

## Local food-based supplementary feeding training: Improving caregiver capacity for undernourished children in Enrekang

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### ABSTRACT

Although local-food-based supplementary feeding is increasingly promoted as a sustainable strategy for addressing childhood undernutrition, evidence on participatory training that simultaneously strengthens caregivers' knowledge and practical food-preparation skills remains limited. This community service program aimed to improve the knowledge and skills of mothers of undernourished children and community health cadres in preparing and utilizing local-food-based Supplementary Feeding (PMT). The program was conducted in the working area of Buntu Batu Community Health Center, Enrekang Regency, South Sulawesi, involving 35 participants. Activities consisted of nutrition education, interactive discussions, food-preparation demonstrations, and supervised hands-on practice using locally available ingredients. Knowledge was assessed using pre-test and post-test questionnaires, while practical skills were evaluated using observation sheets. The mean knowledge score increased from 56.6 before training to 78.2 after training, representing an increase of 21.6 points. Similarly, the mean practical skill score increased from 58.34 to 84.26, an improvement of 25.92 points. These findings demonstrate substantial descriptive improvements in participants' capacity to select, prepare, and serve nutritionally appropriate local supplementary foods. Integrating nutrition education with practical training may therefore support community empowerment, household-level utilization of local foods, and sustainable public health interventions for preventing and managing undernutrition among children under five.

### ABSTRAK

Meskipun pemberian makanan tambahan berbasis pangan lokal semakin banyak dipromosikan sebagai strategi berkelanjutan untuk mengatasi masalah kekurangan gizi pada anak, bukti mengenai pelatihan partisipatif yang secara simultan meningkatkan pengetahuan pengasuh dan keterampilan praktis dalam pengolahan makanan masih terbatas. Program pengabdian kepada masyarakat ini bertujuan untuk meningkatkan pengetahuan dan keterampilan ibu yang memiliki balita gizi kurang serta kader kesehatan masyarakat dalam menyiapkan dan memanfaatkan Pemberian Makanan Tambahan (PMT) berbasis pangan lokal. Program dilaksanakan di wilayah kerja Puskesmas Buntu Batu, Kabupaten Enrekang, Sulawesi Selatan, dengan melibatkan 35 peserta. Kegiatan meliputi edukasi gizi, diskusi interaktif, demonstrasi pengolahan makanan, serta praktik langsung dengan pendampingan menggunakan bahan pangan yang tersedia secara lokal. Pengetahuan peserta dinilai menggunakan kuesioner pre-test dan post-test, sedangkan keterampilan praktis dievaluasi menggunakan lembar observasi. Rerata skor pengetahuan meningkat dari 56,6 sebelum pelatihan menjadi 78,2 setelah pelatihan, atau mengalami peningkatan sebesar 21,6 poin. Demikian pula, rerata skor keterampilan praktis meningkat dari 58,34 menjadi 84,26, dengan peningkatan sebesar 25,92 poin. Temuan ini menunjukkan adanya peningkatan deskriptif yang substansial dalam kemampuan peserta untuk memilih, menyiapkan, dan menyajikan makanan tambahan lokal yang sesuai dengan kebutuhan gizi. Integrasi edukasi gizi dengan pelatihan praktis dapat mendukung pemberdayaan masyarakat, meningkatkan pemanfaatan pangan lokal di tingkat rumah tangga, serta memperkuat intervensi kesehatan masyarakat yang berkelanjutan dalam upaya pencegahan dan penanganan masalah kekurangan gizi pada balita.

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## INTRODUCTION

Undernutrition among children under five remains an important public health challenge because inadequate intake of energy, protein, and micronutrients during early childhood can adversely affect physical growth, cognitive development, immune function, and susceptibility to infectious diseases (Addo et al., 2023; Birhanu et al., 2024). Nutritional deficiencies occurring during critical periods of growth may also produce long-term consequences for educational achievement, productivity, and future human capital. Childhood undernutrition is multifactorial and is influenced not only by inadequate food intake but also by poor dietary quality, recurrent infections, socioeconomic conditions, caregiving practices, and the household environment (Dassie et al., 2024; Dwomoh et al., 2023). The first years of life are particularly important because nutritional deprivation during this period can lead to persistent growth and developmental deficits (Alves & Alves, 2024; Kiani et al., 2022). Therefore, prevention and management of undernutrition require comprehensive interventions integrating nutrition promotion, disease prevention, appropriate feeding practices, and community empowerment.

