



ORIGINAL ARTICLE

Nutrition Education and Dietetics Infant, Child, and Adolescent Nutrition

Implementation and Recommendations of a Supplementary Feeding Education Program for Children Under Two Years in Semarang Regency Central Java, Indonesia

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ABSTRACT

Background: Childhood Malnutrition, particularly stunting and wasting, persist as a major public health challenge worldwide. Globally, stunting affects approximately 148 million children, while wasting impacts 45 million. In Indonesia, the prevalence of stunting declined from 24.4% in 2021 to 21.5% in 2023; however, wasting increased from 7.1% to 7.7% over the same period. In Semarang Regency, stunting and wasting prevalence were recorded at 19.6% and 7.1%, respectively. As part of national efforts to address this burden, the government has implemented supplementary feeding programs utilizing locally sourced ingredients. Prior research indicates that locally tailored nutrition education can enhance child-feeding practices; nevertheless, such interventions remain limited in rural settings.

Aims: This study aimed to evaluate the implementation of a supplementary feeding education program targeting children under two years of age in Semarang Regency.

Participants and Methods: A qualitative case study design with multiple cases was employed, involving 16 participants selected through purposive sampling. Data were collected via in-depth interviews and focus group discussions, and subsequently analyzed utilizing NVivo software to identify recurrent themes.

Results: The findings underscore that active stakeholder engagement, particularly the financial support provided by community leaders, is critical to program success. The recourse to both traditional and digital media proved valuable for disseminating educational content, although literacy challenges persist in rural areas—for instance, maternal and child health books are often consulted only when necessary. While educational materials were adapted to local contexts, significant challenge in ensuring their consistent relevance and accessibility remain.

Conclusions: To enhance program effectiveness, it is essential to strengthen stakeholder collaboration through regular forums between community health centers and village governments during village meetings, optimize media utilization by incorporating short videos and WhatsApp-based pocket books to facilitate home-based learning for mothers, and ensure the cultural appropriateness of educational content through the integration of local food ingredients.

Keywords: Supplementary Feeding; Education Programs; Community Engagement.

Article Information

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1 INTRODUCTION

Malnutrition in early childhood — most critically manifested in the forms of stunting and wasting — remains one of the most persistent and consequential global health challenges of the twenty-first century. Stunting, defined as low height-for-age, currently affects about 148 million children under five years of age, whilst wasting, defined as low weight-for-height, affects more than 45 million children in the same age group (UNICEF, 2023). These conditions are associated with profound and often irreversible consequences for child survival, cognitive development, physical growth, and long-term human capital formation, rendering their elimination a global health and development priority.

At the global level, the World Health Organization (WHO) has established targets to reduce the prevalence of stunting to below 20% and the prevalence of wasting rate to below 3% by 2030. However, the most recent global estimates indicate that in 2024, the prevalence of stunting reached 23.2% and the prevalence of wasting reached 6.6% among children under five years of age (UNICEF, 2025), confirming that the world remains considerably off-track in achieving these internationally agreed targets.

In Indonesia, whilst the national prevalence of stunting demonstrated a modest decline — from 24.4% in 2021 to 21.5% in 2023 — the prevalence of wasting increased during

the same period, rising from 7.1% in 2021 to 7.7% in 2023 (Ministry of Health of the Republic of Indonesia, 2024). The national targets established under the 2024 Medium-Term National Development Plan (RPJMN) set an ambitious goal of reducing the stunting rate to 14% and the wasting rate to 7% by the plan's terminal year. Despite the observed reduction in stunting prevalence, the current figures remain substantially above both the national and global targets, indicating the significant and ongoing challenges confronting Indonesia in its efforts to fulfil its established nutrition commitments.

At the subnational level, Central Java Province, one of the priority intervention areas within the national stunting reduction strategy, exhibits a broadly similar epidemiological pattern. The prevalence of stunting in this province was recorded at 20.8% in 2023, while the prevalence of wasting increased from 7.9% in 2022 to 8.5% in 2023 (Ministry of Health of the Republic of Indonesia, 2023). Within Central Java, Semarang Regency recorded a stunting prevalence of 19.6%, and a wasting prevalence of 7.1% in 2023 — both figures remaining above the established national targets and indicative of the persistence of significant nutritional vulnerabilities within this priority area (Dinas Kesehatan Provinsi Jawa Tengah, 2023).

In response to this nutritional burden, the Indonesian Government has implemented the Supplementary Feeding Program (PMT — *Program Makanan Tambahan*) as a core national strategy targeting children under two years of age. The program is founded upon a contextually grounded and sustainable approach, prioritizing the utilization of locally available food ingredients as a means of supporting household food security whilst simultaneously enhancing the cultural acceptability and practical feasibility of nutritional interventions (Badan Pangan Nasional, 2023). The effectiveness of such supplementary feeding programs is, however, critically contingent upon the provision of adequate and sustained nutrition education for parents and caregivers, as well as upon the availability of locally sourced ingredients that fulfill balanced nutritional criteria. Previous investigations have demonstrated that locally adapted nutrition education interventions can ameliorate child-feeding knowledge and practices among caregivers; however, the implementation of such educational initiatives remains uneven, particularly in rural and peri-urban areas where access to trained nutrition personnel and educational resources is limited (Viajar et al., 2020).

