motor, and immune system development [2].

Regions with a high prevalence of stunting typically face multifactorial challenges [3]. Limited access to nutritious foods and the lack of nutrition education and counseling further increase the risk of energy and protein deficiencies among toddlers [4]. Nutrition education and counseling have been proven effective in enhancing mothers' or respondents' knowledge, attitudes, and feeding practices. However, education alone is often insufficient if not complemented by direct food-based interventions. Providing meals with moderate energy density and high protein content represents one potential strategy to improve nutritional status within a relatively short period, particularly among children at risk of stunting or wasting [5]. Food-based nutrition interventions are also aligned with WHO recommendations to improve toddlers' dietary quality [6]. Most toddlers experiencing undernutrition also exhibit developmental delays in gross motor, fine motor, language, and/or social skills [7].

The high prevalence of toddler malnutrition is not limited to rural areas but also occurs in urban areas. Duri Kepa, a sub-district in West Jakarta, is an urban area with a high prevalence of malnutrition (23%) and has been designated as a stunting locus by the local government. In addition to growth disorders, the majority of toddlers with malnutrition also exhibit developmental delays, indicating the need for interventions that focus not only on nutritional status but also on stimulating child development.

Although supplementary feeding programs for toddlers with malnutrition have been implemented, the interventions generally have not been designed with sufficient energy density and protein to optimally catch up on growth delays. Furthermore, while nutrition education has been included in monthly health service activities, its implementation remains general and lacks structured counseling tools, resulting in less-than-optimal impact on changing parenting behaviors and feeding practices.

Thus, there is a gap in the integration and delivery mechanisms of nutrition services at the community level, particularly in combining adequate food-based interventions with systematic and standardized education and counseling. The community-based nutrition clinic model developed in this study is designed to address this gap by providing high-calorie and protein foods, education using a nutrition smart book,

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counseling using structured forms, and education on child development stimulation [8–12] based on standard guidelines. This integrated approach is expected to have a more comprehensive impact on improving the nutritional status and development of toddlers compared to current routine practices.

This integrated approach is expected not only to enhance dietary intake and nutritional status but also to foster sustainable healthy eating behaviors and appropriate parenting practices among families in stunting-prone areas. Ultimately, such interventions may contribute to the long-term prevention of nutritional deficiencies and developmental delays [13,14]. Therefore, this study aims to examine the feasibility and preliminary results of community-based nutrition interventions for toddlers in the stunting locus. The selected stunting locus is one of the areas where stunting has become a prevalent concern. The term "locus" refers to a specific geographical location or region having a greater rate of stunting in its population [15,16].

METHODS

Study Design and Location

This study employed a mixed-methods, explanatory sequential design. The quantitative phase employed a one-group pretest-posttest design to evaluate the preliminary results on the nutritional status and development of toddlers. Following the completion of this phase, a qualitative phase was conducted to further explore the feasibility through Focus Group Discussions (FGDs). The integration of these two data sets was carried out through triangulation to explain the quantitative results and identify barriers and enablers to the program implementation in the field.

This study was carried out in the Duri Kepa Sub-district, a stunting locus, from May to October 2025. Duri Kepa is located in West Jakarta, Indonesia's capital city. The intervention was administered for 30 days. Baseline measurements were taken on day 0, immediately before the intervention began. Post-test measurements were taken on day 31, after participants completed the full 30-day intervention.

Sample Selection

In the quantitative phase, this study used a purposive sampling method to ensure that the selected subjects met the targeted criteria. The study sample was toddlers aged 1–5 years who experienced acute or chronic undernutrition. The respondents were mothers of these toddlers who had previously participated in a community-based nutrition intervention program conducted from June to August 2025. All samples underwent initial nutritional status assessments as part of the preliminary screening process.

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Eligible samples and respondents were toddlers aged 1–5 years presenting with at least one of three nutritional problems—underweight, wasting, or stunting—defined by weight-for-age, weight-for-height, or height-for-age z-scores below the normal range (<-2SD) according to WHO growth standards [17]. Anthropometric measurements, including body weight and height, were conducted by six trained nutritionists using standardized equipment [18]. Toddlers with severe infectious diseases were excluded. To minimize bias from confounding variables, toddlers who were the target of nutritional intervention programs from external parties, such as community health centers, were excluded. The final inclusion criterion was the respondent's willingness to participate in the entire intervention process. All study procedures were approved by the Research Ethics Committee of Esa Unggul University with reference number 0925-07.155/DPKE-KEP/FINAL-EA/UEU/VII/2025.

All respondents were explained the research objectives and procedures and provided written informed consent before data collection began. To ensure confidentiality, all identifying data was disguised using an anonymizer. Regarding intervention photo documentation, data protection procedures included facial blurring and storing all digital data in an encrypted folder on Google Drive, accessible only to the primary research team.

Sample selection was conducted through a screening process to ensure the accuracy of intervention targets. Initial identification was conducted using secondary data from routine records at the Community Health Center (Puskesmas), which identified 85 toddlers with undernutrition out of a total population of 303 toddlers in the Duri Kepa. After applying exclusion criteria (14 toddlers aged <12 months and 2 toddlers participating in other nutrition programs), 69 toddlers qualified for the next stage. Researchers then conducted independent screening through direct measurements (primary data) on these 69 toddlers to verify their current nutritional status. The field screening results identified 53 toddlers who objectively met the criteria as a sample. During the 30-day intervention period, one toddler moved, resulting in a final sample size of 52 toddlers. This recruitment process is presented in a Flowchart (Figure 1).

Informants for the qualitative phase were selected using a convenience sampling technique, where participants were selected based on their availability and willingness to participate after the quantitative intervention phase was completed. Qualitative data collection employed the principle of thematic saturation, meaning data collection was stopped when no new information or additional themes emerged from the discussions. The informant group consisted of six community health cadres and three representatives of mothers of toddlers who participated in Focus Group Discussions (FGDs). The primary inclusion criterion for informants was direct

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involvement in program implementation or as beneficiaries during the 30-day intervention period, to ensure the data obtained represented the real experiences.

