Volume 10, Issue 9, September – 2025 International Journal of Innovative Science and Research Technology
ISSN No:-2456-2165 https://doi.org/10.38124/ijisrt/25sep426

Improving the Knowledge of Posyandu Cadres and the Practice of Making Supplementary Food from Local Food Sources for Stunting Prevention in the Era of Primary Health Service Transformation

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Publication Date: 2025/09/15

Abstract: The main objective of this study is to improve the knowledge of Posyandu cadres and the practice of making supplementary food from local food sources for stunting prevention based on primary service integration at the Modayag Community Health Center. This study used a quasi-experimental method with a non-equivalent control group design with a pre-test-post-test design. This study was conducted on June 16-19, 2025, involving 35 Posyandu cadres. The data obtained were analyzed using a paired t-test to compare the average knowledge scores before and after the intervention, with a significance level of p <0.05, while the practice of making supplementary food was assessed and the results were described. The results of the study. The pretest showed that 88.6% of cadres had insufficient knowledge, after training the number decreased by 8.5% and the number of cadres with moderate knowledge increased to 65.7% compared to the pretest results which were moderate at 11.4% and good at 25.8%.Based on the results of the Paired Samples Test, the sig value is 0.000 < p = 0.05. It can be concluded that there is an average difference between the Pre-Test and Post-Test variables, which means there was a significant increase in the knowledge of the training participants after attending the training. This indicates that the training was successful in increasing the knowledge of the training participants.

Keywords: *Stunting, Knowledge, Practice, Cadres, Integrated Health Posts, Local Food.*

How to Cite: Vera. T. Harikedua; Meildy E. Pascoal; Joy VL Sambuaga (2025) Improving the Knowledge of Posyandu Cadres and the Practice of Making Supplementary Food from Local Food Sources for Stunting Prevention in the Era of Primary Health Service Transformation. *International Journal of Innovative Science and Research Technology*, 10(9), 519-526. https://doi.org/10.38124/ijisrt/25sep426

I. INTRODUCTION

Stunting is one of the unresolved nutritional problems in Indonesia. "Decreased cognitive, intellectual, mental, and physical development is one of the long-term impacts of stunting."(Adedeji et al., 2017)Because it is difficult to correct, stunting that begins at age five can persist into adulthood and increase the risk of low birth weight. According to World Health Organization (WHO) estimates in 2020, stunted children accounted for 22.9% of the global population, and their nutritional status was the cause of 2.2 million newborn deaths worldwide.(World Health Organization, 2016)In Asia and Africa, malnutrition is the leading cause of infant mortality. Three million children die from this problem every year.(Ohyver et al., 2017)Stunting before the age of two has significant educational and economic consequences for individuals, households, and communities. Furthermore, stunting predicts poorer health, cognitive development, and educational outcomes later in life.(Piniliw et al., 2021)

Stunting is one of the most common nutritional problems among toddlers in Indonesia. The national prevalence of stunting was 19.8% in 2024, down 1.7% from 21.5% in 2023, according to research data from the Indonesian Nutritional Status Survey. The stunting rate in North Sulawesi Province fell by only 0.5% from 20.8% in 2024, despite previously reaching 21.3% in 2023.(Ministry of Health of the Republic of Indonesia, 2025)This shows that stunting remains a public health problem in Indonesia.

A child's nutritional status is influenced by supplementary feeding (PMT), which is the practice of providing nutritious food when needed. PMT aims to help toddlers in the community who have reached a developmental stage where they need food in addition to breast milk to

ISSN No:-2456-2165 https://doi.org/10.38124/ijisrt/25sep426

address and avoid nutritional problems.(Sinaga et al., 2023)Toddlers who participate in the supplementary feeding program at the Integrated Health Post (Posyandu) will be able to increase their daily nutritional intake by supplementing their main meals with additional nutrients. Furthermore, Posyandu cadres must train themselves to create menu variations to provide a variety of PMT foods, according to(Bobihu et al., 2023).

