

Integrated Family Education on Complementary Feeding, Handwashing, and Household Sanitation for Stunting Prevention

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Abstract

Background: Stunting reflects interacting nutritional, infectious, environmental, socioeconomic, and caregiving pathways. In Toriyo Village, program records identified 266 mothers with children under five and 22 children with stunting.

Aims: To describe an integrated family education program on complementary feeding, handwashing with soap, and household sanitation and to report participants' post-education knowledge and attitude profiles.

Methods: The program was conducted on 16 May 2026 with 12 mothers who attended after mobilization by village partners and community health cadres; no probability sampling or formal sample-size calculation was used. Education covered stunting and the first 1,000 days of life, age-appropriate complementary feeding, nutrient-dense local foods, handwashing, feeding-utensil hygiene, safe drinking water, and household sanitation. Knowledge was measured with 10 true-or-false items (0–100) and attitude with 10 four-point Likert items (10–40). Psychometric estimates were exploratory because $n = 12$.

Results: Mothers were aged 21–42 years (31.58 ± 6.13); 75.0% had completed senior high school and 75.0% were homemakers. Knowledge scores ranged from 70–100 (92.50 ± 12.15 ; median 100), and attitude scores ranged from 30–40 (34.83 ± 4.00 ; median 35). Cronbach's alpha was 0.536 for knowledge and 0.932 for attitude.

Conclusion: The program integrated three household prevention domains and produced reusable media for cadres. The post-education scores describe activity participants only; without baseline measurement and with an attendance-based sample of 12, they do not demonstrate improvement, effectiveness, or population-level effects.

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INTRODUCTION

Stunting is a chronic impairment of linear growth, commonly defined as length- or height-for-age below -2 standard deviations of the World Health Organization child growth standards. It reflects interacting nutritional, biological, environmental, caregiving, and socioeconomic pathways and is associated with adverse health and developmental outcomes (Ariska et al., 2024; Givani, 2022; Siregar et al., 2025; Vaivada et al., 2020; Victora et al., 2014; Wardani et al., 2023; Yolanda & Iskandar, 2024). Because these pathways converge in daily child care, family-level feeding, hygiene, care-seeking, and sanitation are relevant components of prevention.

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The first 1,000 days of life are especially important because growth trajectories are shaped by maternal conditions, household resources, infection exposure, and infant and young child feeding (Adriana & Wahyu, 2025; Permana et al., 2025; Rezaeizadeh et al., 2024; Sayekti et al., 2025; Sharn et al., 2025; Sitorus, 2024). Indonesian evidence likewise identifies determinants at the child, maternal, household, and environmental levels (Agushybana et al., 2025; Mulyaningsih et al., 2021). These findings favor prevention strategies that address several modifiable determinants together rather than in isolation.

In Toriyo Village, Bendosari District, Sukoharjo Regency, the initial program situation analysis recorded 266 mothers with children under five and 22 children with stunting. These administrative program records provided a practical basis for a family-oriented activity but were not collected through an epidemiological sampling framework and therefore should not be interpreted as a population prevalence estimate.

Complementary feeding is one modifiable family practice relevant to child growth. Inadequate meal frequency, low dietary diversity, inappropriate texture, limited nutrient-dense foods, unsafe food handling, and recurrent infection can occur together (Amatullah & Indriyani, 2024; Santoso & Pujianto, 2024). Accordingly, family education should address food quality and diversity, texture progression, feeding frequency, food safety, and affordable nutrient-dense foods rather than food quantity alone.

Water, sanitation, and hygiene are also relevant because enteric pathogen exposure and diarrheal disease can interfere with dietary intake and nutrient utilization. Studies have reported associations between inadequate sanitation, unsafe water, poor hygiene, infectious disease, and childhood stunting or related health risks (Audiena & Siagian, 2021; Cameron et al., 2021; Marfati et al., 2025; Martias, 2024; Rah et al., 2020; Wijayanto et al., 2026; Wolf et al., 2022). These associations support integrating hygiene and sanitation messages with nutrition education, while avoiding the assumption that any single WASH component alone can prevent stunting.

