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The Effectiveness of Community Health Nurse-Led Education on Mothers' Feeding Practices to Prevent Stunting in Rural Majalengka Regency

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Abstract

Stunting remains a leading public health problem in rural Indonesia, and inadequate maternal feeding practices during the complementary feeding window are among its most modifiable determinants. This study examined the effectiveness of a community health nurse (CHN)-led education programme in improving mothers' feeding practices in rural Majalengka Regency, West Java. A quasi-experimental pretest–posttest design with a control group was used. In total, 120 mothers of children aged 6–23 months were allocated by village cluster to an intervention group (CHN-led education comprising four weekly group sessions and two home visits) or a control group (standard posyandu care); 115 completed the 12-week follow-up. Feeding practices, maternal knowledge, and child dietary diversity were measured with validated instruments aligned to World Health Organization indicators, and analysed using t-tests, chi-square tests, and analysis of covariance. At week 12, the mean feeding practice score rose from 52.3 to 78.6 in the intervention group versus 51.8 to 58.2 in controls. The covariate-adjusted between-group difference was 18.9 points (95% CI 15.2–22.6; $p < 0.001$; Cohen's $d = 1.58$), and minimum dietary diversity reached 72.4% versus 42.1% in controls. CHN-led education substantially improved maternal feeding practices and is a scalable, nurse-driven strategy for stunting prevention in rural settings.

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INTRODUCTION

Childhood stunting, defined as a height-for-age more than two standard deviations below the World Health Organization child growth standards median, continues to be one of the most pressing indicators of chronic undernutrition worldwide and a sensitive marker of entrenched social and nutritional disadvantage (Mulyani et al., 2025) . Stunting during the first 1,000 days of life is associated with impaired linear growth, delayed cognitive development, poorer school performance, and an elevated long-term risk of noncommunicable disease, with consequences

that extend into adulthood and across generations (Sartika et al., 2025; Vir & Suri, 2023) . According to the 2024 Indonesian Nutritional Status Survey (Survei Status Gizi Indonesia, SSGI), national stunting prevalence fell only from 21.5% in 2023 to 19.8% in 2024, which remains far from the national target (Badan Kebijakan Pembangunan Kesehatan, 2025) . Indonesia carries one of the highest absolute burdens of stunting in Southeast Asia, and although national prevalence has declined over the past decade it remains well above the threshold the World Health Organization considers a public health concern, with persistent disparities between urban and rural populations (Qanita et al., 2025; Suratri et al., 2025). In rural regencies such as Majalengka in West Java, limited dietary diversity, constrained household resources, and uneven access to skilled nutrition counselling converge to keep a substantial share of children at risk of growth faltering (Masthalina et al., 2025) . Because the early height deficit that defines stunting is largely irreversible after the first two years of life, preventive effort must be concentrated early and must reach mothers where they live, making the quality of community-level nutrition support a decisive factor in whether rural children achieve their growth potential (Kumar et al., 2025).

Among the many determinants of stunting, maternal feeding practices during the complementary feeding period from six to twenty-three months are consistently identified as highly modifiable and strongly predictive of child nutritional status (Tan et al., 2024; Thenarangam et al., 2025). Appropriate practices—timely introduction of complementary foods, adequate meal frequency, a diverse diet drawn from multiple food groups, continued breastfeeding, responsive feeding, and hygienic food preparation—are protective against both stunting and the wider double burden of malnutrition (Çelik & Köksal, 2024; Mafhungo et al., 2025). Yet in many rural communities these practices fall short of recommended standards because mothers lack accurate knowledge, confidence, and practical support (Olukayode et al., 2025; Tololu et al., 2025). Maternal knowledge, attitudes, and caregiving autonomy have repeatedly been shown to shape the quality of complementary feeding and, ultimately, the odds that a child becomes stunted (Alristina et al., 2025; Zuraida et al., 2025). This positions maternal feeding behaviour as a logical and high-yield entry point for preventive intervention. Importantly, feeding practices are not fixed traits but learned behaviours that can be reshaped through appropriate education and support, which makes them a realistic target for health-system action even where incomes and food environments change only slowly (Mafhungo et al., 2025) .