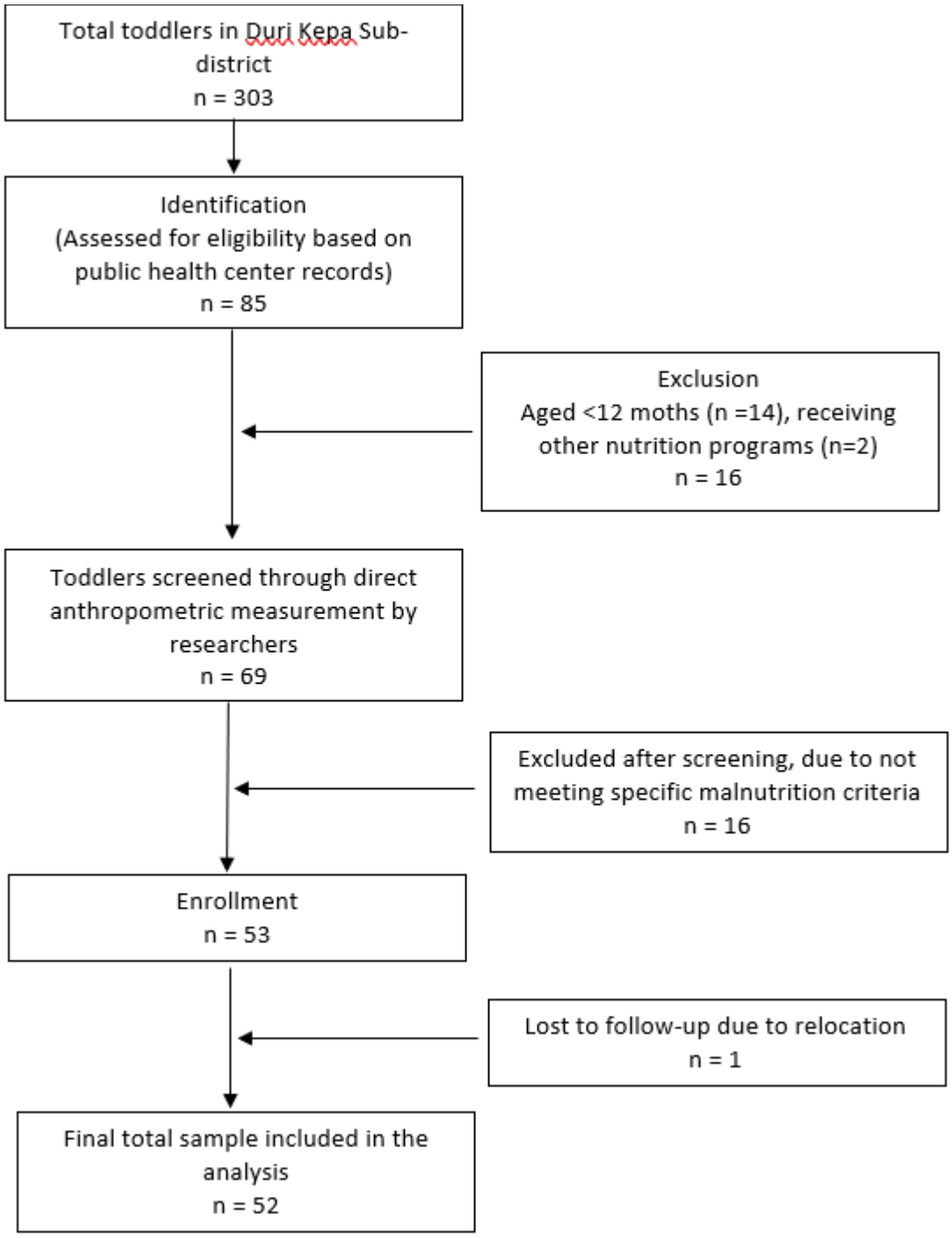


Figure 1: Flow diagram of sample recruitment process

Investigation Team

Given the multidisciplinary nature of this intervention, the investigation team consisted of professionals from various fields, including nutrition, physiotherapy, and

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public health. A pediatrician specializing in child growth and development reviewed and approved all educational materials, nutrition counseling content, developmental stimulation modules, and the instruments used to assess growth, development, dietary intake, and parenting practices.

Measurement of Sample Characteristics

Before the intervention, respondents completed a demographic questionnaire covering sample and family characteristics such as the child's gender, date of birth, birth history, birth weight and length, current health condition, parental age, occupation, and education, as well as parity and the child's medical history over the past month.

To ensure data accuracy, all anthropometric measurements were conducted following the WHO standard protocols. Weight was measured using a digital scale with an accuracy of 0.1 kg, while height was measured using a stadiometer or length board with an accuracy of 0.1 cm. Inter-rater reliability was ensured through joint training for the data collection team before the study. Additionally, duplicate measurements were performed on each sample, with the average of the two measurements recorded as the final data to minimize technical variation.

Maternal nutrition knowledge was evaluated using a structured questionnaire. Validity test results showed that all items had a significant total correlation ($r>0.361$; $p<0.05$), with a Cronbach's Alpha reliability coefficient of 0.85. Child development was assessed using the Prescreening Developmental Questionnaire (PDQ), which is a version of an international screening instrument that has been officially adapted and culturally validated by the Ministry of Health of the Republic of Indonesia for national use in primary health care facilities [19].

Description of the Community-Based Nutrition Clinic

The term *community-based* refers to the implementation of nutrition interventions by trained community health cadres who work directly with mothers of toddlers experiencing nutritional problems. Prior to the intervention, cadres received training in nutrition knowledge and counseling skills. An overview of the Community-Based Nutrition Clinic is presented in Figure 2.

The program began in mid-July 2025 with an online education session for cadres using the Smart Nutrition Book, lasting approximately three hours. The book contained educational materials on both specific and sensitive risk factors associated with stunting and underweight in toddlers from stunting-prone areas (Table 1). These materials were developed based on risk factor studies conducted in the previous year.