However, Indonesia has specific problems, including high rates of stunting, low health literacy, and unequal access to primary health care facilities.(Kusumawati et al., 2024)Therefore, it is very important to train and provide training to health cadres to increase their capacity.(Indriawati and Syaifudin, 2020). Cadres are responsible for implementing the Community Health Center program. "The nutritional status of toddlers cannot be accurately determined early on due to the inactivity of cadres." Therefore, to reduce the incidence of stunting, stunting prevention efforts are needed, such as health education for cadres. Research has been conducted in this area to improve cadre competency in the context of stunting prevention.(Irdawati et al., 2024).

Previous research has shown that health workers often lack adequate training, despite their crucial roles. The effectiveness of many health workers in preventing stunting is hampered by issues such as low staffing levels, lack of expertise, and lack of skills.(Faizah et al., 2023);(Nugraheni and Malik, 2023). In addition, the training provided is usually haphazard and uncertain, thus causing gaps in the skill levels and access to information possessed by cadres.(Yusriani et al., 2022)Therefore, it is impossible to evaluate their proficiency in recognizing and treating stunting methodically or consistently. This emphasizes the importance of assessing the accuracy of anthropometric measurement methods to ensure accurate stunting detection and referral to appropriate medical personnel.(Widiasih et al., 2025).

Cadres must have adequate expertise in their field in order to serve the community effectively, considering the important role of cadres.(Noya et al., 2022)Monitoring the growth, development, and feeding of infants and young children (PMBA) is a crucial competency for Posyandu (Integrated Service Post) cadres. Before they can assist toddlers, cadres must complete training. Training can increase cadres' knowledge and motivation in stunting prevention.(Mediani et al., 2020). In addition, training can improve the knowledge and skills of cadres regarding infant and young child feeding (PMBA), which is very important for reducing stunting.(Afifa, 2019). In addition, cadre performance is influenced by their motivation to participate in the Posyandu program.(Akintola and Chikoko, 2016)states that motivation shapes the personality of cadres to be more responsible for their duties and obligations.

The Modayag Community Health Center in East Bolaang Mongondow Regency has 74 cadres spread across 13 villages and will have an average of new cadres by 2025. As a result, they continue to deal with traditional problems in primary health care, such as a lack of cadre expertise in early disease detection and stunting prevention. Health cadres in rural areas often face challenges in understanding the process of proper anthropometric measurements, according to research.(Juniarti, 2021). (2021). Furthermore, their inability to receive regular training hinders their ability to keep up with the latest developments in health policy, including those outlined in the Technical Guidelines for Integration of Primary Health Services (Ministry of Health, 2023).

A study using the fishbone diagram technique(Kusumawati et al., 2024)found that the capacity of health cadres is influenced by four main factors: people, methods, environment, and technology. Lack of training and basic knowledge among cadres is a human factor. Training methods are often inappropriate for community needs. Other barriers include the lack of resources such as measurement tools and manuals, as well as limitations in digital technology that reduce the efficiency of data collection and reporting.

The urgency of this research to improve the capabilities of health cadres as frontline providers of public health services is why it is so urgent. This study highlights how ongoing training can improve cadres' abilities in carrying out their duties, particularly in the early diagnosis of stunting and non-communicable diseases. Furthermore, empowering health cadres directly impacts public health literacy.

The effectiveness of educating health cadres to improve their skills has been the subject of various studies such as by(Rayasari et al., 2021) which found that the knowledge, attitudes, and abilities of cadres in early detection of non-communicable diseases can be improved through intensive training. Then, research by(Widiastuti and Hapsari, 2024)Other research has shown that cadre knowledge is a key factor in the success of tracking toddler development. Furthermore, empowering cadres through primary care integration programs can improve the quality and accessibility of healthcare services in rural areas.

By combining a knowledge-based training approach with practical skills to identify and address root causes of problems in primary healthcare management, this study provides an update. This method allows for a more comprehensive assessment of the effectiveness of health cadre training, which is not often implemented in rural areas of Indonesia.

The main objective of this study is to improve the knowledge of Posyandu Cadres and the Practice of Making Supplementary Food from local food sources for stunting prevention based on primary service integration at the Modayag Community Health Center.

This research is expected to make a tangible contribution to strengthening the role of health cadres in the primary care system, ultimately improving public health and developing recommendations for implementing health cadre empowerment policies in rural areas. By referring to various literature, such as (Surtimanah et al., 2024), and Sri Rahayu & Puspa Sari (2022), this study offers a holistic approach to empowering health cadres.