The problem is that conventional nutrition services in rural Indonesia frequently fail to translate this evidence into behaviour change at the household level. Posyandu (integrated health post) activities emphasise growth monitoring and supplementary feeding but devote limited time to structured, skills-based education delivered by trained health professionals (Pratiwi et al., 2025; Sukamto et al., 2025). Educational contacts are often brief, didactic, and inconsistent, and the cadre volunteers who sustain these services typically lack the clinical training to counsel mothers on responsive feeding or to resolve individual feeding difficulties (Pratiwi et al., 2025). Socio-cultural beliefs, maternal employment, and family influences further complicate the adoption of recommended practices, and without sustained, culturally grounded guidance many mothers revert to suboptimal habits (Celebier et al., 2025; Mbhenyane et al., 2024). The result is a persistent implementation gap between what is known

about effective feeding and what is actually practised in rural homes, leaving the preventive potential of maternal education substantially unrealised in settings such as Majalengka. Closing this gap requires not merely more information, but education that is structured, repeated, skills-focused, and delivered by a facilitator whom mothers regard as competent and trustworthy.

A growing body of evidence indicates that education and counselling interventions can meaningfully improve maternal knowledge and child feeding when they are structured, repeated, and delivered by competent facilitators (de Hoop et al., 2025; Vilar-Compte et al., 2025). Community-based and nurse-delivered programmes in various low-resource settings have improved dietary diversity, breastfeeding, and nutritional status, and nurse-led breastfeeding and feeding education in particular has been linked to higher rates of recommended practice (Obonyo et al., 2025; Paudel et al., 2025; Solly et al., 2025). Interventions aligned to World Health Organization feeding recommendations have improved maternal knowledge, attitudes, and child weight, underscoring the value of standard-based content (Nafista et al., 2023) . Community health nurses occupy a strategic position within the Indonesian primary health system: they are clinically trained, trusted, embedded in the community, and able to combine group education with individualised home-based support. Despite this, rigorous evaluations of community health nurse-led feeding education remain scarce in rural Indonesia, where most nutrition education is still delivered by lay cadres or through one-off campaigns (Darmayanti et al., 2025; Pudjirahaju et al., 2025).

This gap defines the state of the art and the novelty of the present study. Prior Indonesian research has largely described the determinants of stunting or evaluated supplementary feeding, digital tools, and cadre-based activities, while comparatively little work has tested a professionally delivered, nurse-led education package as a behaviour-change strategy targeting the full set of World Health Organization infant and young child feeding domains (Kekalih et al., 2025; Suratri et al., 2025) . The novelty of this study lies in operationalising the community health nurse as the principal change agent and in measuring effectiveness against a composite, standard-based feeding practice outcome rather than knowledge alone, within a defined rural regency. By combining structured group sessions with home visits and responsive-feeding coaching, the intervention addresses both the cognitive and the practical barriers that limit behaviour change, offering a model that is clinically credible and potentially scalable through existing primary care staffing. Strengthening the evidence on such nurse-led models is directly relevant to Indonesia's national stunting reduction agenda and to the broader effort to prioritise nutrition interventions within the first 1,000 days (Akombi-Inyang, 2025; Rich et al., 2025).

Accordingly, the objective of this study was to evaluate the effectiveness of a community health nurse-led education programme in improving the feeding practices of mothers of children aged 6–23 months in rural Majalengka Regency. Specifically, the study aimed to compare feeding practice scores, maternal feeding knowledge, and child dietary diversity between an intervention group receiving the nurse-led programme and a control group receiving standard posyandu care, before and after the intervention, and to estimate the magnitude of the intervention effect after adjusting for baseline differences. It was hypothesised that mothers receiving community health nurse-led education would demonstrate significantly greater improvements in feeding practices, knowledge, and dietary diversity than mothers receiving standard care, thereby supporting nurse-led education as a practical

component of community stunting-prevention strategies (Ashraf et al., 2025; Kumar et al., 2025).