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Subsequently, cadres participated in a two-hour in-person session on Toddler Development Stimulation, delivered by a pediatrician specializing in child growth and development. They also received three hours of in-person Nutrition Counseling Training.

After completing the cadre training phase, cadres conducted a two-hour education session for respondents at local health centers at the end of July 2025, using the Smart Nutrition Book as a guide. The topics covered were summarized in Table 1. During the session, respondents were also introduced to appropriate developmental stimulation techniques based on the child's age [20]. Each respondent received the Smart Nutrition Book and A Developmental Stimulation Guide. Video links demonstrating examples of nutritious toddler menus were provided to help respondents implement the lessons at home. Educational activities were supervised by the principal investigator. Participant attendance was recorded using an attendance register, and material delivery was monitored using a curriculum checklist to ensure all educational points were conveyed according to protocol.

In early August 2025, the intervention continued with the provision of high-protein meals for 30 consecutive days. The menus were developed by nutritionists with expertise in culinary nutrition and designed to have moderate energy density (approximately 1.4 kcal/g) and high protein adequacy. For children aged 1–3 years, average protein adequacy reached 97%, while for those aged 4–5 years, it reached 77%. Menus were distributed daily by cadres directly to respondents' homes.

A disparity in protein adequacy levels was found between the 1-3 year age group (97%) and the 4-5 year age group (77%). This is a logical consequence of the implementation of a uniform menu. Children's daily nutritional needs increase with age, the same volume and density of nutrients will result in a lower adequacy percentage in older children. Although adequacy in the 4-5 year age group was lower, the menu was still designed to provide a significant protein contribution to their total daily needs compared to menu patterns in other nutrition programs in the study area. This intervention implemented menu standardization by using uniform menu types and cycles for all toddlers (1-5 years old). This approach was chosen to ensure consistent quality of the nutrients provided and facilitate monitoring of distribution by cadres in the field.

Table 2 presents the average energy density (≥1.4 kcal/g) and protein adequacy (>90% on most days) of the menus provided for each age group. The 30-day, seven-day-cycle menu intervention is a potential adaptation of the high-calorie, high-protein (HCHP) menu models discussed in the pediatric nutrition literature [21]. This menu pattern emphasizes a balance of menu variety, affordability, and macronutrient adequacy to support improvements in children's nutritional status.

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To monitor menu consumption, mothers were asked to record daily food waste on a provided food waste form. The form contained a food waste question with answer options including not eaten (score 0), half left (score 1), a little left (score 2), and no left (score 3). The average food waste score for each child was calculated by dividing each child's total score by the number of days provided (30 days). The average daily food waste score indicated the level of acceptance. In addition, for visual validation purposes, respondents were instructed to submit daily photos of their child's meal consumption via a provided Google Form link. Researchers compared the mothers' food waste reports with photographs of plates after meals to minimize self-reporting bias.

During the first week of August 2025, cadres conducted home-visit nutrition counseling sessions lasting approximately 15–40 minutes, using a standardized counseling script. The counseling script was developed by adapting the World Health Organization (WHO) counseling form for children under five years of age [22–24]. Counseling scripts included breastfeeding practices, complementary feeding, food preparation, 24-hour dietary recall, meal and snack frequency, portion sizes, responsive feeding, and feeding during illness. Discussions also addressed household use of iodized salt [25]—covering the type of salt used, storage methods, and use in cooking (Table 1).

To ensure the quality and consistency of counseling, all cadres underwent standardized training on counseling materials before the intervention began. During home visits, cadres were required to complete each section of the counseling form. Completed forms were then periodically verified by field supervisors to ensure all counseling topics were addressed to parents. In addition, weekly evaluations were conducted between the research team and the cadres. In these evaluations, each cadre reported on their progress and any challenges encountered in the field, and a joint review of counseling activities was conducted to ensure their appropriateness and quality.

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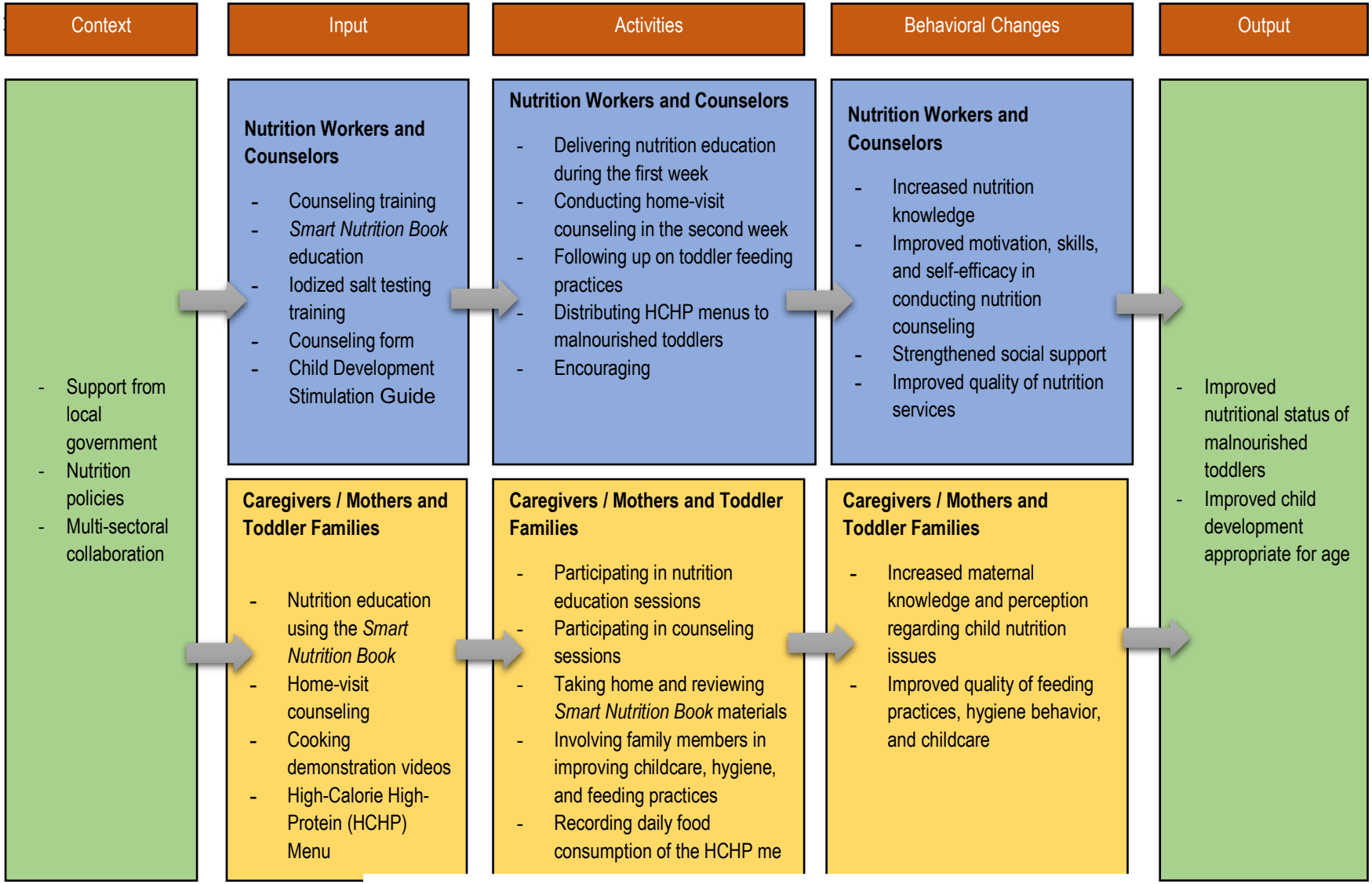