The program also used culturally familiar messages to reinforce evidence-based recommendations. Breastfeeding and early childhood nutrition were linked to Qur'an Surah Al-Baqarah, verse 233, while cleanliness was linked to Al-Baqarah, verse 222 (Al Qur'an Kementrian Agama RI, 2015). The religious framing was used as supportive communication, not as a substitute for nutrition, hygiene, or sanitation guidance.

Complementary feeding provided a practical entry point for the family-centered package. Feeding from around six months requires age-appropriate diversity, nutrient density, consistency, frequency, texture, and food safety. Parenting and feeding practices are closely related to child growth but remain context dependent (Munawar et al., 2024). The Toriyo activity therefore emphasized locally available animal- and plant-source foods, added fats, appropriate textures, and age-based feeding frequency, consistent with community programs that use demonstrations, local foods, and caregiver involvement (Keats et al., 2021; Marlina et al., 2023; Rismayani & Maulani, 2024; Taufikurrahman et al., 2025; Tengkawan et al., 2022; Widhisastri et al., 2024).

Handwashing with soap was presented as an infection-prevention practice rather than a stand-alone treatment for stunting. Handwashing with soap can reduce diarrheal disease when practiced consistently (Ejemot-Nwadiaro et al., 2021). The session integrated handwashing at critical times with feeding-utensil hygiene, safe drinking-water management, sanitary latrine use, and household environmental cleanliness.

Because one educational meeting is unlikely to sustain behavior on its own, the program also emphasized continuity through families and community health cadres (Anita et al., 2025; Martin et al., 2021; Puspitasari et al., 2025; Rsianty, 2024; Taylor et al., 2023; Umar, 2021). Knowledge and attitudes may be influenced by education, but actual practice also depend on resources, social support, habits, and competing priorities (Fitriani et al., 2024; Peirce et al., 2024).

The specific implementation contribution of the Toriyo program was the integration of complementary feeding, handwashing/hygiene, and household sanitation in one family-oriented education package, supported by reusable pocket books, a blueprint, and posters for cadres and Posyandu activities. This article describes that implementation and reports participant characteristics and post-education knowledge and attitude profiles; it does not evaluate intervention effectiveness.

METHOD

Activity Design

The activity used a community service design with a one-time descriptive evaluation conducted after the educational session. The program integrated education on stunting and the first 1,000 days of life, complementary feeding, handwashing with soap, feeding hygiene, safe water, and household sanitation.

Only post-education measurements were available. Accordingly, the quantitative component was designed to describe participant characteristics and the distribution of knowledge and attitude scores. It was not designed to estimate within-participant change, effect size, or causal effectiveness.

Participants and Location

The program was conducted on 16 May 2026 in Toriyo Village, Bendosari District, Sukoharjo Regency, Indonesia. Program records used for the initial situation analysis identified 266 mothers with children under five and 22 children with stunting.

The documented participant group comprised 12 mothers with children under five who attended the activity after mobilization by village partners and community health cadres. The source documentation does not state how many mothers were invited or declined to participation and does not describe formal inclusion or exclusion criteria beyond being a mother of a child under five. No probability sampling, random selection, or formal sample-size calculation was documented. The 12 mothers are therefore treated as activity participants recruited through community mobilization, not as an epidemiological sample representing all mothers with children under five in Toriyo Village.

Program Materials and Procedures

Preparation included coordination with village partners and community health cadres, participant mobilization, preparation of educational materials, and development of reusable media. The educational session used interactive explanation, discussion, question-and-answer activities, and visual media. Topics included stunting and the first 1,000 days of life; complementary feeding from around six months; locally available animal- and plant-source foods; food texture and feeding frequency; handwashing with soap at critical times; feeding-utensil hygiene; safe drinking-water management; sanitary latrine use; and household environmental cleanliness. The university team facilitated the session, while community health cadres supported participant mobilization and reinforcement of the health messages.