Notwithstanding its status as a nationally endorsed strategy for the acceleration of stunting reduction, the field implementation of the local food-based PMT program continues to exhibit a range of substantive limitations. The quality and consistency of local food-based nutrition education delivery are highly variable across regions, being

disproportionately dependent upon the technical capacity of community health cadres and the operational effectiveness of integrated health service posts (*Posyandu*) in each locality. Furthermore, to date, no comprehensive and systematic evaluation of the implementation of the local food-based PMT program has been conducted in Semarang Regency — a designated priority region within the national stunting reduction effort. An additional and critically underexplored gap in the existing evidence base concerns the extent to which inter-stakeholder collaboration, the appropriateness and quality of educational media employed, and the cultural and contextual relevance of program materials are effectively operationalized in practice. The absence of rigorous evaluation of these implementation dimensions creates the risk that the program continues to be delivered without ensuring its effectiveness and long-term sustainability.

The present study therefore aimed to systematically evaluate the implementation of educational programs on supplementary feeding using local food ingredients for children under two years of age in Semarang Regency, and to generate evidence-based recommendations for the optimization and strengthening of the program. The findings of this study are expected to contribute substantively to the knowledge base on locally grounded supplementary feeding interventions by elucidating the factors that facilitate or constrain program effectiveness, including the adequacy of nutrition education delivery, the quality of stakeholder collaboration, the appropriateness of educational media, and the cultural relevance of program content. Ultimately, this research seeks to provide actionable, evidence-grounded insights to inform the decision-making of policymakers and health workers engaged in the design, implementation, and evaluation of community-based nutrition programs at the local and regional levels.

2 SUBJECTS AND METHODS

2.1 Study Design and Setting

This study employed a qualitative case study design to explore and evaluate the implementation of local food-based supplementary feeding education programs for children under two years of age in Semarang Regency, Central Java Province, Indonesia. The qualitative approach was selected as the most appropriate methodology for generating an in-depth, contextually grounded understanding of program implementation processes, stakeholder experiences, and the facilitating and constraining factors that shape program outcomes. Data were collected through in-depth individual interviews and structured focus group discussions (FGDs) involving both primary and triangulation informants, enabling methodological triangulation to enhance the credibility and depth of the findings.

The study was conducted in Semarang Regency, Central Java Province, Indonesia — a region formally designated as a national priority area for stunting and wasting reduction interventions. This regency was purposively selected as the study site on account of its persistently elevated rates of malnutrition among children under two years of age, notwithstanding the sustained implementation of national nutrition programs, rendering it a highly pertinent context for the evaluation objectives of the present investigation (Table 1).

Ethical approval for this study was obtained from the Research Ethics Committee of Semarang State University (Approval Number: 345/KEPK/FK/KLE/2024). The principal researcher is a midwifery lecturer with established expertise in child growth, development research, and qualitative inquiry methodology, ensuring the appropriate professional competence and disciplinary grounding required to conduct and interpret the investigation.

inclusion criteria specific to each informant category, as detailed below (Table 1).

Primary Informants: Four mothers of children aged 6–24 months who were active recipients of the supplementary feeding program (PMT) were selected on the basis of the following criteria: current or recent participation in the PMT; demonstrated capacity and willingness to articulate and communicate their experiences and perspectives; and recommendation by their respective village midwife as being able to provide substantive and relevant information.

Triangulation Informants: Four village midwives were recruited from health facilities serving areas with documented high malnutrition prevalence. Two coordinating midwives and two nutritionists employed at community health centers were selected on the basis of possessing a minimum of ten years of directly relevant professional experience and working within health center catchment areas with elevated

Table 1. Characteristics of Study Participants

No	Category	Initials	Informant Code	Status Informant
1	Mrs. Infant	Infant Mother A	I13	Mother with 12-month-old child, actively participating in the PMT program at <i>Posyandu</i>
		Infant Mother B	I14	Mothers with 18-month-old children, routinely participate in PMT education sessions
		Infant Mother C	I15	Mother with 24-month-old child, living near <i>Posyandu</i> , receives routine PMT
		Infant Mother D	I16	Mother with a 10-month-old child, has a child with malnutrition status
2	Midwife	Midwife E	I9	Serving in village A, actively distributing and monitoring PMT
		Midwife F	I10	Serving in village B, providing nutritional assistance for infant mothers
		Midwife G	I11	Serving in village C, he also prepares a PMT menu made from local ingredients
		Midwife H	I12	Serving in village D, becoming a liaison between <i>Puskesmas</i> and <i>Posyandu</i> cadres
3	Midwife and Nutritionist Coordinator	Midwife Coordinator I	I5	Coordinator of the health center's children's unit A
		Midwife Coordinator J	I6	Coordinator of the health center's children's unit B
		Nutritionist L	I7	Nutritionist at Community Health Center A
		Nutritionist K	I8	Nutritionist at Community Health Center B
4	Health Office Program Manager	Health Office Manager M	I1	Head of the Working Team
		Health Office Manager N	I2	Health Analyst
		Health Office Manager O	I3	Nutrition Program Coordinator
		Health Office Manager P	I4	Health Analyst

2.2 Participants and Recruitment

A total of 16 participants were enrolled in this study, drawn from five stakeholder categories: mothers of children aged 6–24 months who participated in the supplementary feeding program; village midwives; coordinating midwives; nutritionists at community health centers (*Puskesmas*); and Health Office program managers. Participants were selected using a purposive sampling strategy based on predefined

malnutrition rates. Four Health Office program managers responsible for the oversight and coordination of nutrition programs at the regency level were additionally enrolled (Table 1).