ISSN No:-2456-2165 https://doi.org/10.38124/ijisrt/25sep426

This research will integrate findings from various literatures to generate recommendations that can be practically implemented in the development of locally-sourced food-based PMT (Food-Based Nutrition) in the Modayag Community Health Center (Puskesmas) and other similar areas. Thus, this research not only contributes to the development of scientific knowledge but also has a direct impact on improving the quality of community health services, particularly in stunting prevention based on integrated primary care.

II. METHOD

➢ *Design, Location, and Time*

This study used a quasi-experimental method with a non-equivalent control group design with a pre-test-post-test design. This study was conducted in the Modayag Community Health Center, East Bolaang Mongondow Regency, on June 16-19, 2025. This research has been received from the Health Polytechnic Ethics Commission of the Ministry of Health Manado Number: KEPK /01/ 08/199/2024. August 19, 2024.

➢ *Sampling*

The study population consisted of 74 active Posyandu (Integrated Service Post) cadres registered at the Modayag Community Health Center. A purposive sampling technique was used to select 35 respondents who met the inclusion criteria: becoming a Posyandu cadre by 2025, actively participating in Posyandu services, having never received training, and a willingness to participate in the training program. This sampling strategy ensured that participants represented the cadres directly responsible for contact investigations, thus increasing the relevance of the findings to real-world implementation challenges.

➢ *Data Collection*

Data were collected using a structured and validated questionnaire administered in two stages: pre-intervention (basic knowledge assessment) and post-intervention (knowledge evaluation after training). Participants were given training interventions with the following materials: 1). Increasing knowledge through the delivery of materials on: a. Understanding stunting. b. Causes of stunting in toddlers. c. How to prevent stunting. d. Understanding PMT (Supplementary Feeding) local food. 2). Practice making PMT (Supplementary Feeding) in the form of shredded tempeh, egg sausage, tofu nuggets, and tofu roll. Data on the practice of making Supplementary Food Preparation of participants were divided into 7 groups with assessment aspects including: Creativity, Taste, Appearance, Texture, Theme Suitability, Cohesiveness, Cleanliness with a value range of 1 - 5. The assessment scale used to measure the level of achievement or performance of the leader: 1: Very Poor, 2: Poor, 3: Sufficient/Satisfactory, 4: Good, 5: Very Good

➢ *Data Analysis*

There are three levels of knowledge classification: "poor" if the score is less than 60%, "moderate" if the score is between 60 and 80%, and "very good" if the score is more than 80% (Khomsan, 2022). Statistical analysis was performed using a paired t-test to compare the mean knowledge scores before and after the intervention, with a significance level of $p < 0.05$. This method allows for quantification of the knowledge gains caused by the refresher program. Descriptive statistics were also calculated to summarize demographic characteristics and baseline knowledge levels. To minimize bias, the same questionnaire was used for the pre- and post-tests, and the training sessions were standardized for all participants.

Assessment of the results of the practice of making additional food assessment categories, practical results data are evaluated descriptively.

Ethical considerations were prioritized throughout the study. Participants received equal benefits, including comprehensive training on community health post (Posyandu) cadre knowledge and practices for making supplementary food from local food sources for stunting prevention, regardless of socioeconomic status or physical appearance. Confidentiality was strictly maintained, with data stored securely for five years post-study and accessible only to authorized researchers. The research team ensured non-discriminatory participant selection and interaction practices, in line with ethical guidelines for human subjects research. These measures strengthened the validity and ethical integrity of the findings while fostering trust among cadres and local stakeholders.