One strategy for improving the nutritional status of undernourished children is Supplementary Feeding (PMT), which is intended to complement rather than replace the child's regular diet. Supplementary foods should contribute additional energy, protein, vitamins, and minerals when daily dietary intake is insufficient to meet growth requirements. The effectiveness of supplementary feeding is influenced by nutritional composition, acceptability, adherence, food safety, and caregiver involvement in feeding practices (Hanifa et al., 2026; Spyreli et al., 2022). In this context, locally available foods provide an important opportunity for sustainable nutrition interventions. Fish, eggs, legumes, tubers, green leafy vegetables, moringa leaves, and other locally available foods can provide nutrient-dense ingredients that are affordable, culturally acceptable, and accessible to families. Local-food-based PMT may therefore improve dietary quality while simultaneously strengthening household food self-reliance.

Despite the availability of nutritionally valuable local foods, their utilization for supplementary feeding among undernourished children remains suboptimal. Many caregivers have limited knowledge and practical skills in selecting appropriate ingredients, combining foods to achieve balanced nutrient content, applying cooking techniques that preserve nutritional value, and presenting foods in forms that are acceptable to young children. Consequently, families may depend on monotonous foods that provide satiety but insufficient dietary diversity and nutrient density. Dietary diversity is an important indicator of child diet quality because children consuming a wider variety of food groups are more likely to meet their requirements for essential nutrients (Herforth et al., 2024; Russo et al., 2023). Addressing this gap therefore requires not only the provision of supplementary foods, but also interventions that improve caregiver knowledge, practical food-preparation skills, and confidence in utilizing local resources.

Nutrition education combined with demonstration and hands-on practice represents a practical strategy for improving child-feeding behavior. Caregiver knowledge is closely related to decisions regarding food selection, preparation, meal frequency, and feeding practices. Educational interventions are more likely to translate into practice when participants are actively involved in preparing foods rather than receiving information alone. Such approaches can strengthen understanding of balanced nutrition while improving practical competence in transforming local ingredients into safe, affordable, and nutrient-dense meals for young children (Chagwena et al., 2024; Swanson et al., 2025).

Local-food-based interventions also have advantages in sustainability because they can be adapted to seasonal availability, household purchasing power, cultural preferences, and existing food habits. Food-based strategies are therefore particularly relevant in community settings where long-term dependence on commercially manufactured supplementary products may be financially or logistically difficult. Evidence indicates that complementary and supplementary feeding interventions should emphasize both adequate nutrient intake and improvement in dietary quality and diversity (Bechoff et al., 2023; Harrison et al., 2023; Capra et al., 2024). Training mothers and community health

cadres to prepare local PMT can thus serve as both a nutrition intervention and a community empowerment strategy.

Although previous studies have highlighted the importance of supplementary feeding, dietary diversity, and caregiver education, fewer community-based interventions have integrated nutrition education, food demonstration, direct preparation practice, and the utilization of locally available ingredients within a single empowerment program. This gap is particularly relevant in areas where local food resources are abundant but caregiver knowledge and practical utilization remain limited. The working area of Buntu Batu Community Health Center, Buntu Batu District, Enrekang Regency, was considered suitable for this intervention because it serves a substantial population of children under five, continues to face nutritional problems, actively implements maternal and child health and integrated health-post programs, and has access to diverse local food resources. These conditions create an appropriate setting for a context-specific community nutrition intervention.

The novelty of this community service program lies in combining locally based supplementary feeding with participatory training targeting both mothers of undernourished children and community health cadres, thereby strengthening household-level practices and community-level support simultaneously. The activity involved 35 participants and incorporated health education, interactive discussion, demonstrations, and hands-on preparation of local PMT. Knowledge improvement was assessed using pre-test and post-test questionnaires, while practical skills were evaluated through observation sheets. Accordingly, this program aimed to improve participants' knowledge and skills in preparing and utilizing Local Supplementary Feeding based on locally available foods as a sustainable strategy to support nutritional improvement among undernourished children under five.