METHOD

Study Design and Setting

This study employed a quantitative quasi-experimental design with a pretest–posttest control group. The research was conducted over a 12-week period in four rural villages within the working area of a community health centre (puskesmas) in Majalengka Regency, West Java, Indonesia. The villages were purposively selected on the basis of a high reported burden of stunting and comparable socio-demographic profiles, and were then allocated by cluster to the intervention or control condition to minimise contamination between neighbouring mothers (Paudel et al., 2025).

Population, Sample, and Sampling

The target population comprised mothers of children aged 6–23 months—the complementary feeding window most relevant to stunting prevention (Vuong & Tran, 2025) . Inclusion criteria were permanent residence in the study village, a singleton index child aged 6–23 months, and willingness to participate throughout the study; mothers whose children had severe congenital or chronic illness affecting feeding were excluded. The minimum sample size for comparing two independent means was estimated using the following formula:

$$n = 2\,(Z\alpha/2 + Z\beta)^2\,\sigma^2 / (\mu_1 - \mu_2)^2$$

where $Z\alpha/2 = 1.96$ at a 95% confidence level, $Z\beta = 0.84$ for 80% power, σ is the pooled standard deviation of the feeding practice score, and $(\mu_1 - \mu_2)$ is the minimum detectable difference between groups. Applying a standard deviation of 9 points and a target difference of 6 points yielded a minimum of 36 mothers per group; this was inflated to 60 per group to accommodate the cluster design and anticipated attrition. A total of 120 mothers were enrolled, and 115 completed follow-up, as summarised in the participant flow diagram below.

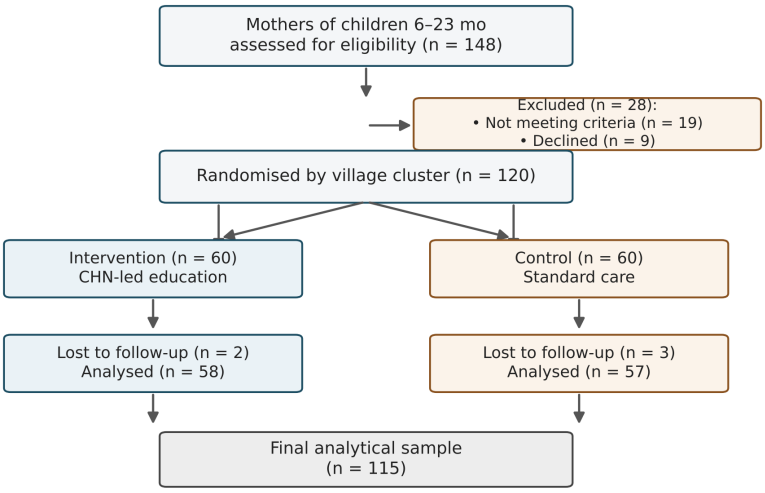


Figure 1. Participant flow diagram

Intervention

Mothers in the intervention group received a structured community health nurse-led education programme delivered by registered community health nurses who had completed a two-day standardisation workshop. The programme consisted of four weekly group sessions of approximately 60 minutes, each limited to 8–10 mothers, supplemented by two individual home visits at weeks 2 and 6. Content was organised around the World Health Organization infant and young child feeding domains and covered the timing and consistency of complementary foods, meal frequency, dietary diversity, continued breastfeeding, responsive feeding, and food hygiene, using locally available foods and culturally appropriate examples (Andargie et al., 2025; A. R. Chowdhury et al., 2025). Teaching methods combined short illustrated talks, cooking demonstrations, hands-on practice, and individualised problem solving during home visits. Mothers in the control group continued to receive standard monthly posyandu services, including growth monitoring and routine counselling, without the structured nurse-led curriculum (Sukamto et al., 2025) . The conceptual framework linking the intervention to the targeted outcomes is presented below **in Figure 2.**