III. RESULTS AND DISCUSSION

➢ *Socio-Demographic Characteristics*

The univariate analysis will describe the characteristics of the respondents and their distribution based on each variable, both independent and dependent. This study involved 10 respondents as research subjects. The results of the univariate analysis can be seen in Table 1 below;

Table 1. Socio-Demographic Characteristics of Respondents' Data (N = 10)

NO	Characteristics	Category	Amount	
			n	(%)
1	Gender	Woman	35	100
2	Age	20 - 25	5	14.3
		26 - 31	14	40
		32 - 37	7	20
		38 - 42	3	8.6
		43 - 47	4	11.4
		48 - 53	2	5.7

ISSN No:-2456-2165 https://doi.org/10.38124/ijisrt/25sep426

3	Education	Elementary School	1	2.9
		JUNIOR HIGH SCHOOL	6	17.1
		High School	27	77.1
		Bachelor	1	2.9
4	Long Time as a Cadre	< 1 Year	35	100
5	Marital status	Marry	35	100

Based on table 1, 100% of respondents were female with the highest age being 26-31 years old, amounting to 14 people (40%), and the last education was high school amounting to 27 people (77.1%), while for the length of time as a cadre, 100% were less than a year or had only started working in 2025 with a marital status of 100% being married.

➢ *Results of Pre and Post Cadre Knowledge Tests*

The general overview of Table 2 shows that the knowledge of Posyandu cadres increased from the pre-test to the post-test, with most Posyandu cadres possessing sufficient and good knowledge regarding stunting prevention. The pre-test results showed that 88.6% of cadres had insufficient knowledge, but after training, this number decreased to 8.5%, and the number of cadres with moderate knowledge increased to 65.7%, compared to the pre-test results of 11.4% with moderate knowledge and 25.8% with good knowledge.

Table 2. Distribution of Pre and Post Knowledge Test Results

Category	Pre-Test		Test Post	
	n	%	n	%
Very Good > 80%	0	0	9	25.8
Medium 60 – 80%	4	11.4	23	65.7
Less than < 60%	31	88.6	3	8.5
Amount	35	100	35	100

- *Bivariate Analysis*

The research used a One-Group Pretest-Posttest Design to see the difference in knowledge before and after training using a Paired t-test with the following results:

➢ *Data Normality Test*

The pre- and post-test cadre knowledge data for normality testin table 3.

Table 3. Results of the Normality Test of Cadre Knowledge Data Pre and Post Test

Group	Shapiro-Wilk			Information
	Statistics	df	Sig.	
Pre-Test	0.969	35	0.429	Normal
Post Test	0.961	35	0.246	Normal

The results of the normality test showed a sig value for the pre-test of 0.969 and a sig value for the post-test of 0.961 with $p > 0.05$. It can be concluded that the pre- and post-test data were normally distributed.

➢ *Parametric Test Results (Paried T Test)*

The results of the comparison of the knowledge and practices of Posyandu cadres through training before and after can be seen in the following table 4:

Table 4. Distribution of Pre- and Post-Test Knowledge Statistics

Variables	N	Mean	Elementary School	Min-Max	95% Confidence Interval for Mean
Pre-Knowledge	35	53.34	6.51	38.0 - 70.0	51.11 – 55.58
Post Knowledge	35	74.43	10.87	50.0 – 93	70.70 – 78.16

Paying attention to table 4, the mean value of the action during the pretest was 53.34 and increased to 74.43, the standard deviation before the intervention was 6.51 and after the intervention was 10.87 with the lowest value before the intervention being 39 increasing to 70 after the intervention, while the highest value after the intervention was 50 and after the intervention was 93.

Table 5. Test of Differences in Pre- and Post-Test Knowledge

Variables	Mean	Standard Deviation	Std. Error Mean	Sig. (2-tailed)
Pre Test - Post Test	-21,086	8,793	1,486	0.000

ISSN No:-2456-2165 https://doi.org/10.38124/ijisrt/25sep426

Based on table 5 as the result of parametric test (paired t test) Based on the result of Paired Samples Test, it is known that sig value is 0.000 < p = 0.05, it can be concluded that there is an average difference between Pre Test and Post Test variable which means there is a significant increase in knowledge of training participant cadres after attending the training. This shows that the training has succeeded in increasing the knowledge of cadres.

The findings of this study are consistent with(Setiyaningrum and Dewi, 2025)stated that cadres who had knowledge with good criteria about stunting were 69.6% with a strong relationship in carrying out early detection through anthropometric examinations and nutritional status assessments in toddlers, as well as research by(Ramadhaniah et al., 2025) structured education is able to significantly increase the knowledge and skills of cadres, whereas according to findings(Aisyah et al., 2023), namely providing nutrition and malnutrition education to Posyandu cadres, the results show a difference between pretest and posttest scores or there is an effect of providing material on increasing cadres' knowledge about malnutrition.