Educational Media

The program produced a 23-page Family Pocket Book for Stunting Prevention, a 16-page Stunting Prevention Blueprint, and three educational posters on handwashing with soap, bone broth for children under five, and preparation of complementary foods using bone broth. The materials were intended for repeated use by families and cadres in Posyandu activities and family counseling. Their production and handover were treated as implementation outputs.

Instruments and Scoring System

Post-activity data were collected using an evaluation questionnaire with three sections: participant characteristics, knowledge, and attitudes. Maternal characteristics included age, education, occupation, and number of children; child characteristics included age, sex, and body weight.

The knowledge instrument contained 10 true-or-false statements covering stunting, the first 1,000 days of life, complementary feeding, animal-source protein, handwashing with soap, and household sanitation. Correct responses were scored 1 and incorrect responses 0. The summed score was converted to a percentage with a theoretical range of 0–100.

The attitude instrument contained 10 statements on stunting-prevention practices, complementary feeding, hygiene, and household sanitation. Each item used a four-point Likert response: 1 (strongly disagree), 2 (disagree), 3 (agree), and 4 (strongly agree). Item scores were summed, yielding a theoretical total range of 10–40.

Corrected item-total correlations and Cronbach's alpha were calculated as exploratory indicators of item performance and internal consistency. A corrected item-total correlation of 0.30 was used only as a descriptive reference. Because the instrument analysis was based on 12 participants, these estimates are statistically unstable and should not be interpreted as formal evidence that the instruments are validated.

In this small sample, all attitude items had corrected item-total correlations at or above 0.30 and Cronbach's alpha was 0.932. For the knowledge instrument, several items had little or no response variability because many participants answered them correctly; Cronbach's alpha was 0.536. The lower knowledge coefficient and the very small sample limit psychometric interpretation. Therefore, both instruments are used here to describe post-education scores rather than to support causal or population-level conclusions.

Data Analysis

Categorical variables were summarized as frequencies and percentages. Quantitative variables were summarized using mean and standard deviation, median, and minimum–maximum range. Corrected item-total correlations and Cronbach's alpha were reported descriptively as exploratory instrument statistics.

Observed knowledge scores were 70, 80, 90, and 100, while attitude scores ranged from 30 to 40. Because no analyzable baseline measurement was available, no paired comparison or inferential test of educational effectiveness was performed.

Child body weight was reported only as a participant characteristic. It was not used to classify nutritional status because standardized anthropometric interpretation requires age, sex, and length or height.

Evaluation Scope and Limitations

This evaluation is a descriptive community service report. The attendance-based sample of 12 participants limits generalizability; the absence of a comparable pre-education measurement precludes estimation of improvement or causal effects; and psychometric estimates based on $n = 12$ are imprecise, with low internal consistency for the knowledge instrument. No behavioral, knowledge-retention, infectious-disease, or anthropometric follow-up was available.

RESULTS AND DISCUSSION

Results

The community service activity was conducted on 16 May 2026 in Toriyo Village, Bendosari District, Sukoharjo Regency, and involved 12 mothers with children under five. The session

integrated education on complementary feeding, handwashing with soap, and household hygiene and sanitation.

1. Participant Characteristics

Participants were 21–42 years old, with a mean age of 31.58 ± 6.13 years. Nine participants (75.0%) had completed senior high school, and three (25.0%) had completed junior high school. Nine (75.0%) were homemakers, two (16.7%) private-sector employees, and one (8.3%) self-employed. The number of children ranged from 1 to 4 (mean 1.83 ± 1.03); six participants (50.0%) had one child.