Figure 2: Description of the Community-based Nutrition Clinic

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Preliminary and Feasibility Measurement and Analysis

Quantitative Study

In the quantitative phase, the preliminary results of the intervention were assessed through indicators of change in children's weight, height, nutritional status, and developmental outcomes. The results of the Child Development Pre-Screening Questionnaire were scores ranging from 1 to 10. A higher score indicates a child's development is more in line with normal developmental milestones for their age. A developmental score of 1-6 indicates a developmental deviation, a score of 7-8 indicates questionable developmental status (doubtful), and a score of 9-10 indicates developmental status that is in line with normal developmental milestones for the children's age (appropriate) [26]. Changes in respondents' nutrition knowledge were also evaluated. Post-intervention assessments were conducted 30 days after the nutrition intervention using the instruments previously described in the section on respondent characteristic measurements.

The questionnaire assessing satisfaction with the overall nutrition intervention comprised seven items covering perceptions of the Smart Nutrition Book education sessions, nutrition counseling, and provision of high-protein menus for 30 days. Each question offered five response options: *strongly agree* (score 5), *agree* (score 4), *unsure* (score 3), *disagree* (score 2), and *strongly disagree* (score 1).

Only samples and respondents with complete data were included in the final analysis. Questionnaires were checked for completeness immediately; if any answers were incomplete, the researcher asked respondents to complete them on the spot to prevent missing data.

Qualitative Study

For the qualitative phase, the feasibility of the intervention was explored through Focus Group Discussions (FGDs), which were conducted with six community health cadres and three representatives of respondents. Although the number of mother representatives in was limited to three people, the adequacy of the sample was based on source triangulation involving six health cadres.

The semi-structured interview guide covered feasibility indicators such as acceptability, implementation, affordability, resource availability, and sustainability, comprising a total of nine questions for cadres and eight for respondents. Data from the focus group discussions (FGDs) was recorded with the participants' consent and transcribed verbatim. Data analysis was conducted using a content analysis approach. The primary researcher conducted the coding process by repeatedly reading all transcripts to understand the context and identify categories relevant to the intervention feasibility indicator framework: acceptability, implementation, affordability, resource availability, and sustainability. This framework served as the

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initial categories (deductive). However, during the coding process, new relevant categories not fully covered by the initial framework were identified and included in the analysis (inductive).

To enhance the credibility of the analysis, the coding and category grouping results were discussed with a senior researcher experienced in qualitative research until a consensus was reached on data interpretation. Source triangulation was conducted by comparing findings across informant groups (respondents and cadres) to ensure consistency of information. Data collection continued until information saturation was reached, when additional interviews no longer yielded new relevant categories.

Statistical Analysis

Quantitative Analysis

Quantitative analyses were performed using IBM SPSS Statistics. A two-tailed significance level of $\alpha = 0.05$ was applied. Child nutritional status was determined based on the WHO z-score, which includes Weight-for-Height (WHZ) for wasting, Height-for-Age (HAZ) for stunting, and Weight-for-Age (WAZ) for underweight. The z-score calculation was performed using the WHO Anthro Survey Analyser software (version 3.2.2).

The Shapiro-Wilk test for normality showed that the numerical data were normally distributed ($p>0.05$). Outliers were checked using boxplot analysis, and no extreme values were found to affect the results. Changes in weight, height, nutritional status, developmental outcomes, and respondents' knowledge before and after the intervention were analyzed using a paired t-test. McNemar's test was applied for categorical variables [27,28]. For the analysis of respondents' responses or satisfaction with the nutrition intervention, the proportions of respondents who selected *agree* or strongly agree for each item were combined and presented as percentages. A summary of satisfaction responses is presented in Table 6.

Qualitative Analysis

Qualitative data were analyzed using content analysis [29], which involved the following steps: verbatim transcription of FGDs, coding according to the main themes (acceptability, implementation, affordability, resources, and sustainability), categorization of responses from each informant group (respondents and cadres), and extraction of overarching themes to identify supporting and constraining factors from each perspective. The qualitative findings were used to complement and strengthen the quantitative results [30], thereby providing a more comprehensive understanding of the feasibility of the community-based nutrition intervention.