The primary focus of the Posyandu primary service transformation is education, specifically through strengthening the role of cadres. Community empowerment in the implementation of the health service management system at the Integrated Primary Service Posyandu (ILP) is led by Integrated Primary Service Posyandu (ILP) cadres. Cadres act as community mobilizers and sources of public health information, making their expertise crucial. The integration of primary health services at the village level is greatly facilitated by the presence of health cadres. However, a significant obstacle to optimizing these services is the cadres' limited ability to understand basic competencies.(Inayah et al., 2025)

Posyandu cadres play an important role in reducing stunting rates, according to(Faizah and Suryani, 2024)The cadre's activities demonstrate this, including educating pregnant women and young children about stunting, assessing stunted toddlers based on weight and measurements, conducting home visits, and providing supplementary food and vitamins.(Widyaningsih et al., 2025).

Low socioeconomic status, inadequate prenatal care, and lack of knowledge about newborn and early childhood feeding practices are some of the factors that can contribute to underweight in early life. To prevent underweight in early childhood, the findings of this study offer a compelling case for stakeholders and policymakers to take necessary steps to address and improve maternal nutritional status, household socioeconomic status, and infant and young child feeding practices. (Salleh et al., 2023).

Stunting in toddlers is directly caused by food intake, which is influenced by maternal parenting practices. This study shows how maternal parenting practices influence toddler nutritional status, including stunting, wasting, and underweight during the first year of life.(Beniko et al., 2016). The prevalence of stunting and parenting patterns are strongly correlated, according to research.(Tahun *et al.*, 2024), which shows that the mother's ability to prepare food that meets the nutritional needs of toddlers is very important for good parenting.

According to other studies, one of the main causes of stunting is a lack of certain nutrients, including protein, energy, and iron, all of which are necessary for toddlers to grow and develop.(Sholikhah and Dewi, 2022)A child's brain development is greatly influenced by the food they eat during the first thousand days of life. Inadequate nutritional intake can lead to impaired motor development, low activity levels, and a lack of interest in their surroundings.(Ilmani and Fikawati, 2023).

Research conducted by Faizah et al. (2023) revealed that the role of integrated health post (Posyandu) cadres is crucial in preventing and addressing stunting, such as providing education to disseminate knowledge about stunting to the community. Furthermore, Posyandu cadres also provide nutritional health advice to raise public awareness, particularly for mothers with toddlers or expectant mothers, so they can improve their health.(Faizah and Suryani, 2024)

The ability to implement public health programs will be given to cadres with the necessary training and expertise. Cadres' advanced knowledge will be applied to oversee the implementation of their duties. Health cadres' ability to detect stunting can be enhanced by their high level of expertise. Length of service, active participation in integrated health posts (Posyandu), and formal education all impact cadre knowledge and skills.(Setiyaningrum and Dewi, 2025)

Cadre training is an activity aimed at improving their knowledge and skills in fulfilling their roles in the community. As agents of change, Posyandu cadres play a significant role in improving maternal and infant nutrition knowledge, which is expected to help reduce nutritional problems.(Nuburi et al., 2025).

Knowledge has an important role in the development of open behavior, which arises from curiosity after sensing, especially with the eyes and ears, a particular object.(Purwanti and Sukamto, 2024). A person's level of knowledge is correlated with the volume of information received. The levels of knowledge are as follows: knowing, understanding, applying, analyzing, synthesizing, and evaluating. (Lestari and Dwihestie, 2020).

The expertise of integrated health post (Posyandu) cadres is crucial for improving community health. Community health centers (Puskesmas) or professional medical personnel select and recruit community members as Posyandu cadres to volunteer to oversee the Posyandu. Posyandu cadres are tasked with educating the community about health issues and encouraging them to attend. One example of a clean and healthy lifestyle is demonstrated by Posyandu cadres.(Juniarti and Usman 2021).

ISSN No:-2456-2165 https://doi.org/10.38124/ijisrt/25sep426

To prevent and combat stunting in the community, cadres must have sufficient knowledge about stunting to perform their duties at integrated health posts (Posyandu). To improve cadre skills in line with the latest scientific findings relevant to stunting, community health centers operating under the auspices of the health office must conduct annual routine activities such as cadre training and refresher courses.(Masri et al., 2021).