Table 1. Characteristics of participating mothers (n = 12)

Variable	Category/statistic	Result
Age	Mean $\pm$ SD	31.58 ± 6.13 years
	Minimum-maximum	21-42 years
Education	Senior high school	9 (75.0%)
	Junior high school	3 (25.0%)
Occupation	Homemaker	9 (75.0%)
	Private-sector employee	2 (16.7%)
	Self-employed	1 (8.3%)
Number of children	Mean $\pm$ SD	1.83 ± 1.03
	1 child	6 (50.0%)
	2 children	3 (25.0%)
	3 children	2 (16.7%)
	4 children	1 (8.3%)

2. Characteristics of Children Under Five

Participating children were 2–59 months old, with a mean age of 24.58 ± 17.09 months and a median of 24 months. Nine children (75.0%) were male, and three (25.0%) female. Body weight ranged from 4.90 to 16.40 kg, with a mean of 10.39 ± 2.98 kg and a median of 9.70 kg.

Table 2. Characteristics of participating children (n = 12)

Variable	Category/statistic	Result
Age	Mean $\pm$ SD	24.58 ± 17.09 months
	Median (minimum-maximum)	24 (2-59) months
Sex	Male	9 (75.0%)
	Female	3 (25.0%)
Body weight	Mean $\pm$ SD	10.39 ± 2.98 kg
	Median (minimum-maximum)	9.70 (4.90-16.40) kg

3. Respondent Knowledge Profile

Post-education knowledge scores ranged from 70 to 100, with a mean of 92.50 ± 12.15 and a median of 100. Eight participants (66.7%) scored 100, one (8.3%) scored 90, one (8.3%) scored 80, and two (16.7%) scored 70. Thus, the observed post-education distribution was concentrated at the upper end of the 0–100 scale.

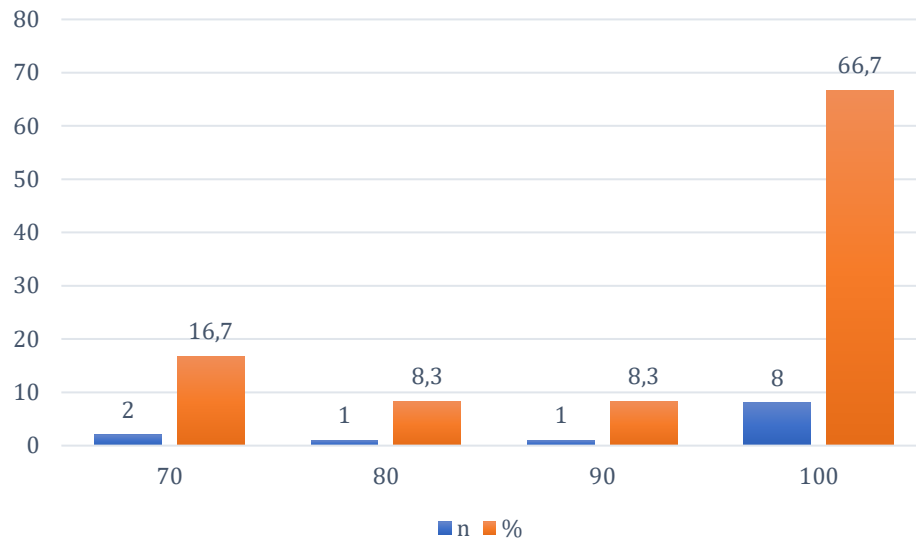


Figure 1. Distribution of participants' knowledge scores

4. Respondent Attitude Profile

Post-education attitude scores ranged from 30 to 40, with a mean of 34.83 ± 4.00 and a median of 35. A score of 30 was observed in three participants (25.0%), and a score of 40 in two (16.7%); the remaining scores were distributed between 31 and 39.