All participants provided written informed consent prior to enrolment and prior to the commencement of any data collection activities. Participation was entirely voluntary, and participants were informed of their right to withdraw from the study at any point without consequence.

2.3 Data Collection Procedures

All data collection activities were conducted in person during August 2024. Focus group discussions were organized into four distinct stakeholder groups — the mothers' group, the village midwives' group, the coordinating midwives and nutritionists' group, and the Health Office program managers' group — each convened at separate sessions to ensure group homogeneity and to facilitate open and candid discussion within each stakeholder category. Each focus group discussion lasted approximately 60 minutes.

Discussion sessions were conducted at venues appropriate to each participant group: the Health Office program managers' group convened at the Health Service Office; the coordinating midwives and nutritionists' group met at the community health center; the village midwives' group was hosted at a university meeting room; and the mothers' group discussions were conducted at the residences of community health volunteers (*kader posyandu*), to facilitate participant comfort and accessibility. All discussion and interview sessions were conducted using structured interview guidelines specifically developed to explore the implementation of supplementary feeding education programs. The interview and discussion process were audio-recorded using three voice recorders to ensure the completeness and accuracy of the data transcription.

2.4 Data Analysis

Data processing and analysis were conducted using NVivo 12 qualitative data analysis software (QSR International). All recorded interviews and focus group discussions were transcribed verbatim and imported into NVivo 12 for systematic coding and thematic organization (Table 2). The software facilitated a structured and comprehensive thematic analysis process, enabling the systematic extraction of units of meaning, the development of codes, and the organization of codes into categories and overarching themes pertaining to participants' experiences, perceptions, and observations regarding the implementation of the supplementary feeding education program. Themes were identified from the data through a process of reading, coding, and comparative analysis, with the aim of generating a contextually understanding of the program's implementation dynamics, facilitating factors, and overall effectiveness from multiple stakeholder perspectives.

3 RESULTS

3.1 Health Education Programs

Nutrition education and feeding education programs targeting children under two years of age were found to be implemented through a diverse array of structured and community-based activities, spanning both health facility

settings and community-level platforms. The key program modalities identified through participant accounts included counselling sessions, toddler mother classes, Community Feeding Centers (CFCs), and Infant and Child Feeding (PMBA — *Pemberian Makan Bayi dan Anak*) training. The *posyandu* (integrated health service post) emerged as the central platform for the delivery of nutrition counselling, growth monitoring, and nutritional status assessment, with the Mother and Child Health (*Kesehatan Ibu dan Anak* — KIA) book serving as the primary educational reference document.;

Representative participant accounts corroborating these findings include the following:

"The activities include counselling, such as providing supplementary food every day, every month" (I14)

"There are toddler mother classes, where there are several topics that must be covered" (I6)

"We also have an activity called CFC, Community Feeding Center, where those with nutritional issues are examined there, at the health center." (I1)

"There is PMBA— infant and child feeding — training" (I2)

"The program usually involves counselling through the posyandu, then Toddler mother classes, then there are quarterly cadre meetings at the posyandu, where material is provided on supplementary feeding for toddlers, infants, and then complementary feeding" (I9)

These accounts collectively confirm that nutrition education and intervention programs are implemented in a variety of modalities and at multiple levels of the health system, with the *posyandu* serving as the principal community-level hub for counselling, growth monitoring, nutrition status surveillance, and education delivered through the KIA book. Program activities are further supported by structured activities including toddler mother classes, pregnant women's classes, Community Feeding Centers (CFCs) for toddlers with identified nutritional concerns, and PMBA (Infant and Child Feeding) training.

3.2 Frequency of Health Education Program Implementation

The frequency of health education program implementation varies was noticed to vary considerably across program components and localities, reflecting the coexistence of both ongoing routine activities and periodic or event-based interventions. Four distinct patterns of implementation frequency were identified:

- 1) **Monthly programs:** A number of program components are implemented on a monthly basis, reflecting a commitment to ongoing monitoring and sustained assistance. These include *posyandu* activities, Community Feeding Center sessions, Family Assistance Teams, and field visits by nutrition and midwifery officers to target areas.

