

Empowering Pregnant Women Through Nutrition Literacy for Stunting Prevention in Tabunganen, South Kalimantan

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ABSTRACT

Stunting remains a major public health problem in many low- and middle-income countries, including Indonesia, and maternal nutrition during pregnancy plays a critical role in its prevention. This study aimed to evaluate the effect of a nutrition literacy intervention on pregnant women's knowledge regarding stunting prevention in Tabunganen, Barito Kuala Regency, South Kalimantan. A one-group pretest–posttest quasi-experimental design was used. A total of 48 pregnant women were recruited using purposive sampling in May 2025. Nutrition knowledge was assessed using a structured questionnaire before and after a nutrition counseling intervention. Data were analyzed using a paired t-test with SPSS version 25 to compare pretest and posttest scores. The results showed that most respondents had sufficient knowledge at baseline (79.2%). After the intervention, the proportion of respondents with good knowledge increased from 20.8% to 58%. The paired t-test indicated a statistically significant increase in knowledge scores after the intervention (mean difference = 2.9; $p < 0.001$). These findings suggest that nutrition literacy counseling was associated with improved knowledge of stunting prevention among pregnant women. Integrating structured nutrition education into routine antenatal care may support efforts to strengthen maternal nutrition knowledge in communities at risk of stunting.

Keywords: Nutrition Literacy; Pregnant Women; Stunting

INTRODUCTION

Stunting is a significant global health problem, particularly in low- and middle-income countries (LMICs) (Watson et al., 2023; Victora et al., 2021). In 2022, an estimated 149 million children under five worldwide suffered from stunting, a condition characterized by being too short for their age. Malnutrition, including stunting, wasting, and underweight, is associated with nearly half of all deaths in children under five, especially in LMICs. The long-term impacts of malnutrition are severe and sustained, affecting individuals, families, communities, and national development (World Health Organization, 2024).

The critical period for preventing stunting begins during pregnancy and continues through the first two years of a child's life, known as the first 1,000 days of life. During this crucial window, adequate maternal nutrition and care are direct determinants of a child's nutritional status (United Nations Children's Fund, 2021). The World Health Assembly in 2012 emphasized the need to reduce low birth weight, stunting, and wasting in children, as well as anaemia in women, and to increase exclusive breastfeeding in the first six months of life; however, these targets remain difficult to achieve in many LMICs. Social disparities, development gaps, low education, and poor regional access exacerbate these nutritional

challenges, highlighting the need for multi-sectoral action to accelerate progress (Victora et al., 2021; United Nations Children's Fund, 2021).

In this context, maternal nutrition during pregnancy is influenced not only by food availability but also by mothers' knowledge and understanding of appropriate dietary practices. Adequate nutrition literacy enables pregnant women to interpret nutrition information, select balanced foods, and adopt healthy dietary behaviours that support fetal growth and development. Limited nutrition knowledge may lead to inappropriate dietary choices during pregnancy, which can contribute to poor maternal nutritional status and increase the risk of adverse outcomes such as low birth weight and stunting. Therefore, improving nutrition literacy among pregnant women is considered an important strategy to support stunting prevention, particularly in communities with limited access to reliable health information (Victora et al., 2021; United Nations Children's Fund, 2021).

In Barito Kuala Regency, South Borneo, stunting was a serious issue with a prevalence reaching 33.6% in 2022, based on the Indonesian Nutritional Status Survey (INSS). Thanks to various local government interventions and cross-sectoral collaborations, this figure successfully decreased to 22.3% in 2023, and as of January 2024, the prevalence of stunting based on Electronic Recording and Community-Based Nutrition Reporting (ER-CBNR) data reached 10.39%, which was below the national target of 14% (Nugroho et al., 2023). Nevertheless, challenges persist, particularly in specific areas like Tabunganen District, which in 2023 recorded the highest number of stunted children in Barito Kuala, with 428 children (19%) out of a total of 2,246 stunted children across the entire district (Pemerintah Kabupaten Barito Kuala, 2023). Tabunganen District in Barito Kuala Regency, South Kalimantan, is known as a wetland area (wetland) dominated by swamps and river networks. Approximately 70% of Tabunganen's area consists of freshwater swamps, both peat and non-peat, which are influenced by river tides.

Tabunganen District in Barito Kuala Regency, South Kalimantan, is characterized by extensive wetland ecosystems dominated by swamps and river networks. Environmental conditions in wetland areas can influence community health and nutrition, particularly through limited access to clean water and sanitation facilities. In Tabunganen, many households rely on river water and rainwater for daily needs, while groundwater is rarely used due to its difficult accessibility and the risk of saltwater intrusion. River water contamination from domestic and agricultural activities may also affect water safety and sanitation practices within the community. These environmental and socioeconomic conditions may contribute to nutritional challenges among pregnant women and children. Limited access to clean water, inadequate sanitation, poor dietary patterns, and restricted availability of nutritious foods are recognized risk factors associated with stunting in wetland communities such as Barito Kuala (Faktor Risiko Kejadian Stunting, 2023).