## METHODS

This community service program was conducted in the working area of Buntu Batu Community Health Center, Buntu Batu District, Enrekang Regency, South Sulawesi Province. The primary participants were mothers of undernourished children under five and community health cadres who were involved in nutrition improvement activities at the community level. A total of 35 participants took part in the program. The activity was designed using an educational and participatory approach so that participants could acquire not only theoretical knowledge but also practical skills in preparing and utilizing locally available foods as Supplementary Feeding (PMT) for undernourished children.

The program consisted of three main stages: preparation, implementation, and evaluation. During the preparation stage, coordination was carried out with Buntu Batu Community Health Center to determine the implementation schedule, participant targets, venue, and logistical requirements, including equipment and ingredients needed for the training. Local food resources commonly available in the community were also identified to ensure that the supplementary feeding menus introduced during the training were affordable, accessible, and appropriate to local dietary practices. This approach was intended to facilitate the continued application of the intervention by participants after completion of the program.

The implementation stage began with nutrition education addressing balanced nutrition for children under five, the potential effects of undernutrition on child growth and development, and the role of local supplementary feeding in helping meet children's energy and nutrient requirements. The educational material was delivered through interactive lectures combined with question-and-answer sessions and group discussions. This format was used to encourage active participation and provide participants with opportunities to discuss nutritional problems commonly encountered in their households and communities.

Following the educational session, the community service team conducted a demonstration of local PMT preparation using food ingredients that were readily available in the Buntu Batu area. The demonstration covered the selection and combination of nutrient-dense foods, appropriate food-processing methods to minimize nutrient loss, portion adjustment according to the child's age, and attractive presentation techniques to improve food acceptance among young children. Participants were subsequently divided into small groups and engaged in hands-on preparation of local PMT

menus under direct supervision and guidance from the community service team. This practical component was intended to strengthen participants' confidence and ability to independently reproduce the menus at home and during community nutrition activities.

Program evaluation was conducted to assess changes in participants' knowledge and practical skills. Knowledge was evaluated using pre-test and post-test questionnaires administered before and after the educational and training sessions. The questionnaires assessed participants' understanding of balanced nutrition, undernutrition, appropriate supplementary feeding, selection of local food ingredients, and preparation of nutrient-dense PMT. Practical skills were evaluated using structured observation sheets during the hands-on sessions. The observed indicators included participants' ability to select appropriate ingredients, follow recommended preparation procedures, apply hygienic food-processing practices, determine suitable portions, and present local PMT according to the training instructions.

Participants were also invited to provide feedback regarding the relevance, clarity, and feasibility of the training activities. This feedback was used as additional information for evaluating the implementation process and improving future community-based nutrition programs. Data obtained from the pre-test, post-test, and practical skill observations were analyzed descriptively. Knowledge scores before and after the intervention were compared to identify changes following the training, while participants' practical performance was summarized based on the observation results. The findings were presented in narrative and tabular forms to describe the effectiveness of the program in improving the knowledge and practical capacity of mothers and community health cadres to utilize locally available foods as supplementary feeding to support the nutritional improvement of undernourished children.

## RESULTS AND DISCUSSION

The findings indicate that the local-food-based Supplementary Feeding (PMT) training was accompanied by substantial improvements in both participants' knowledge and practical skills, suggesting that the program achieved its immediate objective of strengthening the capacity of mothers of undernourished children and community health cadres. The training combined nutrition education, interactive discussion, demonstration, and hands-on practice using locally available foods. Participants showed active engagement throughout the activities, particularly during discussions on food selection, menu variation, food-processing techniques, and strategies to improve children's appetite.

### Improvement in Participants' Knowledge

A total of 35 participants completed the knowledge assessment before and after the training. The mean pre-test score was  $56.6 \pm 5.3$ , with scores ranging from 47 to 65. Following the intervention, the mean post-test score increased to  $78.2 \pm 5.1$ , with a range of 69–87. Therefore, the average knowledge score increased by 21.6 points after the training. The slightly lower standard deviation after the intervention, from 5.3 to 5.1, also suggests that participants' knowledge scores became somewhat more homogeneous following the educational activities (see Table 1).