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RESULTS AND DISCUSSION

Sample characteristics

The study included 52 toddlers aged 12–59 months, consisting of 29 boys (56%) and 23 girls (44%), with the majority (77%) aged 24–59 months. Anthropometric assessments indicated a high prevalence of stunting, with 73% of respondents classified as stunted. The distribution of nutritional conditions showed that approximately 53% were stunted and underweight, 18% were stunted and wasted, and 29% were stunted only. Developmental assessments revealed that 35% of toddlers were classified as developmental delay, and 35% as questionable, indicating that only about 30% reached age-appropriate developmental milestones (Table 3).

The high proportion of stunting (73%) observed in this sample reflects the persistent issue of stunting, which remains a major public health concern in many lower-middle-income countries, including Indonesia. Prior studies have identified multiple determinants of stunting—such as household socioeconomic status, sanitation, feeding practices, recurrent infections, and access to quality health and nutrition services—highlighting the multifactorial nature of this condition [31]. Although national trends show a gradual decline in stunting prevalence, the absolute numbers remain substantial, indicating ongoing vulnerability at the community level.

The finding that only 30% of children reached age-appropriate developmental milestones is consistent with previous research reporting a link between chronic malnutrition and developmental delays. Deficiencies in key micronutrients—particularly iodine and iron, which are essential for neurodevelopment [32–34]—further justify the inclusion of developmental stimulation, household dietary improvement, and micronutrient supplementation within nutrition interventions.

Post-Intervention Changes

The results presented in Figure 3 indicate descriptive changes across several indicators of child nutrition and development following the intervention. Prior to the intervention, the major issues identified were low maternal knowledge (48%), developmental delays (69%), wasting (35%), stunting (73%), and underweight (58%). After the intervention, modest reductions were observed in some indicators: the proportion of respondents with poor knowledge decreased to 33%, developmental delays to 40%, wasting to 15%, stunting to 62%, and underweight to 42%.

Enhanced maternal nutrition literacy, including improved knowledge and feeding practices, has been shown to positively influence children's nutritional status and developmental outcomes [35]. Similarly, integrated early stimulation and parenting interventions can significantly improve child development [9].

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After 30 days of nutritional intervention among 52 respondents, modest changes were observed across in several indicators. The average body weight increased from 10.69±1.8 kg to 11.03±1.7 kg (p=0.000; d=0.19), indicating a statistically significant but small effect. Height also increased significantly (p=0.000; d=0.22) with a small effect size.

This 30-day intervention resulted in statistically significant increases in weight and height, albeit with small effect sizes. Clinically, the average weight gain of 0.34 kg and average height gain of 1.6 cm in one month in undernutrition toddlers is an important finding, considering that catch-up growth in children with malnutrition requires a longer intervention period to achieve a large effect size.

Although there was a statistically significant increase in height after 30 days of intervention, linear growth in such a relatively short period is biologically limited. This is reflected in the lack of significant changes in the Height-for-Age Z-score (HAZ). Therefore, short-term absolute height gains do not necessarily reflect clinically significant improvements in linear growth status. Therefore, these results should be interpreted as a short-term response, while evaluating the impact on stunting status requires a longer observation period.

Child development scores increased from 7.27±1.9 to 8.38±1.9 (p=0.000; d=0.58), representing a moderate effect. However, given the short duration of the intervention, this increase should be interpreted cautiously. Maternal knowledge scores also increased significantly (p=0.010; d=0.35), showing a small-to-moderate effect (Table 4).

In this study, the 30-day intervention among 52 toddlers demonstrated significant changes, particularly in body weight (d=0.19; p<0.001). It indicates positive, albeit small, effects. Although height also increased significantly (d=0.22; p<0.001), the change in HAZ was not statistically significant. The clinical implications for linear growth should be interpreted with caution. These results align with meta-analytic evidence suggesting that short-term (<6 months) nutrition interventions can yield measurable changes, though sustained physical growth changes typically require longer durations [36].

Relatively larger changes were observed in developmental scores (d=0.58; p<0.001) and maternal knowledge (d=0.35; p=0.010). The moderate effect on child development may suggest that the program's educational and stimulation components had a potential influence. This finding appears consistent with previous research in Indonesia, where integrated nutrition education and child stimulation interventions are associated with improvements in both cognitive and anthropometric outcomes [37].

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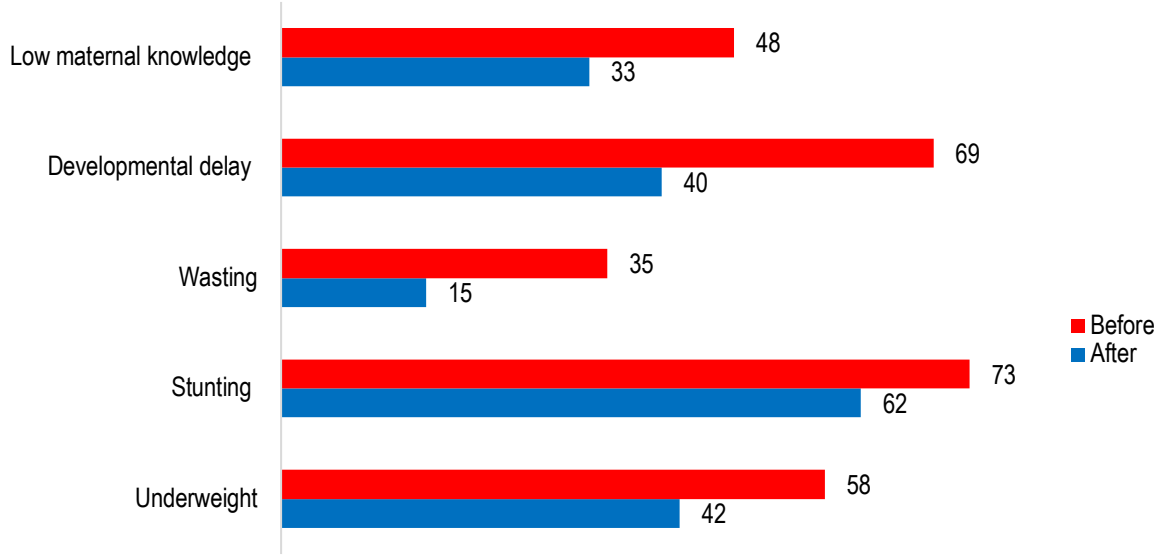