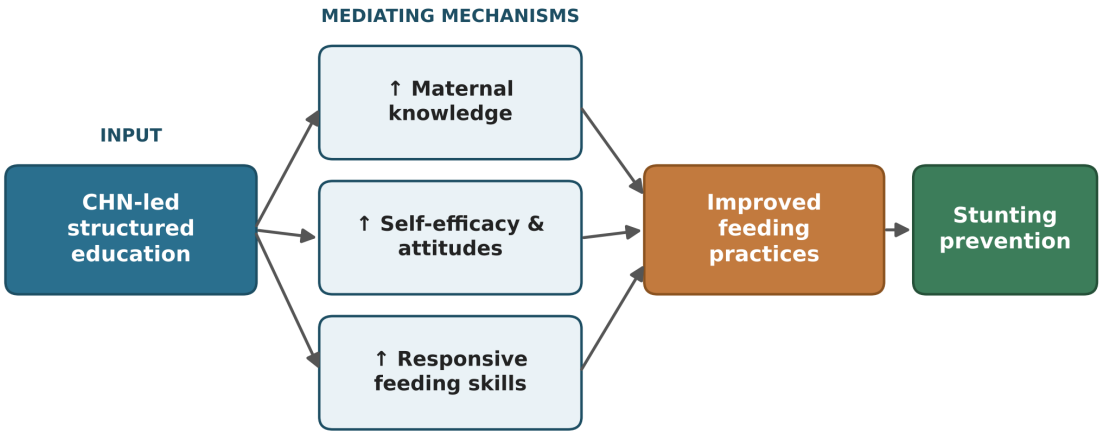


Figure 2. Conceptual framework of the community health nurse-led education programme

Instruments and Measurement

Three validated instruments were administered at baseline and at week 12. Maternal feeding practice was measured with a 20-item structured observation and interview checklist covering the six feeding domains, each item scored and transformed to a composite 0–100 scale. The composite feeding practice score was computed as:

$$FPS = (\Sigma w_i x_i / \Sigma w_i x_{max}) \times 100$$

where x_i is the score obtained on item i, x_{max} is the maximum attainable item score, and w_i is the domain weight. Domain sub-scores, including the responsive feeding sub-score reported in Table 3, were computed with the same formula restricted to the items of each domain [n] items for responsive feeding) and expressed on a 0–100 scale. Maternal knowledge

was assessed using a 25-item questionnaire (0–100), and child dietary diversity was evaluated using the World Health Organization minimum dietary diversity indicator based on eight food groups, with a diverse diet defined as consumption of at least five groups in the preceding 24 hours (Çelik & Köksal, 2024; Thenarangam et al., 2025). Instrument content validity was confirmed by three nutrition and nursing experts, and internal consistency was acceptable (Cronbach's $\alpha > 0.78$ for all scales). Enumerators collecting outcome data were independent of the nurses delivering the programme, however, because allocation was made at village level, they could not be fully blinded to group allocation.

Data Analysis

Data were analysed using statistical software with significance set at $p < 0.05$. Baseline comparability was assessed with independent t-tests and chi-square tests. Within-group change was evaluated using paired t-tests, and between-group differences at follow-up using independent t-tests and chi-square tests. To isolate the intervention effect while controlling for baseline scores and relevant maternal and child covariates, analysis of covariance (ANCOVA) was applied, and the standardised effect size (Cohen's d) was calculated (Vilar-Compte et al., 2025) . The study protocol was approved by an institutional health research ethics committee, and written informed consent was obtained from all participating mothers.

RESULTS AND DISCUSSION

Baseline Characteristics of Participants

A total of 115 mother–child pairs completed the study (intervention n = 58; control n = 57). The two groups were comparable at baseline across maternal age, education, employment, household size, child age, and sex, with no statistically significant differences, supporting the internal validity of the subsequent between-group comparisons. The baseline profile of participants is presented in the following table.