Table 2. Examples of the Coding Process

Theme	Sub-theme	Interpretation of Findings
Health Education Program	Regular community health center programs and accidental programs	Health education on child feeding is provided through various programs, both structured programs at health facilities and community-based programs.
	Annual nutritious action	Nutrition action programs are planned and integrated into the routine agenda of community health centers, but have not been implemented regularly or frequently enough.
	<i>Bankeu Program Program Bantuan Keuangan</i> — Financial assistance program) July 2024	The <i>Bankeu</i> Program is implemented on a scheduled basis during specific periods in accordance with the program plan and is not a routine monthly activity.
	Community Feeding Center once a month	The Community Feeding Center program is conducted regularly every month.
	Toddler mother classes vary in each location	The frequency of toddler mother classes varies depending on the number of health posts and arrangements.
	Maternity classes in accordance with the community health center program	The maternity class program is carried out in accordance with the schedule and provisions of the community health center program, so the frequency depends on the routine planning established by the community health center.
	Regular visits by health workers (nutritionists and midwives) to target areas	The program of regular visits by health workers to target areas demonstrates continuous monitoring and assistance in the implementation of health education programs.
	Annual PMBA (infant and child feeding) training	The PMBA (infant and child feeding) training program is conducted periodically in accordance with annual planning.
	Monthly <i>Posyandu</i>	The <i>Posyandu</i> program is a means of education and monitoring of children's health that takes place regularly and continuously.
	Family support team once a month.	The family support team program demonstrates continuous assistance to families in the implementation of the Health Education program.
Media Used in the Implementation of Health Education Programs	Various educational media	Education is carried out using various media to facilitate understanding of the target audience (KIA books, print media videos, standardized food models, digital media)
Sources of Funding Used in the Implementation of Health Education	Programs Funding for toddler mother classes comes from community health centers	The implementation of toddler mother class programs depends on funding support and program planning by community health center
	Supplementary Feeding Program (PMT) funding source from the government	The Supplementary Feeding Program (PMT) activities depend on the availability of funding support from various levels of government (village, district, province)
Challenges in implementing health education programs and nutritional interventions	Challenges for mothers/target groups	Challenges for mothers/target groups due to limited knowledge, time, economic constraints and low utilization of the Maternal and Child Health Handbook, care provided by grandmothers or nannies and limited access to information due to lack of signal.
	Family constraints	Family constraints due to culture, economic factors, number of family members, and parenting patterns that influence the acceptance of information and feeding practices for children.
	Health worker constraints	Health worker constraints due to midwives and cadres having limited time to handle many other services/targets and a large amount of educational material, making it difficult to deliver optimally.
	Child constraints	Constraints from the child's perspective include children being fussy during health education activities.
	Mothers' difficulties in feeding	The challenges mothers face in feeding their children include children being picky eaters, frequently falling ill, being too preoccupied with playing, using mobile phones while eating, finding it difficult to sit still, and taking a long time to eat.

"We have many programs at the *posyandu* — several programs per month" (15)

2) **Annual programs:** Certain program activities — most notably PMBA (Infant and Child Feeding) Training, are

implemented in accordance with annual planning cycles. The Nutritious Action program, whilst formally planned and integrated into the annual program calendar, has not been implemented with regularity that exceeds once per year. Budgetary constraints were identified as a primary determinant of annual program scope:

"In PMBA, we cannot achieve the 100% target. Because in one year we can only train 13 people, one activity, because the budget is not sufficient" (I3)

2) Specially scheduled programs: The *Bankeu* Program (*Program Bantuan Keuangan*— Financial assistance program) is implemented during designated periods in accordance with a specific schedule and does not constitute a routine monthly activity. Pregnant women's classes are equally conducted according to the schedule and provisions of the community health center program:

"The last one is from Bankeu Program. We provide education through temporary cadres, that was just last July, 2024" (I1)

3) Programs with variable frequency: Classes for mothers of toddlers exhibited considerable variation in implementation frequency across localities. Although six meetings per cycle is formally stipulated, actual implementation in the field can be found to range from one meeting per health post per annum to three meetings for specific age-group cohorts, contingent upon the availability of the coordinating midwife and other relevant personnel. Financial dependency on village-level budgets was identified as a significant determinant of this variability:

"The implementation depends on the village, as the funding comes from the village fund — it depends on the village head" (I9)

"In our village, it depends on the number of posyandu. So, it is allocated within a year — if there are nine posyandu, there will be nine meetings. Everyone receives a share, but only once a year." (I11)

"In the toddler mother class, it is not a single topic, — we provide several topics that we must be conveyed to the target audience. The program does indeed have six meetings." (I6)

3.3 Educational Media Employed in Program Implementation

The educational media employed across program sites were found to be highly diverse and adapted to local contextual conditions. The KIA (*Kesehatan Ibu dan Anak*) book was consistently identified by participants as the most accessible and universally available educational resource. Physical media, including leaflets, flipcharts, and flyers distributed by community health cadres remained the predominant format, especially in rural areas with limited digital connectivity. The Nutritious Action program employed miniature food models to concretely illustrate

appropriate portion sizes and food group composition. Digital media were additionally utilized in contexts with adequate technological infrastructure, including educational videos, QR codes embedded in printed leaflets enabling access to supplementary digital materials, and radio broadcasts in specific areas.