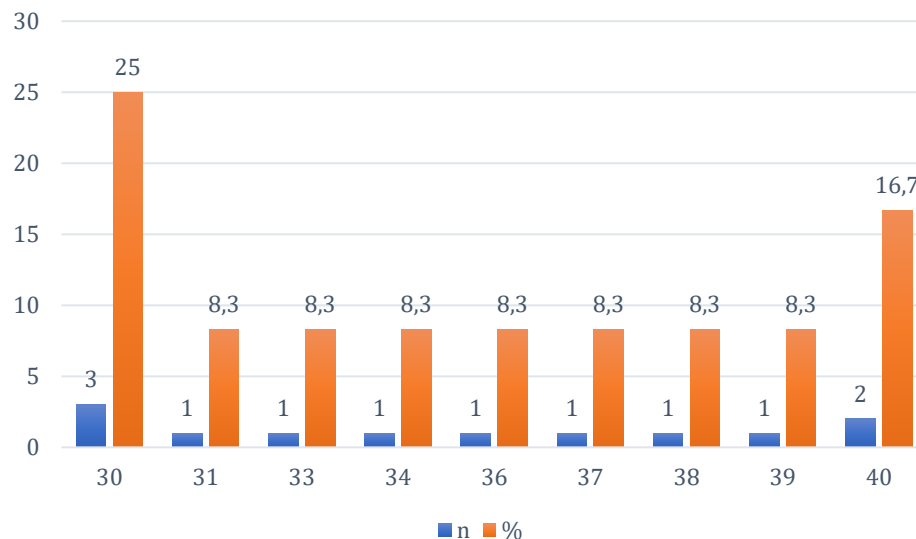


Figure 2. Distribution of participants' attitude scores

Table 3. Summary statistics of post-education measurements (n = 12)

Variable	n	Mean $\pm$ SD	Median	Minimum	Maximum
Knowledge	12	92.50 $\pm$ 12.15	100	70	100
Attitude	12	34.83 $\pm$ 4.00	35	30	40

5. Activity Outputs

The activity also produced reusable educational media: the 23-page Family Pocket Book for Stunting Prevention, the 16-page Stunting Prevention Blueprint, and three posters on handwashing

with soap, bone broth for children under five, and preparation of complementary foods using bone broth.

Table 4. Program outputs

No	Output	Status	Description
1	Community service activity	Completed	16 May 2026; Toriyo Village; 12 participants
2	Post-activity data	Completed	Characteristics of mothers and children; knowledge and attitude scores
3	Family Pocket Book for Stunting Prevention	Completed	23 pages
4	Stunting Prevention Blueprint	Completed	16 pages
5	Educational posters	Completed	Three posters: handwashing with soap; bone broth; complementary feeding with bone broth
6	Activity documentation	Completed	Photographic documentation of implementation and media handover
7	Community service article	Prepared	Prepared according to the AKTUAL journal template

The educational media were handed over to community partners for potential repeated use in Posyandu activities, family counseling, and subsequent health education. This handover was reported as an implementation output; subsequent use and impact of the materials were not measured.



Figure 3. Handover of educational media as appropriate technology outputs to community partners in Toriyo Village, Bendosari, Sukoharjo.

Discussion

The participant profile should be interpreted descriptively because the 12 mothers were activity attendees rather than a population sample. Most had completed senior high school and were homemakers. Maternal education is associated with child growth through pathways such as household resources, health-service use, decision-making, and health literacy (Fitriani et al., 2024; Laksono et al., 2022; Rezaeizadeh et al., 2024).

Participants also differed in caregiving experience and likely in prior exposure to information from Posyandu, health workers, family experience, and other sources. Because no analyzable pre-education measurement was available, pre-existing knowledge cannot be separated from knowledge acquired during the session.

The participating children ranged from 2 to 59 months, spanning infancy, the complementary-feeding period, and preschool age. This range matters because feeding recommendations change with development, particularly after complementary feeding begins at around six months. Practical demonstrations and locally available foods are commonly used in community feeding programs (Marlina et al., 2022; Rismayani & Maulani, 2024; Taufikurrahman et al., 2025; Tengkawan et al., 2022).