Table 1. Baseline characteristics of participants by group

Characteristic	Intervention (n = 58)	Control (n = 57)	p-value
Maternal age, years (mean ± SD)	28.4 ± 5.6	29.1 ± 6.0	0.52
Maternal education ≤ primary, n (%)	25 (43.1)	23 (40.4)	0.77
Employed mother, n (%)	19 (32.8)	21 (36.8)	0.65
Household size ≥ 5, n (%)	31 (53.4)	29 (50.9)	0.78
Child age, months (mean ± SD)	13.9 ± 4.8	14.3 ± 5.1	0.66
Male child, n (%)	30 (51.7)	31 (54.4)	0.77
Baseline stunting (HAZ < −2), n (%)	17 (29.3)	16 (28.1)	0.88

Effect on Maternal Feeding Practices and Knowledge

At baseline, mean feeding practice scores were almost identical between groups (intervention 52.3; control 51.8). After the 12-week programme, the intervention group improved to 78.6 while the control group reached only 58.2. Maternal knowledge followed the same pattern, rising from 54.1 to 82.7 in the intervention group compared with 53.5 to 61.0 in controls. The paired improvements within the intervention group were statistically significant

($p < 0.001$), and far exceeded the modest gains seen under standard care. These pre–post results are displayed in figure 3.

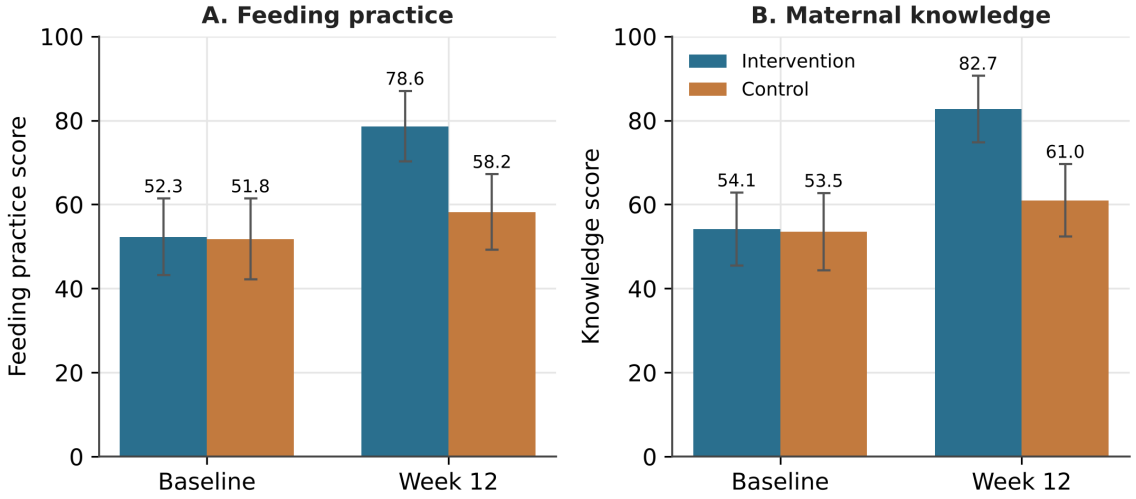


Figure 3. Mean (± SD) feeding practice (A) and maternal knowledge (B) scores at baseline and week 12, by group

The within- and between-group comparisons, together with the covariate-adjusted effects, are summarised in the following tables. After adjusting for baseline scores and maternal and child covariates, the intervention produced an adjusted mean difference of 18.9 points in the feeding practice score (95% CI 15.2–22.6; $p < 0.001$), corresponding to a large effect size (Cohen's d = 1.58). This magnitude is consistent with, and in several cases larger than, improvements reported for community- and nurse-delivered nutrition education elsewhere (Nafista et al., 2023; Obonyo et al., 2025; Paudel et al., 2025).

Table 2. Within-group changes in outcomes from baseline to week 12 (mean ± SD or %)

Outcome (0–100 unless stated)	Group	Baseline	Week 12	Mean change	p (within)
Feeding practice score	Intervention	52.3 ± 9.1	78.6 ± 8.4	+26.3	<0.001
	Control	51.8 ± 9.6	58.2 ± 9.0	+6.4	<0.001
Maternal knowledge score	Intervention	54.1 ± 8.7	82.7 ± 7.9	+28.6	<0.001
	Control	53.5 ± 9.2	61.0 ± 8.6	+7.5	<0.001
Minimum dietary diversity, %	Intervention	34.5	72.4	+37.9	<0.001
	Control	33.3	42.1	+8.8	0.04