Figure 3: Growth and Development Problems of Toddlers and Maternal Knowledge Before and After the Intervention (%). *Low maternal knowledge: <60% correct answers (Bloom's cut-off point)*

In terms of nutritional status based on z-scores, a statistically significant change was observed in weight-for-height (p=0.000; d=0.26) with small effect sizes, whereas height-for-age (p=0.889; d=0.02) and weight-for-age (p=0.087; d=0.15) did not show significant change. Although this result showed a modest change in the acute nutritional indicator (weight-for-height), the height-for-age z-score (HAZ) did not show significant changes. This is understandable considering the intervention duration was only 30 days. Changes in height, as an indicator of chronic nutrition, require a longer period of exposure to nutritional interventions to show a meaningful shift in the z-score growth curve. However, recovery from acute malnutrition (wasting) and increased protein intake are crucial prerequisites for long-term improvements in linear/stunting indicators.

The proportion of respondents with insufficient knowledge declined from 48% to 33% (g=0.15; moderate effect). A relatively larger change was found in child development, where the proportion of children not developmentally appropriate decreased from 69% to 40% (g=0.29) (Table 4). Although this change suggests a positive shift, these findings should be interpreted cautiously, given the short duration of the intervention and the study design.

The reduction in wasting prevalence from 35% to 15% (g=0.19; p=0.010) may indicate a positive change in wasting status, although the effect size was small. It may be linked to improved food quality, increased feeding frequency, and enhanced nutrition monitoring, but causal relationships cannot be established. However, there

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were no significant changes in underweight (58% to 42%; g=0.10; p=0.180) and stunting (73% to 62%; g=0.16; p=0.100) prevalence, indicating that chronic undernutrition requires longer-term, sustained interventions. This is consistent with Goudet *et al.* who emphasize that reductions in stunting demand extended, multi-sectoral approaches [38].

The persistent prevalence of stunting underscores the need for integrated strategies that address food security, healthcare access, and environmental sanitation [2]. These findings reinforce that while wasting can respond to short-term interventions, stunting requires broader structural and behavioral changes.

Overall, the 30-day nutrition intervention was associated with several observed changes, particularly in body weight, child development scores, and maternal knowledge, with effect sizes ranging from small to moderate. These findings may suggest that a combined approach integrating nutrition education and developmental stimulation has potential value, although the results should be interpreted cautiously. However, changes in height-related indicators were not observed, which may reflect the longer intervention duration to detect measurable differences in linear growth.

The analysis also suggests that maternal education and caregiving components played a key role in improving outcomes, particularly in maternal knowledge and child development. This supports a nutrition-sensitive intervention model, which combines nutrition-specific strategies (food and supplementation) with behavioral and educational components [39]. Previous research has also demonstrated that the effectiveness of specific nutrition interventions increases when integrated with nutrition-sensitive approaches such as education, water and sanitation improvement, and poverty reduction [40,41].

Compliance rates were analyzed quantitatively. Of the 53 participants who started the intervention, 52 (98.1%) completed the entire 30-day program (retention rate). Only one participant (1.9%) did not complete the program due to a change of residence, not because of refusal to participate in the intervention.

The average level of compliance with daily menu consumption was 79%. Most toddlers (79%) consumed more than half of the intervention meals daily, while 21% consumed less than half on average (Table 5). Twenty-one percent of toddlers consumed less than half of the assigned menu. Theoretically, inadequate nutritional intake in this group (21% consumed less than half a portion) acts as a limiting factor, diluting the overall impact of the intervention. The low compliance of this small proportion of participants explains the small effect sizes on weight and height (d=0.19 and d=0.22, respectively). In the short term (30 days), the biological

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response to growth is highly dependent on achieving a certain protein intake threshold.

Based on responses to a structured satisfaction questionnaire completed by respondents, the intervention was generally perceived positively by respondents. All respondents (100%) stated that the educational messages were easy to understand, the counseling sessions increased their self-confidence, and they were satisfied with the overall intervention and hoped the program would continue. Furthermore, most mothers reported that the intervention menu was well-received by their toddlers (94.3%) and easy to implement in their daily lives (97.1%) (Table 5). Overall, these responses indicated that the nutrition intervention was perceived as relevant and practical by participating families; however, these findings reflect respondents' perceptions and should be interpreted with caution.

In the qualitative phase, focus group discussions (FGDs) were conducted to explore responses from health cadres and respondents to the community-based nutritional intervention. The findings are presented based on five main themes: acceptance, affordability, implementation, resources, and program sustainability.

1. Acceptance

Overall, both cadres and respondents perceived the intervention program as useful and relevant to their needs. As one cadre stated: "*This program is very helpful for mothers and relevant to their needs*". (Cadre 6). Respondents expressed that the menu component was particularly beneficial, as it provided practical examples of diverse, palatable, and easy-to-prepare dishes. The one-dish meal concept was viewed as insightful, offering a new perspective that toddler meals could consist of various side dishes served together on a single plate, making them more appealing to children. As one mother stated: *From the provided menu, I came to know that vegetable, protein, and animal side dishes might be included on a single menu. My child can consume them all as a result".* (Mother 3).