**Table 1**  
*Descriptive Statistics of Pre-test and Post-test Knowledge Scores*

| Variable  | n  | Mean | SD  | Minimum | Maximum |
|-----------|----|------|-----|---------|---------|
| Pre-test  | 35 | 56.6 | 5.3 | 47      | 65      |
| Post-test | 35 | 78.2 | 5.1 | 69      | 87      |

Before the training, some participants perceived supplementary feeding primarily as packaged products or food assistance provided through government programs. After the educational sessions, participants demonstrated greater understanding that supplementary foods can be prepared independently using locally available ingredients, provided that nutritional balance, food safety, and children's nutritional requirements are considered. Participants also developed

greater understanding of the need to combine energy sources, protein-rich foods, vitamins, and minerals when preparing supplementary meals for children.

The observed improvement is consistent with previous evidence suggesting that nutrition education can strengthen caregivers' understanding of appropriate infant and young-child feeding practices. Educational interventions are particularly useful when information is delivered using simple language, familiar food examples, and opportunities for participants to interact with educators. Dewey and Adu-Afarwuah (2008) emphasized that complementary feeding interventions should address not only the availability of food but also caregivers' capacity to provide nutritionally appropriate diets. Similarly, Stewart et al. (2013) highlighted the importance of improving feeding practices as part of interventions addressing childhood undernutrition.

The participatory characteristics of the present program may provide an advantage over education that relies only on one-way information delivery. Participants were encouraged to ask questions, relate the information to daily feeding problems, and discuss locally available food alternatives. Such interaction may make nutritional information easier to understand and more applicable to household circumstances. This approach is consistent with evidence showing that educational interventions directed toward caregivers can improve feeding knowledge and practices when they are adapted to the participants' context (Arikpo et al., 2018). The use of foods familiar to participants also strengthened the practical relevance of the intervention because the recommended dietary changes did not depend entirely on commercially manufactured products.

The increase in knowledge has important implications for community-based nutrition interventions. Caregivers with better nutritional understanding may be more capable of selecting appropriate ingredients, combining food groups, and providing supplementary meals that improve dietary variety and nutrient density. For community health cadres, improved knowledge may also strengthen their ability to provide consistent nutrition messages during community health activities.

However, the findings should be interpreted as descriptive changes rather than definitive evidence of causal effectiveness. No control group was included, and no inferential statistical test was reported to determine whether the difference between pre-test and post-test scores was statistically significant. Nevertheless, the magnitude and consistency of the descriptive increase suggest that participatory nutrition education is promising as a component of community empowerment programs.

## Improvement in Practical Skills

The second major finding was the improvement in participants' practical skills in preparing local PMT. Before the intervention, the mean skill score was  $58.34 \pm 6.12$ , with scores ranging from 46 to 69. After the training, the mean score increased to  $84.26 \pm 5.47$ , with a minimum score of 73 and a maximum of 94. The average increase of 25.92 points was greater than the increase observed for knowledge, indicating that the hands-on component was accompanied by a marked improvement in practical performance (see Table 2).

The reduction in the standard deviation from 6.12 to 5.47 indicates that participants' skill levels became more similar after the training. During practice sessions, participants were guided in selecting ingredients, applying appropriate preparation techniques, preparing child-appropriate portions, and presenting foods in attractive forms. This process gave participants direct experience in converting nutrition information into practical feeding activities.

**Table 2**  
*Descriptive Statistics of Practical Skills Before and After Training*

| Variable                   | n  | Mean  | SD   | Minimum | Maximum |
|----------------------------|----|-------|------|---------|---------|
| Skills before intervention | 35 | 58.34 | 6.12 | 46      | 69      |
| Skills after intervention  | 35 | 84.26 | 5.47 | 73      | 94      |



The improvement in practical skills supports the value of combining information with direct experiential learning. Nutrition knowledge alone does not necessarily result in behavioral change if caregivers lack the confidence or practical ability to implement recommended practices. The present program addressed this gap by providing demonstrations followed by supervised practice, allowing participants to reproduce the procedures themselves.

This finding is consistent with broader evidence that child nutrition interventions are more likely to influence household practices when education is combined with feasible behavioral strategies (Bhutta et al., 2013; Ruel et al., 2013). The advantage of the current training approach lies in its emphasis on practical application using ingredients already available in the local environment. Instead of introducing unfamiliar or expensive products, participants learned how to transform commonly available foods into supplementary meals. This approach may reduce barriers related to affordability, availability, and cultural acceptance.