Table 3. Covariate-adjusted between-group differences at week 12

Outcome	Adjusted mean difference	95% CI	Cohen's d	p-value
Feeding practice score	18.9	15.2 – 22.6	1.58	<0.001
Maternal knowledge score	20.2	16.4 – 24.0	1.71	<0.001
Responsive feeding sub-score	23.7	18.9 – 28.5	1.49	<0.001
Minimum dietary diversity (OR)	3.58	1.98 – 6.47	—	<0.001

Note. Adjusted for the baseline score and Cohen's d = adjusted mean difference / pooled week-12 SD; OR = odds ratio from logistic regression; CI = confidence interval.

Changes Across Feeding Domains and Over Time

The intervention effect was evident across every feeding domain. The largest relative gains occurred in dietary diversity, responsive feeding, and hygienic food preparation—domains that depend heavily on skills and confidence rather than resources alone, and that are therefore particularly responsive to hands-on, nurse-led coaching (Andargie et al., 2025; Mbhenyane et al., 2024). The domain-level comparison at week 12 is shown in Figure 4. At week 12, the between-group gap was approximately 30 percentage points for minimum dietary diversity (72% vs. 42%), hygienic food preparation (79% vs. 49%), and overall feeding adequacy (69% vs. 39%), 27 points for responsive feeding (80% vs. 53%), and 26 points for minimum meal frequency (81% vs. 55%). The smallest gap was observed for continued breastfeeding (86% vs. 70%), a practice that was already relatively common in both groups

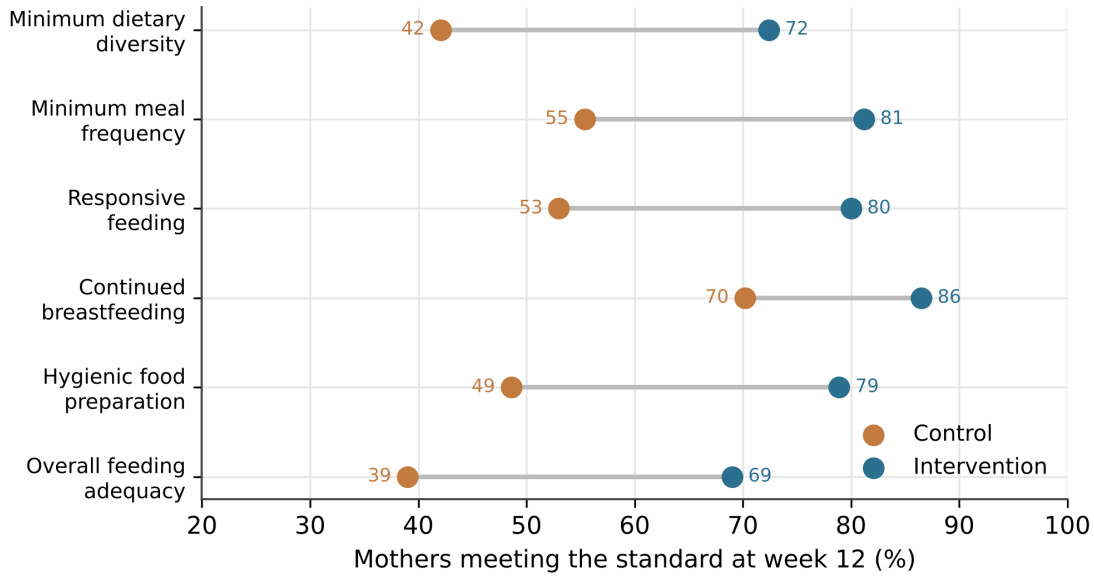


Figure 4. Proportion of mothers meeting the standard for each feeding domain at week 12, by group

Tracking the feeding practice score across the four measurement points reveals a steady, sustained divergence between the groups, with the intervention group improving progressively

after each contact while the control group remained comparatively flat. This dose–response pattern strengthens the inference that the structured, repeated nurse-led contacts—rather than secular trends or assessment effects—drove the observed change (de Hoop et al., 2025; Vilar-Compte et al., 2025) . The trajectory is illustrated in the following figure.