Body weight was retained only as a descriptive characteristic. Stunting is defined using age- and sex-specific length- or height-for-age, so body weight alone cannot establish stunting status or demonstrate a change in linear growth.

The mean post-education knowledge score was 92.50 ± 12.15 , with a median of 100; 8 of 12 participants (66.7%) achieved 100. This indicates a high score profile at the time of measurement. Contextual nutrition education can support caregiver knowledge and feeding practices (Peirce et al., 2024; Rsianty, 2024; Tengkawan et al., 2022), but the present data do not establish that the Toriyo session caused the observed scores.

The absence of a comparable baseline is central to interpretation. Participants may already have received related information before the activity. The result should therefore be described as a post-education knowledge profile, not as an increase, improvement, or intervention effect.

The knowledge questionnaire contained 10 true-or-false items scored 0–100. Because eight participants obtained the maximum score of 100, the distribution suggests a possible ceiling effect and limited discrimination among participants with relatively high knowledge. This interpretation is descriptive and should be viewed cautiously given the very small sample.

The psychometric statistics also require caution. Cronbach's alpha was 0.536 for the knowledge instrument, indicating limited internal consistency in this sample, likely affected in part by restricted item-response variability. The attitude instrument yielded an alpha of 0.932, and its corrected item-total correlations were at least 0.30. However, with only 12 participants, neither the alpha coefficients nor item-total correlations provide stable evidence of instrument validity or reliability.

Future evaluations should pre-specify content domains, item-development procedures, response options, scoring, and interpretation rules and should assess validity and reliability in an adequately sized sample. Pilot testing may also identify ambiguous items and reduce ceiling effects before the instrument is used for outcome evaluation.

The attitude instrument comprised 10 four-point Likert items with a theoretical range of 10–40. Observed scores ranged from 30 to 40 (mean 34.83 ± 4.00 ; median 35). Because validated interpretive cut-offs were not established, these scores should be reported as a post-education distribution rather than categorized as “positive,” “moderate,” or “negative.”

Knowledge and attitudes are related but distinct. Even when caregivers understand recommended practices, implementation may still depend on affordability, time, household routines, confidence, family influence, and child acceptance. Family support and caregiver knowledge have been associated with nutrition-related behavior among Indonesian families with children who have stunting (Wiliyanarti et al., 2022). Engagement of other household members may also support maternal, infant, and young child nutrition activities (Martin et al., 2021).

The program's integrated content was consistent with the multifactorial nature of stunting: complementary feeding addressed dietary adequacy and feeding quality, while handwashing, feeding-utensil hygiene, safe water, and sanitation addressed infection-related pathways. Studies in Indonesia and other low- and middle-income settings report associations between WASH conditions, diarrheal risk, and childhood stunting (Cameron et al., 2021; Marfati et al., 2025;

Martias, 2024; Rah et al., 2020; Wijayanto et al., 2026). These findings justify the relevance of WASH within a broader prevention package but do not establish that a single household component will change linear growth.

Growth stunting is also shaped by parenting and feeding practices that vary across household and social contexts (Munawar et al., 2024). Accordingly, the Toriyo activity did not frame hygiene or sanitation education as a stand-alone therapy; these messages were combined with complementary feeding and family caregiving guidance.

Reusable educational media were an implementation output intended to extend message exposure beyond the one-time university activity. The pocket book, blueprint, and posters can be reused during counseling or group education, but their availability alone is not evidence of behavior change or effectiveness.

Community health cadres may provide continuity by using the materials in Posyandu and family health activities. Community- and family-based approaches can support participation and program continuity (Anita et al., 2025; Puspitasari et al., 2025; Taylor et al., 2023). Whether the Toriyo materials are actually used, understood, and retained should be evaluated in future implementation.

Implications

The integrated package offers a practical implementation model for delivering complementary-feeding, hygiene, and sanitation messages together. Repeated use by cadres may extend exposure beyond the single activity, but the present evaluation cannot determine whether repeated exposure changes knowledge, attitudes, or practices.