Cadre training efforts are needed to refresh or provide new information to them. Cadres need training in making locally-based complementary foods to help mothers with toddlers feed their children. Integrated service post (Posyandu) cadres are the spearhead in helping improve public health. Cadres are embedded within the community, thus better understanding their characteristics, being closer to them, and being able to assist them in improving their health. Cadres are trained to be facilitators of change, connecting communities with primary care services, and encouraging the transformation of health services.(Yulyuswarni et al., 2023). In addition, cadres also build community trust by socializing the function of integrated health posts (Posyandu) and explaining to parents to participate more actively in Posyandu (Dian, 2023). Training Posyandu cadres in preparing anti-stunting complementary foods using local food ingredients is an effective step in improving the nutritional quality of toddlers and reducing the prevalence of stunting.(Subratha et al., 2023).

➢ *PMT Making Practice*

The PMT making practice was guided by the research team, with the PMT menu demonstrated in the form of shredded tempeh, egg sausage, tofu nuggets, tofu rolled chicken potato sticks. Through this practical activity, participants had the opportunity to be directly involved in making PMT and were provided with various PMT menus with other local food ingredients included in the educational module. Other PMT menu recipes contained in the educational module include: 1) Corn vla pudding, 2) Octopus potato sausage, 3) Vegetable sausage pizza, 4) Potato satay wrap, 5) Cabbage dumplings, 6) Vegetable chicken nuggets, and 7) Potato croquettes.

Practice making PMT (Supplementary Food) in the form of tempeh floss, egg sausage, tofu nuggets, and rolled tofu with the results as in table 6 below:

Table 6. Results of the PMT Preparation Practice Assessment

NO	ASSESSMENT ASPECTS	GROUP						
		I	II	III	IV	V	VI	VII
1	Creativity	5	4	5	5	5	5	4
2	Taste	5	5	5	5	5	5	5
3	Appearance	5	4	4	5	4	5	5
4	Texture	4	5	3	4	5	5	5
5	Theme Suitability	5	5	5	5	5	5	5
6	Compactness	5	5	5	5	5	5	5
7	Cleanliness	5	5	5	5	5	5	5
	Total	34	33	32	34	34	35	34
	Mark	4.9	4.7	4.6	4.9	4.9	5.0	4.9

Based on table 6, it can be described that all groups are in the very good category with values between 4–5.

Providing local food supplementary feeding (PMT) is one effort to address nutritional issues in toddlers, as stipulated in Presidential Regulation No. 72 of 2021 (Ministry of Health, 2023). One effort to implement this policy, through this research, is to conduct training on the production of local food supplementary feeding for integrated health post (Posyandu) cadres.

Local food-based PMT is considered very important because local foods provide good nutrition without additives that are harmful to toddlers, and they are also easily accessible and more affordable (Pingge et al., 2023). Lailatul Muniroh

Empowering cadres, including providing education to parents on consuming food with balanced nutrition, especially in villages affected by stunting, is the key to the success of public health interventions.(Lubis et al., 2024).

IV. CONCLUSION

This study concluded that the low capacity of integrated health post (Posyandu) cadres in the Modayag Community Health Center area was caused by limited knowledge, lack of intensive training, and minimal understanding of the types of PMT, as well as very limited work experience. Interventions through needs-based training and practice were proven effective in improving cadre competency. Providing education on stunting prevention and practices for making supplementary food from local food sources helped previously unknown people become knowledgeable and those already knowledgeable became more knowledgeable.

As a follow-up, this program can be replicated in other sub-districts by adapting locally available materials. Further collaboration with community health centers and local governments is needed to support the sustainability of the independent cadre program and its integration with the primary care system.

ISSN No:-2456-2165 https://doi.org/10.38124/ijisrt/25sep426

ACKNOWLEDGEMENT

We would like to express our gratitude to the Manado Ministry of Health Polytechnic for its assistance with research development costs for the 2025 fiscal year.

DECLARATION OF CONFLICT OF INTERESTS

The authors have no conflict of interest in preparing the manuscript

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