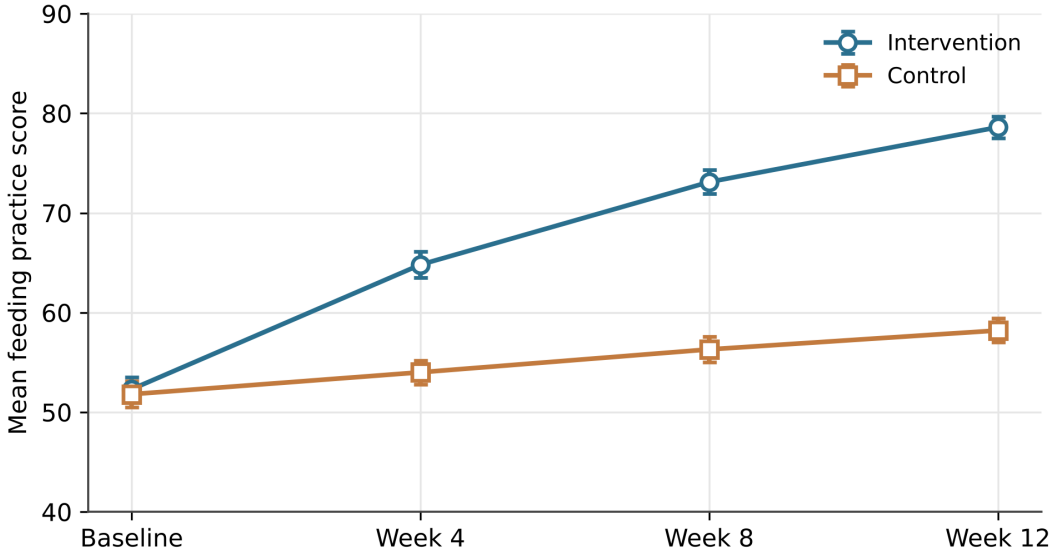


Figure 5. Mean feeding practice score across the four measurement points, by group

Discussion

The findings demonstrate that a community health nurse-led education programme substantially improved maternal feeding practices, knowledge, and child dietary diversity in a rural Indonesian setting, and that these gains clearly exceeded those achieved through standard posyandu care. The result aligns with the broader evidence that maternal knowledge and caregiving behaviour are central, modifiable determinants of complementary feeding quality and, ultimately, of stunting risk (Alristina et al., 2025; Zuraida et al., 2025). By targeting the full set of World Health Organization feeding domains and combining group education with individualised home support, the programme addressed both the cognitive and the practical barriers that typically limit behaviour change in rural households (Celebier et al., 2025; Tololu et al., 2025).

Several features of the intervention appear to explain its effectiveness. First, delivery by clinically trained community health nurses, rather than lay cadres alone, provided credible, individualised counselling capable of resolving specific feeding difficulties—an element often missing from routine services (Pratiwi et al., 2025; Solly et al., 2025). Second, the repeated structure and home-visit component created multiple opportunities for practice and reinforcement, consistent with the dose–response trajectory observed and with evidence that sustained contact outperforms one-off education (Nafista et al., 2023; Paudel et al., 2025). Third, grounding the content in locally available foods improved feasibility and acceptability, mirroring successful context-adapted approaches reported elsewhere (Z. T. Chowdhury et al., 2025; Mafhungo et al., 2025) . The pronounced improvement in dietary diversity is particularly important, because inadequate diversity is one of the most consistent correlates of poor

nutritional status among children aged 6–23 months (Çelik & Köksal, 2024; Olukayode et al., 2025; Thenarangam et al., 2025).