Representative participant accounts include:

"The easiest and most readily available medium is the Mother and Child Health book" (I2)

"Even though the leaflet medium is provided in physical form, it also carries a barcode that can be accessed with mobile phone" (I2)

"It depends on the area — in urban areas, barcodes can be employed, but in rural areas, we still rely on physical media and leaflets" (I1)

"Our activity is called 'Nutritious action' — an educational program utilizing teaching aids. The media employed are miniature food models, made to resemble actual foods in shape and color. We do not use large gram measurements; instead, we use one tablespoon of food, a piece of chicken of a particular size, a piece of tempeh of a particular size — all using miniature food models, including a miniature plate of rice." (I12)

"There is a flipchart — each class has a flipchart." (I5)

3.4 Funding Sources for Health Education Program Implementation

The funding arrangements for supplementary feeding education programs were found to involve multiple sources, frequently requiring collaborative financial arrangements between community health centers and village-level administrations. In a number of instances, community health centers provided funding for a defined period — such as six months — whilst the remaining program duration was financed through village development planning funds (*dana desa*), subject to approval through village planning deliberation meetings (*musrenbangdes*). This dependency on multiple and asynchronous funding streams was identified as a significant source of operational uncertainty, with delays in village fund disbursement generating disruptions to program scheduling and creating the risk that established targets — including the critical 90-day intervention duration — would not be fulfilled within the program year.

"For example, there is a community health center that only has funding for four months of mother and toddler activities. It can only cover six months, so it negotiates with the village head. The health center funds four sessions, and the village fund contributes the remainder. That arrangement exists, but not in all health centers — some collaborate with the integrated health posts. (I1)

"The source of funding varies. If it comes from the DAU (General Allocation Fund) or DAUSG (Special Allocation Fund), it is managed by the Health Office. Village funds are managed by the

village and the speed of fund management at the village level really depends on the administrators there. Sometimes the schedule gets delayed, which cascades into other activities. The concern is that by the end of the year, the 90-day target may not be completed.” (I2)

3.5 Constraints in Program Implementation

A range of constraints affecting the effective implementation of health education and nutritional intervention programs were identified across multiple stakeholder levels.

3.5.1 Caregiver-Level Constraints

Access to Technology and Digital Information

Access to technology and digital educational resources was identified as a significant barrier, particularly in rural areas, where not all caregivers possess Android-capable mobile devices, where mobile network signal reception is unreliable or absent, or where some individuals do not own a mobile phone

“Not everyone has an Android phone to access online media, not everyone in the villages necessarily has a mobile phone” (I2)

“Some people in the villages also have poor signal reception, and there are still those who do not own a mobile phone” (I1)

Caregiver Attitude, Knowledge, and Beliefs

Attitudinal barriers were identified, characterized by resistance to recommended feeding practices and a strong adherence to established but nutritionally suboptimal feeding habits. Levels of comprehension and sustained behavioral change following education sessions varied considerably among participants, with some caregivers expressing initial agreement but failing to implement recommendations consistently in practice.

“The obstacle is that they are all stubborn, they believe that what they give their toddlers is correct. Some say: ‘My child has always been fed this way, and they have grown up and worked fine.’” (I14)

“The mindset of parents can be difficult when it comes to feeding. Some say: ‘My child has already eaten — if you give me that, I’ll throw it away’” (I10)

Time Constraints and Competing Demands

Working mothers were found to possess adequate nutritional knowledge and but frequently lacked the time to translate this knowledge into practice, instead opting for convenient processed or instant food products. These time constraints were also identified as a contributing factor to low attendance rates at toddler mother classes, with attendance sometimes comprising substitute caregivers rather than the primary mothers:

“The education is available, the knowledge is there, but they do not have time to put it into practice. They tend to give their children instant foods that are easier to prepare, such as nuggets, rather than fresh food. Most of them report this when asked.” (I11)

“Sometimes the target audience is not accurately reached, and attendance is low. For example, in toddler mother classes, we invite 20 or 25 people, but only a few attends. Many parents in our area work.” (I5)

3.5.2 Family-Level Constraints

Alternative Caregiving Arrangements

A frequently reported family-level constraint concerned children being cared for by grandparents or hired caregivers whilst parents worked. Even where mothers possessed adequate nutritional knowledge, translating this knowledge into practice was constrained by the reluctance to challenge caregiving relatives or hired help, for fear of interpersonal conflict or loss of caregiving support:

“Parents understand what exclusive breastfeeding is and can identify the four food groups, but they cannot put it into practice because their children are looked after by their nannies. If they try to instruct the nannies, they fear the nannies will become upset and refuse to continue caring for the children.” (I12)

“Many women work. Their children are cared for by grandparents or left with others. The priority becomes that the child is quiet, when it is mealtime and the child does not want to eat, they are simply left alone.” (I7)

Family Priorities and Established Feeding Habits

Participants reported that child undernutrition and stunting were not exclusively associated with household poverty, but were frequently attributable to established family feeding habits and prevailing attitudes that deprioritized structured and nutritionally adequate feeding. Cases of stunting come in economically sufficient households — where children were permitted to refuse meals and were offered only milk as a substitute — were specifically documented:

“Sometimes we find cases of malnutrition and stunting not in poor families, but in many families that are economically well-off. One of the reasons is the pattern where, when the child does not want to eat, they are simply left alone, they are only given milk. That is also a problem.” (I7)