Improved food-preparation skills are particularly important because dietary recommendations must ultimately be implemented within households. The ability to select, prepare, combine, and serve foods appropriately may help caregivers translate nutritional knowledge into daily feeding practices. In addition, community health cadres who develop these skills can potentially demonstrate PMT preparation to other families, extending the benefits of training beyond the initial participants.

The findings also suggest that future community nutrition programs should maintain an experiential learning component rather than relying exclusively on lectures. Repeated demonstrations, supervised practice, recipe adaptation, and follow-up mentoring may help reinforce newly acquired skills and support long-term behavior change. Nevertheless, the present evaluation assessed skills immediately following training; therefore, the persistence of these skills over time remains unknown.

## **Utilization of Local Foods and Participant Engagement**

Another important finding was the high level of participant engagement during discussions, demonstrations, and practical sessions. Participants raised questions regarding appropriate food ingredients, menu variation, processing methods, and strategies to improve children's appetite. Local foods were considered particularly suitable because they were readily available, relatively affordable, and consistent with local dietary habits.

This contextual relevance is central to the intervention. Local foods such as fish, eggs, legumes, tubers, and vegetables can be incorporated into supplementary meals without requiring families to depend on specialized products. Their use therefore supports both nutritional improvement and household self-reliance.

The use of local foods is consistent with food-based approaches emphasizing dietary diversity and nutrient density rather than dependence on a single supplementary product. Ruel et al. (2013) emphasized that interventions addressing maternal and child nutrition should improve overall dietary quality and promote sustainable practices. Dewey and Adu-Afarwuah (2008) similarly emphasized the importance of complementary feeding strategies that are feasible within household and community contexts.

Compared with interventions dependent on externally supplied foods, local-food-based PMT has the potential advantage of greater accessibility and cultural compatibility. However, this advantage depends on continued availability, affordability, caregiver motivation, and adequate nutrition knowledge. Consequently, local food utilization should be accompanied by continuous education and monitoring.

Overall, the program demonstrates the potential value of integrating nutrition education, participatory discussion, food demonstrations, and hands-on practice into community-based efforts to address undernutrition among children under five. The concurrent improvements in knowledge and skills indicate that the program successfully strengthened participants' immediate capacity to prepare and utilize local PMT. These findings are relevant to primary health care because community health centers and cadres can serve as sustainable platforms for replicating similar activities.

Future programs should incorporate follow-up assessments to determine whether improved knowledge and skills are maintained and translated into regular household feeding practices. Subsequent evaluations should also assess dietary diversity, PMT consumption, child weight gain, and nutritional status to determine whether improvements in caregiver capacity produce measurable health outcomes. The inclusion of comparison groups and appropriate inferential analyses would further strengthen evidence regarding program effectiveness. Thus, local-food-based PMT training represents a promising community empowerment strategy, but its long-term contribution to nutritional recovery should be evaluated through more rigorous and sustained monitoring.

## CONCLUSION

The community service program on the preparation and utilization of local-food-based Supplementary Feeding (PMT) in the working area of Buntu Batu Community Health Center was successfully implemented and received high participation from mothers of children under five and community health cadres. The mean knowledge score increased from 56.6 before the intervention to 78.2 after the intervention, representing an increase of 21.6 points. Practical skill scores also increased from 58.34 to 84.26, with an improvement of 25.92 points. These findings indicate that combining nutrition education with demonstrations and hands-on practice can strengthen participants' knowledge and skills in selecting, processing, and serving locally available foods as PMT. The program highlights the potential of local-food-based nutrition interventions to support community empowerment and the prevention of undernutrition among children under five. Continued mentoring by community health centers and health cadres, supported by local government and academic institutions, is recommended to maintain participants' practices and expand similar programs. Future activities should include longer-term monitoring of feeding practices and child nutritional outcomes.

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## AUTHORS' CONTRIBUTION

Ma'rifat Istiq Mukty: Conceptualization, methodology, supervision, and manuscript preparation. Zulfitriwati: Training implementation and data collection. Dien Abdul Munir: Participant coordination and data collection. Andi Ade Ulasaswini: Training implementation and community engagement. Nurhidayah Tiasya Sanas: Data documentation and activity administration. Nina Isywar Kusuma: Data analysis and manuscript review. All authors contributed to the implementation of the community service activity, reviewed the final manuscript, and approved the version submitted for publication.

## COMPETING INTEREST

The author(s) declare no potential conflict of interest with respect to the research, authorship, or publication

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