Future evaluation should include observable family practices, such as age-appropriate feeding, handwashing with soap at critical times, safe food preparation and storage, feeding-utensil cleanliness, drinking-water management, and sanitation use, rather than relying only on immediate post-education scores.

Program Contribution

The principal contribution of the Toriyo program is its implementation design: complementary feeding, hand hygiene, and household sanitation were combined in one family-oriented education package, and reusable media were transferred to cadres for continued use. This integrated approach is consistent with the recognition that stunting has multiple interacting determinants (Sayekti et al., 2025; Umar, 2021). The program should therefore be understood as a descriptive implementation-oriented community service activity, not an effectiveness trial.

Limitations

Several limitations constrain interpretation. First, the 12 attendance-based participants do not represent all 266 mothers with children under five recorded in Toriyo Village. Second, no comparable pre-education measurement was available, so improvement and causal effects cannot be estimated. Third, eight participants reached the maximum knowledge score, suggesting a possible ceiling effect. Fourth, psychometric estimates were based on only 12 participants, and the knowledge instrument had low internal consistency (Cronbach's $\alpha = 0.536$). Fifth, no follow-up data were available on feeding, handwashing, sanitation, infectious disease, knowledge retention, or child growth. Finally, length/height-for-age data were unavailable, so changes in stunting status could not be evaluated.

Recommendations

Future programs should use paired pre- and post-education measurements, larger and more clearly defined participant groups, and follow-up assessment of knowledge retention and family practices.

Instruments should be developed and tested systematically in samples large enough to support psychometric evaluation.

If child growth is an evaluation outcome, standardized length or height measurements should be interpreted by age and sex using appropriate growth standards and followed longitudinally. Continued use of the pocket book, blueprint, and posters by cadres should also be evaluated for reach, usability, message retention, and association with family practices.

CONCLUSION

The Toriyo Village community service program implemented an integrated family education package covering complementary feeding, handwashing with soap, feeding hygiene, safe water, and household sanitation. It also produced reusable educational media, a Family Pocket Book for Stunting Prevention, a Stunting Prevention Blueprint, and three posters, for continued use by cadres and community partners. Among the 12 activity participants, the post-education mean knowledge score was 92.50 ± 12.15 (median 100; range 70–100) and the mean attitude score was 34.83 ± 4.00 (median 35; range 30–40). These values describe the participants at the time of post-education measurement. Because no comparable baseline was available and the group was small and attendance based, the findings cannot be interpreted as evidence of improvement, intervention effectiveness, or population-level effects. The program's contribution lies in integrating complementary feeding, hygiene/handwashing, and sanitation in one family-oriented package and providing reusable media for cadres and Posyandu activities. Future evaluations should use paired pre-post measurements, adequately tested instruments, larger and clearly defined participant groups, follow-up of family practices, and standardized anthropometry when child growth is an outcome.

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AUTHOR CONTRIBUTION STATEMENT

SK conceptualized and coordinated the community service program, supervised implementation, and led preparation of the report and manuscript. SF contributed to the operational design, preparation of stunting and nutrition educational materials, facilitation, evaluation, and manuscript review. LM supported administration, participant data management, and program documentation. LW contributed to complementary-feeding demonstration materials and activity documentation. SM supported education on handwashing with soap and sanitation as well as field observation. SKa contributed to family follow-up planning, field monitoring, documentation, and preparation of the final report. All authors reviewed and approved the final manuscript.

AI DISCLOSURE STATEMENT

The authors used ChatGPT (OpenAI) during manuscript preparation to support language editing, improvement of logical flow and academic readability, alignment of the manuscript structure with the journal template, and organization of citations and references. The authors are responsible for reviewing and verifying all scientific content, numerical data, citations, and references and retain full responsibility for the submitted manuscript.

CONFLICTS OF INTEREST

The authors declare that there is no conflict of interest.

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