3.5.3 Health Worker and Operational Constraints

Operational constraints at the health worker level were identified as significant barriers to the consistent delivery of supplementary feeding programs. Of particular concern was the financial burden placed upon community health cadres, who were required to advance the cost of local supplementary

food ingredients from personal funds prior to reimbursement — a requirement that substantially reduced cadre willingness to participate in and sustain local food-based supplementary feeding activities:

“For the provision of local supplementary food, the cadres were required to pay for ingredients in advance on credit. In the end, it was difficult to find cadres willing to cook, because they had to finance the food themselves before being reimbursed — whilst they were also supposed to be the ones delivering the education.” (I10)

3.5.4 Child-Level Feeding Challenges

Specific and recurring challenges encountered by mothers in the daily management of child feeding were additionally identified. These included selective eating behaviors, refusal of staple foods, and food rejection — all of which directly compromised the consistency and adequacy of dietary intake:

“He is a fussy eater — he wants to play with my mobile phone...” (I13)

“My first child does not want to eat rice, he prefers snacks.” (I14)

“The longest it takes for him to eat is one hour.” (I13)

“He is picky, if he does not like something, he will not eat it; he spits it out.” (I15)

4 DISCUSSION

4.1 Health Education Programs for Supplementary Feeding

The findings of the present study indicate that health education and feeding practice education for children under two years of age are implemented through a diverse array of structured and community-based programs. These activities include counselling at integrated health service posts (*posyandu*), home visits conducted by community health center personnel, classes for mothers of toddlers and pregnant women, and capacity-building training for community health cadres. This strategy illustrates a complementary multi-component approach, with the *posyandu* serving as the central hub for nutrition counselling, growth monitoring, and education outreach through the KIA book. These findings are consistent with published evidence demonstrating that community-based nutrition interventions integrating education, behavioral guidance, and cadre empowerment are significantly more effective in improving child feeding practices and reducing the risk of stunting than single-component or facility-only approaches (Majidah & Paramashanti, 2021; Prasetyo et al., 2023). Additionally, Mardani et al. (2024) demonstrated that a structured four-week educational program significantly increased maternal self-efficacy in providing appropriate complementary foods and produced measurable improvements in children's

anthropometric indicators over a 12–14 week follow-up period — findings that further support the potential effectiveness of the program modalities documented in the present study.

The role of community health cadres and health workers is crucial in ensuring the sustainability of nutrition education at the community level. The present findings reinforce evidence from prior investigations demonstrating that enhancing cadre capacity through structured balanced nutrition education produces significant improvements in cadre knowledge and practical skills for the prevention of nutritional problems in children under five years of age (Nuhan et al., 2023; Panjwani & Heidkamp, 2017). Additionally, complementary feeding education interventions delivered through demonstration-based and interactive discussion methods at the *posyandu* level have been shown to significantly improve nutritional intake and growth outcomes in infants aged 6–7 months (Arumsari et al., 2023; Makwela et al., 2024), further corroborating the value of the program modalities identified in the present investigation.

The role of *posyandu* cadres as intermediaries between health system personnel and mothers of toddlers represents one of the principal advantages of community-based interventions. The engagement of local cadres enables the delivery of more sustainable and culturally sensitive nutrition education—a finding consistent with evidence from Prasetyo et al. (2023), who concluded that maternal nutrition education can improve knowledge and feeding practices, although its impact on anthropometric status is not always consistent.

4.2 Frequency of Health Education Program Implementation

The frequency of health education program implementation was found to vary considerably across program components and localities, ranging from monthly routine activities to periodic scheduled visits such as home visits—a pattern reflective of a sustainable and adaptive intervention strategy. This importance of implementation frequency is well substantiated in the published literature: Apriliani et al. (2023) demonstrated a statistically significant positive correlation between the frequency of *posyandu* attendance and the nutritional status of toddlers ($p = 0.001$), and Destiadi et al. (2015) similarly reported that the frequency of *posyandu* visits was associated with a reduced risk of stunting among children aged 3–5 years, underscoring that repeated and sustained attendance constitutes a meaningful determinant of nutritional outcomes rather than a merely procedural metric.

The annual implementation of cadre capacity-building activities such as PMBA training present particular challenges for maintaining cadre competency and ensuring the sustained

effective delivery of long-term nutritional interventions. Whilst evidence from [Nuzula et al. \(2020\)](#) confirms that targeted health education for cadres through specific nutrition intervention training significantly improves their knowledge, and practical competencies, the effectiveness of annually delivered training is liable to diminish progressively in the absence of structured reinforcement and regular follow-up support. In this context, a combined strategy integrating high-frequency community-based activities with periodic intensive training represents a more robust and sustainable formula for maintaining the quality and impact of nutritional intervention delivery over time.

Specially scheduled programs, such as classes for pregnant women's classes and toddler mother classes — exhibited considerable variability in implementation frequency across field settings, reflecting the practical flexibility required to adapt program delivery to diverse local contexts, funding availability, and human resource capacity. This observation is consistent with the position advanced by [Nugraha et al. \(2021\)](#), who emphasize that community-based nutrition education programs must adopt adaptive and contextual methods for interventions to be effective.