However, several suggestions for improvement emerged. Some respondents recommended that the menus be prepared in a soupier consistency, as certain dishes were perceived as too dry. As one mother said: "*Some menus still require the addition of soup stock or something similar to make them less dry for kids".* (Mother 2). The fish-and-tofu muffin menu was less popular because it was considered bland and had a slight fishy odor. Additionally, several respondents noted the absence of fruit in the menu. As one cadre said: "*The mothers clarify that there is no fruit on the menu, while some, as they typically receive fruit from government programs*" (Cadre 4). Despite these suggestions, most informants agreed that the dishes were tastier and more varied. As one cadre said: "*The menu is different from the usual menu from government programs, and is more varied*" (Cadre 2). The cadres also reported

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observing changes in body weight and height during the intervention period based on the measurements taken during the Integrated Health Post (Posyandu) session.

2. Affordability

Respondents reported that the menu ingredients were easily available within their local environment, making the intervention affordable and feasible for home application. The cost of the menu was also considered reasonable and suitable for the economic conditions of most families with toddlers. As one mother said: "*The ingredients are reasonably priced, and the menu is simple to prepare at home*" (Mother 1). Nevertheless, informants emphasized the need for more intensive recipe dissemination, such as through cooking demonstrations, to ensure that respondents could replicate the dishes independently at home. As one cadre said: *"If there were a cooking demonstration, it would be better".* (Cadre 5).

3. Implementation

In terms of implementation, each nutrition counseling session lasted approximately 20 minutes. According to the cadres, respondents actively participated in the sessions, and the activities were not perceived as burdensome for either group. Nonetheless, some logistical challenges were also reported by participants. These included difficulties in gathering respondents during the Smart Nutrition Book education sessions and limited internet data among respondents, which occasionally hindered communication regarding activity schedules. As one cadre told*: There are one or two mothers who occasionally don't have an online quota, thus there is confusion".* (Cadre 3)

Cadres suggested integrating cooking demonstrations to facilitate a better understanding of menu preparation among respondents. Additional challenges included the afternoon distribution schedule of the menus, which sometimes coincided with children's nap times, as well as lower participation rates among working respondents.

4. Resources

Intervention activities were not perceived as burdensome for cadres, as they were implemented collaboratively in teams rather than individually. As one cadre stated: *"We don't mind because we work in groups and can set our own schedules".* (Cadre 1). However, several cadres emphasized the need to ensure greater menu variety to prevent toddlers from becoming bored with the meals. They also noted that nutrition counseling activities were typically conducted only during *posyandu* sessions or outreach events by community health centers (Puskesmas), often without standardized counseling sheets. Integrating this intervention with *posyandu*

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activities was considered a practical approach for optimizing existing community resources.

5. Sustainability

In terms of program sustainability, both cadres and respondents highlighted the importance of continued sponsor support. In addition to sponsorship, active involvement from Puskesmas, the Family Welfare Empowerment Program (PKK), and the government was considered essential. Cadres also suggested implementing a rotation system to ensure that program benefits are distributed more equitably. As one cadre said: *"We hope that if the program goes on, the target recipients will be switched around so that more kids and families may take advantage of it"* (Cadre 3). Despite potential challenges, such as limited menu variation, scheduling constraints, and reduced participation among working respondents, informants maintained a positive perception of the program.

Overall, the findings of this study suggest that a multi-component nutrition intervention approach that integrates nutrition education, feeding, counseling, and developmental stimulation may be a promising approach, although longer-term evaluations and more robust study designs are needed. This aligns with the Lancet Series on Maternal and Child Nutrition [42], which emphasized that combining nutrition-specific and nutrition-sensitive actions produces greater and more sustainable impacts on child nutrition and development than isolated efforts.

Although the sample size (n=52) is considered limited for broad generalizations, this sample represents the majority of eligible toddlers in the stunting locus area after meeting inclusion criteria. Furthermore, the one-group pretest-posttest design in this study attempted to minimize confounding variables by excluding toddlers participating in other government nutrition programs from the initial sample selection stage. However, the researchers acknowledge that the use of a one-group pretest-posttest design in this study has limitations in controlling for confounding variables such as children's natural growth during the intervention period. Therefore, the observed changes in nutritional status cannot be fully attributed to this intervention alone. Nevertheless, this study still provides a valuable initial insight into the potential benefit of the program in the stunting locus area.

This study had limitations in terms of real-time monitoring of counseling quality. Although cadres were trained and used standardized forms, interpersonal variations in the delivery of educational messages could not be fully controlled or audio/visually recorded. This could potentially lead to differences in how each mother received the information.

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Furthermore, this study showed that despite a positive change in acute malnutrition (wasting), stunting did not show statistically significant changes. This is understandable because stunting is a chronic malnutrition that requires a much longer duration of nutrient exposure than 30 days to show a significant shift in the growth curve. Therefore, the observed decrease in stunting prevalence from 73% to 62% (g=0.16) in one month likely does not represent a stable linear change, but rather an early sign of a nutritional recovery process that still requires continued intervention.

Despite these limitations, the study provides preliminary insight into the development of community-based nutrition intervention models in resource-limited urban settings. The participatory approach—actively involving cadres and families—may have contributed to the observed short-term changes in several nutritional indicators, and may offer useful consideration for the development of strategies aimed at supporting stunting reduction and early childhood development.

For future programs, extending the intervention duration, strengthening maternal education and caregiving components, and establishing referral pathways for malnourished children are strongly recommended. Implementing a monitoring system that incorporates both statistical significance and effect size analysis would further enhance program evaluation and resource allocation efficiency.

CONCLUSION AND RECOMMENDATIONS FOR DEVELOPMENT

The results of this study suggest that community-based nutrition clinic interventions may contribute to improving maternal nutritional knowledge, reducing wasting, and enhancing child development indicators. However, because it used a one-group pretest-posttest design without a control group, the findings of this study must be interpreted with caution due to limitations in determining causal implications. The persistently high prevalence of stunting highlights the need for long-term, sustainable strategies to address chronic malnutrition.

The nutrition intervention was generally well perceived positively by both community health cadres and respondents. Participant reported that the program was beneficial, affordable, and manageable for either group.