When compared with previous studies, the direction of the present findings is consistent with community- and nurse-delivered nutrition education evaluated in other low-resource settings, including the community-based programme for undernourished children in rural Nepal (Paudel et al., 2025) , education on World Health Organization feeding recommendations that improved maternal knowledge, attitudes, and child weight in Indonesia (Nafista et al., 2023) , and hands-on breastfeeding education for maternity nurses associated with higher exclusive breastmilk feeding (Solly et al., 2025) . Within Indonesia, the findings complement the quasi-experimental evaluation of feeding guidance delivered through the Posyandu Pintar application (Darmayanti et al., 2025) , suggesting that face-to-face, professionally delivered coaching can produce behavioural change of at least comparable magnitude. Nevertheless, standardised effect sizes above 2 are unusually large for a behavioural intervention and should be interpreted cautiously, because estimates derived from only two clusters per arm, with partly self-reported and observer-assessed outcomes, may be inflated by village-level differences and measurement reactivity. The relatively small gap in continued breastfeeding suggests that this practice was already widely accepted in the study communities; maintaining exclusive and continued breastfeeding alongside diverse complementary feeding nonetheless remains central to the stunting-prevention pathway (Bancin et al., 2025; Safitri et al., 2025).

These results extend the Indonesian evidence base, which has largely focused on the determinants of stunting, supplementary feeding, digital reminders, or cadre-based activities, by showing that a professionally delivered, nurse-led education model is both effective and plausibly scalable within existing primary care structures (Darmayanti et al., 2025; Pudjirahaju et al., 2025; Suratri et al., 2023, 2025). Because community health nurses are already embedded in the puskesmas system, the model offers a realistic pathway for strengthening the nutrition-education component of Indonesia's stunting-reduction strategy during the critical first 1,000 days (Rich et al., 2025; Sartika et al., 2025). The approach is also congruent with global calls to prioritise nutrition-sensitive and nutrition-specific interventions that improve maternal capability and child feeding (Akombi-Inyang, 2025; Ashraf et al., 2025; Kumar et al., 2025).

Some limitations should be acknowledged. The quasi-experimental, cluster-allocated design and the single-regency setting limit causal certainty and generalisability, and the 12-week follow-up captured proximal behavioural outcomes rather than long-term changes in linear growth (Ndahimana et al., 2025) . Self-reported and observed feeding measures may be subject to social-desirability bias, although independent enumerators and direct observation were used to mitigate this. Household socio-economic and cultural factors that also shape feeding were controlled statistically but not eliminated (Kekalih et al., 2025; Masthalina et al., 2025; Qanita et al., 2025) . Future research should employ randomised designs with longer follow-up and anthropometric endpoints to confirm whether the behavioural gains translate into measurable reductions in stunting, and should assess the cost-effectiveness and sustainability of nurse-led delivery at scale (Vuong & Tran, 2025).

CONCLUSION

This study provides promising evidence that a community health nurse-led education programme improves mothers' feeding practices, nutrition knowledge, and child dietary diversity in rural Majalengka Regency. Compared with standard posyandu care, mothers who received four structured group sessions and two home visits achieved a substantially greater adjusted improvement in feeding practice scores, and the proportion of children meeting minimum dietary diversity nearly doubled. Because community health nurses are already embedded in the puskesmas system, the model offers a practical and potentially scalable means of strengthening the behaviour-change component of stunting prevention. Integrating structured nurse-led feeding education into routine rural nutrition services is therefore recommended. However, given the small number of clusters and the short follow-up, cluster-randomised trials with longer follow-up and growth outcomes are needed to confirm its impact on stunting.

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CONFLICT OF INTEREST

The authors declare that this research was conducted without any commercial or financial relationships that could be construed as a potential conflict of interest.

AUTHOR CONTRIBUTION

Wawan Kurniawan contributed to the conceptualisation and design of the study, development and supervision of the community health nurse-led education programme, data collection, interpretation of the findings, and preparation of the original manuscript. Ikhsan Nendi contributed to the methodology, data analysis, interpretation of the findings, and critical review and revision of the manuscript. Both authors reviewed and approved the final manuscript and agree to be accountable for the integrity of the work.

GENERATIVE ARTIFICIAL INTELLIGENCE USAGE STATEMENT

The authors acknowledge the limited use of generative artificial intelligence tools to assist with language editing and figure formatting during manuscript preparation. All scientific content, data analyses, and interpretations were produced and verified by the authors. Both authors reviewed and approved the final manuscript and take full responsibility for its accuracy, originality, and integrity.

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