4.3 Educational Media Employed in Program Implementation

The diversity of educational media employed across program sites — encompassing Mother and Child Health (KIA) books, printed leaflets, flyers, miniature teaching aids representing food portions, and digital resources including educational videos, QR code-linked digital content, and radio broadcasts — reflects a commendable and pragmatic adaptation to the local context and audience needs. The utilization of print media such as leaflets has been demonstrated to constitute an effective modality for the direct and accessible dissemination of nutrition messages, especially in rural low-resource settings, as evidenced by [Hasanica et al. \(2020\)](#), who reported that leaflets and health posters are associated with significant improvements in public health knowledge. Furthermore, the combined use of leaflets and video media has been demonstrated to produce significantly greater improvements in nutrition knowledge among target populations relative to either modality employed in isolation, as documented in multiple quasi-experimental studies ([Jannah & Jamni, 2022](#); [Zares & Simanungkalit, 2021](#)).

The strategic deployment of video-based educational materials within nutrition intervention programs warrants particular emphasis, especially when integrated with direct contact from cadres or health workers. [Peiris et al. \(2023\)](#) demonstrated that nutritional education delivered through videos media significantly enhanced maternal understanding of child care and feeding practices, whilst [Manullang et al. \(2025\)](#) reported that nutritional education videos were

comparably effective to leaflets in improving maternal knowledge regarding stunting prevention in the Indonesian context. The advantages of video media — encompassing richer content presentation, enhanced interactivity, and superior audience retention compared with static print materials — render it a particularly valuable component of a comprehensive educational communication strategy ([Afify, 2020](#); [Asmi et al., 2024](#)). Collectively, the multi-modal media approach documented in the present study constitutes a contextually appropriate and evidence-consistent educational communication strategy, well-suited to reaching diverse community segments characterized by varying educational backgrounds, literacy levels, and technology access.

4.4 Funding Sources for Health Education Programs

The cross-sectoral funding arrangements for nutrition education programs — involving collaborative financial contributions from community health centers and village-level development funds — reflect a strategically important and increasingly prevalent approach to the sustainable financing of community health interventions in the Indonesian context. Evidence from [Agustina, \(2025\)](#) and [Rahmawati et al., \(2023\)](#) confirms that funding for integrated health service post programs is predominantly derived from a combination of village funds (*dana desa*), Health Operational Assistance (*Bantuan Operasional Kesehatan* — BOK), and local community contributions. However, this funding faces challenges, as the management of village funds at the village level is delayed and not synchronized with the health program schedule.

The capacity of village administrative officials in financial management and budget allocation constitutes a critical determinant of the operational effectiveness of village-funded health programs, as demonstrated by [Suryani \(2022\)](#), whose findings confirm that village-level administrative competency directly influences the timeliness and adequacy of health budget disbursement. These observations are further corroborated by [Salwa et al. \(2024\)](#), who reported that the effective and continuous implementation of health programs requires sustained and synergistic collaboration between community health center operational funding streams and village development fund mechanisms.

The imperative of robust inter-institutional collaboration in providing stable long-term funding cannot be overstated. [Renzaho et al. \(2022\)](#) and [Sasmito et al. \(2025\)](#) collectively emphasize that cross-sectoral financial synergy is crucial to maintaining the sustainability of community-based health interventions. In the absence of stable, coordinated, and institutionally anchored funding support, nutrition education programs risk degenerating into episodic and inconsistently implemented activities, with predictable and significant

negative consequences for their capacity to produce sustained improvements in child nutritional status.

4.5 Constraints in Program Implementation

Caregiver-Level Constraints

A range of individual-level barriers were identified as significant determinants of the effectiveness of nutritional interventions, with technology access inequality constituting a particularly salient constraint. Disparities in digital infrastructure and technological literacy in rural communities substantially limit the reach and effectiveness of digitally mediated health education, consistent with the findings of Freeman *et al.* (2019) and Kusumawardani *et al.* (2020). Caregiver attitudes and established beliefs represent an additional and critical barrier: where parents perceive traditional feeding practices as adequate or reject evidence-based nutritional guidance as culturally incongruent, behavioral change is substantially impeded. This observation is consistent with evidence from Jhaveri *et al.* (2023) and Kavle & Landry, (2018), who demonstrated that effective nutritional education interventions must actively engage with and address cultural resistance and old norms for behavioral change to truly occur. Time constraints arising from maternal employment outside the home further compound these barriers, as working mothers frequently resort to processed or instant food products due to time limitations, and demonstrate consistently lower attendance at structured nutrition education sessions — a pattern reflective of the broader tension between productive employment and primary caregiving demands in peri-urban and rural communities.

Family-Level Constraints

Family-level constraints — most notably the delegation of primary childcare responsibilities to grandparents or hired caregivers during parental working hours — represent a significant structural barrier to the consistent application of recommended feeding practices within the household. These dynamics reflect intergenerational power asymmetries in parenting decision-making that fundamentally constrain the translation of maternal nutrition knowledge into consistent feeding practice. Furthermore, the prevalence of feeding attitudes prioritizing child compliance over nutritional quality — manifested as permissiveness towards food refusal and substitution with milk — was identified as a contributing factor to stunting and wasting even within economically sufficient households. These observations are consistent with the findings of Verma *et al.* (2024) and Yusriadi *et al.* (2024), whose investigations emphasize that culturally and behaviorally targeted change strategies are essential components of effective stunting prevention programs.