Nutrition programs should be implemented over a longer duration (at least six months) and designed for sustainability, emphasizing improvements in parenting practices, maternal nutrition education and counseling, and the integration of child health and nutrition services to achieve more substantial and sustained improvements in nutritional outcomes.

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CONFLICT OF INTEREST

The authors have no conflicts of interest to declare.

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372 **Table 1: Topics of the Smart Nutrition Book and Nutrition Counseling**

Topics of the Smart Nutrition Book
Stunting, Its Risks, and Impacts
Feeding for Children Aged 6–59 Months
Nutrition for children aged 6–24 months
Tips to enrich complementary feeding with nutrients
Tips to meet zinc, iron, and iodine needs
Variety, frequency, and quantity of complementary feeding
Responsive feeding techniques
Feeding during illness and recovery
Clean and Healthy Living Behavior
Parenting tips to prevent stunting
Sanitation tips for a healthy household
Preparing safe complementary foods
Keeping feeding bottles clean
Safety tips for breast milk (expressed milk) handling
Becoming a Mentally Healthy Mother
Topics of Nutrition Counselling
Child Feeding Patterns
Child's breastfeeding history
How food is prepared
Foods consumed by the child previously
Frequency of main and snack meals
Portion size per meal
Responsive feeding practices
Feeding during illness
Practices of Salt Use
Types of iodized and non-iodized salt
Containers, storage, and placement of iodized salt
Use of iodized salt during cooking

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373 **Table 2: Seven-Day Cycle Menu During 30-Day Intervention**

Day	Menu Name	Nutrient Value (per portion)				Energy Density (kcal/g)	Protein Adequacy (%) years		Food Cost (Rp)
		Energy (kcal)	Protein (g)	Fat (g)	Carbo-hydrate (g)		1-3	4-5	
Monday	Rice balls Chicken liver stew with potatoes and carrots Boiled egg and spinach	398	20	17	42	1.9 (high)	100	80	15.000
Tuesday	Meatball "rambutan" Egg *martabak*	372	20	27	21	2.7 (high)	100	80	15.000
Wednesday	Fish tofu muffin Egg noodle omelet	210	19	13	10	1.45 (mid)	95	76	16.000
Thursday	*Nasi uduk (*coconut rice*)* with anchovies Egg rollade *Capcay* (mixed vegetables stir-fry)	315	18	10	35	1.43 (mid)	90	72	18.000
Friday	Chicken tofu dimsum Macaroni omelet	238	18	12	15	1.54 (high)	90	72	18.000
Saturday	*Bitterballen* Rice Carrot omelet	362	20	14	38	1.96 (high)	100	80	13.000
Sunday	Spaghetti with chicken bolognese Chicken cheese egg pizza	375	21	23	24	1.53 (high)	105	84	15.000

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376 **Table 3: Characteristics of Malnourished Toddlers in Duri Kepa Before the**
377 **Intervention (n = 52)**

Characteristics	n (%)
Sex	
Male	29 (56)
Female	23 (44)
Age group (months)	
12-23 months	12 (23)
24-59 months	40 (77)
Nutritional status	
Acute (non-stunting)	14 (27)
Chronic (stunting)	38 (73)
Type of stunting	
Stunting-underweight	20 (53)
Stunting-wasting	7 (18)
Stunting only	11 (29)
Developmental status	
Deviant	18 (35)
Doubtful	18 (35)
Appropriate	16 (30)

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Table 4: Comparison of mean differences and proportions of variables before and after the 30-day intervention (n = 52)

Variable	(Mean ± SD)		Mean Diff. (95% CI) or Percentage Diff.	*p*[a]	Effect size[b]	Interpretation[c]
	Before	After				
Body weight (kg)	10.69 ± 1.8	11.03 ± 1.7	0.35 (0.22 – 0.47)	.000[1]	0.19	Small effect
Height (cm)	84.48 ± 7.4	86.08 ± 7.1	1.61 (1.31 – 1.90)	.000[1]	0.22	Small effect
Developmental score	7.27 ± 1.9	8.38 ± 1.9	1.12 (0.54 – 1.69)	.000[1]	0.58	Medium effect
Knowledge score	56.42 ± 20.4	63.9 ± 22.7	7.56 (1.92 – 13.19)	.010[1]	0.35	Small effect
Weight-for-height (WHZ)	-1.27 ± 1.3	-0.96 ± 1.1	0.31 (0.15 – 0.48)	.000[1]	0.26	Small effect
Weight-for-age (WAZ)	-2.04 ± 0.9	-1.91 ± 0.9	0.13 (-0.02 – 0.29)	.087[2]	0.15	Small effect
Height-for-age (HAZ)	-2.08 ± 1.3	-2.09 ± 1.0	-0.02 (-0.28 – 0.24)	.889	0.02	Very small effect
Wasting (%)	35	15	20%	.010[1]	-	
Underweight (%)	58	42	16%	.180	-	
Stunting (%)	73	62	11%	.100	-	
Low maternal knowledge (%)	48	33	15%	.021[1]	-	
Developmental delay (%)	69	40	29%	.001[1]	-	

[1]p<0.05, [2] p<0.1 indicates a significant change; [a]Continuous data were analyzed using paired t-tests, and categorical data were analyzed using McNemar's test; [b]Hedges' g (small-sample correction); [c]Based on Cohen (1988).

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Table 5: Responses of respondents to the community-based nutrition intervention using a structured questionnaire

Response	Mean Score±SD	% Agree/Strongly Agree
Messages were easy to understand	4.26±0.44	100
Counselling improved self-confidence	4.26±0.44	100
Intervention menu was well accepted by toddlers	4.03±0.38	94.3
Intervention menu was easy to apply	4.11±0.40	97.1
Satisfied with the overall intervention	4.23±0.43	100
Hope the intervention will continue	4.23±0.43	100
Toddlers consumed on average more than half of the portion served	-	79

strongly agree (score 5), *agree* (score 4), *unsure* (score 3), *disagree* (score 2), and *strongly disagree* (score 1)

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