Health Worker and Operational Constraints

Operational constraints at the health worker and program implementer level were found to exert a significant inhibitory influence on program delivery. The financial burden imposed upon community health cadres substantially reduced cadre willingness to engage in and sustain local food-based supplementary feeding activities. This finding is consistent with evidence from Beggs *et al.* (2024) and Ireen *et al.*, (2018), who identified personnel burden and inadequate operational resource provision as major systemic barriers to the effective delivery of community-based nutrition interventions. These observations are further corroborated by Kusumawardani *et al.* (2020), who documented that limitations in human resources and deficiencies in cadre organization frequently constitute the most proximal and tractable determinants of community nutrition program effectiveness.

Limitations of the study

While this study provides important insights, several limitations should be noted. First, the reliance upon self-reported data from caregivers introduces a risk for recall bias, which may affect the accuracy and completeness of reported feeding practices and program participation. Second, the qualitative and observational nature of the study design limits the establishment of causal relationships between educational interventions and observed outcomes. Third, the study was conducted exclusively within Semarang Regency and may not be fully generalizable to other regencies or provinces characterized by different socioeconomic, geographical, or programmatic contexts. It is additionally noted that residents of urban areas within the study setting demonstrated comparatively greater access to digital technology, attributable to stronger internet connectivity and more accessible health facility infrastructure, which may have introduced differential information access across the study population.

Future Research Directions

The present study has documented the implementation landscape and key determinants of effectiveness of the local food-based supplementary feeding education program (PMT) for children under two years of age in Semarang Regency. These findings highlight several important priorities for future research. Longitudinal studies are required to assess the long-term effects of these programs on child nutritional status, growth trajectories, and developmental outcomes, particularly in rural and peri-urban areas characterized by limited resource availability. Future investigations should additionally explore the potential of digital and mobile health technologies to extend program reach to underserved and geographically isolated populations. Research addressing the systematic assessment and mitigation of potential biases in caregiver dietary reporting — including the use of objective

dietary assessment methods — is warranted. Finally, studies investigating effective strategies for the sustainable scale-up of local food-based supplementary feeding interventions — including analyses of cost-effectiveness, program fidelity, and implementation quality at scale — are required to inform evidence-based policy development and program optimization at the national level.

5 CONCLUSIONS

The findings of the present study demonstrate that health education programs targeting feeding practices for children under two years of age are most effective when delivered through structured, multi-component, community-based approaches that are systematically adapted to the socioeconomic, cultural, and infrastructural characteristics of the local context. The active involvement of various stakeholders, including health workers, *posyandu* cadres, village-level administrations, and community leaders, was identified as a critical determinant of program sustainability and operational effectiveness. The implementation of diverse array of educational activities, such as monthly *posyandu* sessions, home visits, pregnant women's classes, and toddler mother classes, reflects the flexibility required to respond effectively to the heterogeneous requirements and circumstances of the target community. Furthermore, the strategic utilization of multiple complementary educational media such as printed leaflets, educational videos, direct demonstrations, and miniature teaching aids, was found to substantially expand the reach of nutritional information and to enhance community understanding of balanced and contextually appropriate nutrition practices. Cross-sectoral financial support integrating village development funds (*dana desa*), Health Operational Assistance (*Bantuan Operasional Kesehatan* — BOK), and community contributions were additionally identified as essential mechanisms for sustaining the continuity and operational viability of these interventions at the local level.

Notwithstanding these strengths, the study identified a number of implementation challenges that constrain program effectiveness and equity, including disparities in caregiver access to digital technology, attitudinal and behavioral barriers to the adoption of evidence-based feeding practices, time constraints arising from maternal employment, intergenerational caregiving dynamics within the household, and operational and financial burdens placed upon community health cadres. These findings underscore the necessity of addressing not only the content and delivery of nutrition education but also the structural, financial, and human resource conditions that enable its consistent and equitable implementation.

Research Implications and Recommendations

The findings of this study carry substantive implications for the design, delivery, and governance of community-based nutrition education programs in Indonesia and comparable low- and middle-income country contexts. The following evidence-based recommendations are advanced for consideration by policymakers, program managers, and health system administrators:

Strengthening cadre capacity through continuous training and mentorship is essential to maintaining consistent nutrition education quality, as annual training cycles alone are insufficient without sustained reinforcement. The adoption of contextually relevant digital media — including videos, mobile health applications, and QR code-linked resources — can expand program reach, provided that concurrent investment in digital infrastructure and technological literacy in rural areas is ensured. Cross-sectoral coordination must be improved, particularly through the alignment of village fund disbursement cycles with health program schedules, supported by formal institutional frameworks governing collaboration between community health centers, village administrations, and the Health Office. Finally, nutrition education efforts should extend beyond primary caregivers to encompass the broader family unit — including grandparents and fathers — given the documented influence of intergenerational dynamics on feeding practice adoption.

Collectively, these strategic directions have the potential to substantially enhance caregiver knowledge and nutrition-related behaviors, and to contribute meaningfully to the reduction of stunting and wasting prevalence and the sustained improvement of child nutritional status in Semarang Regency and comparable settings across Indonesia.

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