Recognizing that nutritional status is influenced not only by food availability but also by knowledge and health practices, interventions focusing on behaviour change have shown promising results in improving maternal and child nutritional outcomes. Evidence suggests that strategies incorporating behavioural change theories, communication, and counselling can significantly improve nutritional knowledge and dietary practices among pregnant and lactating mothers. Nutrition literacy refers to the ability of individuals to obtain, understand, and apply nutrition-related information in order to make appropriate dietary decisions. Improving nutrition literacy is particularly important for pregnant women, as adequate knowledge can support

healthier dietary practices during pregnancy and contribute to optimal fetal growth and development (Watson et al., 2023; World Health Organization, 2024).

The UNICEF Conceptual Framework on Maternal and Child Nutrition emphasizes the importance of enabling practices, services, and supportive conditions, including positive social norms and access to health information, in achieving improved nutritional outcomes for women and children. In Barito Kuala Regency, several stunting prevention programs have been implemented, including the PERMATA BUNDA program providing supplementary food for pregnant women and toddlers, routine Supplementary Feeding (SF) programs in early childhood education and primary healthcare facilities, and the Foster Parent Program for Stunted Children. Although these programs contribute to improving nutritional support, they primarily focus on food supplementation and programmatic assistance, while community-level nutrition literacy among pregnant women has received relatively limited attention (United Nations Children's Fund, 2021).

Furthermore, few studies have specifically evaluated the effectiveness of nutrition literacy interventions among pregnant women in wetland communities such as Tabunganen. Considering the unique environmental and socioeconomic characteristics of wetland areas, strengthening maternal nutrition knowledge may play an important role in supporting stunting prevention strategies (Aditya & Permata, 2025). Therefore, this study aimed to determine the effectiveness of nutrition literacy interventions in improving the knowledge of pregnant women in Tabunganen, Barito Kuala Regency, South Kalimantan, for stunting prevention.

METHODS

Research Design

This study employed a one-group pretest–posttest quasi-experimental design to evaluate the effect of a nutrition literacy intervention on pregnant women's knowledge regarding stunting prevention in Tabunganen District, Barito Kuala Regency, South Kalimantan, Indonesia.

Population and Sample

The minimum required sample size for paired measurements was calculated using a paired t-test approach with a significance level of 0.05 and statistical power of 80%, resulting in a minimum sample of approximately 32 participants. To increase statistical reliability, a total of 48 pregnant women were recruited using a purposive sampling method through antenatal care services at local primary healthcare facilities. The inclusion criteria were pregnant women in the first to third trimester, residing in the Tabunganen area, and willing to participate in the study. Participants with severe illness, communication difficulties, or prior participation in similar nutrition education programs were excluded from the study. Written informed consent was obtained from all respondents before participation.

The intervention consisted of a structured nutrition counselling session aimed at improving nutrition literacy related to stunting prevention. The counselling was delivered by trained health personnel using printed educational materials and verbal explanations. The educational content covered key topics including the importance of maternal nutrition during pregnancy, balanced diet principles for pregnant women, sources of macronutrients (particularly protein) for fetal growth, the role of maternal nutrition during the first 1,000 days of life, the relationship between poor maternal nutrition and stunting, and practical dietary recommendations using locally available foods. The intervention was delivered in a single

counselling session and standardized across participants to ensure consistency of information provided

Data Collection Technique

Data collection was conducted in May 2025. Knowledge was measured before the intervention (pretest) and again after the counselling session (post-test). The data were collected through direct administration of the questionnaire by trained researchers during antenatal care activities. For respondents who had difficulty reading or understanding certain questions, assistance was provided to ensure that all questions were clearly understood before answering. Data quality was ensured by checking the completeness of questionnaires immediately after collection.

Nutrition literacy among respondents was assessed using a structured questionnaire adapted from previous studies on maternal nutrition knowledge and stunting prevention. The questionnaire consisted of several items measuring pregnant women's understanding of essential nutrition concepts related to pregnancy and early child growth. Content validity was reviewed by experts in maternal and child nutrition, and reliability testing showed acceptable internal consistency (Cronbach's $\alpha > 0.70$). Respondents' knowledge scores were categorized into two levels: good knowledge (>80) and sufficient knowledge (70–80), based on commonly used scoring criteria in health education evaluation studies.

Data Analysis

Data were analyzed using the paired t-test to compare pretest and posttest knowledge scores, with statistical processing performed using SPSS version 25. Prior to hypothesis testing, data normality was assessed using the Shapiro–Wilk test. A significance level of $\alpha = 0.05$ was used to determine statistical significance.

RESULTS AND DISCUSSION

This section presents and interprets findings on the effectiveness of the nutrition literacy intervention in improving pregnant women's knowledge of stunting prevention in Tabunganen. Key outcomes focus on changes in pretest and posttest knowledge scores, with statistical analysis using paired t-tests illustrating the intervention's impact. The discussion contextualizes these results by considering factors such as educational background, socioeconomic status, and access to health services influencing effectiveness.

Table 1. Characteristics of Pregnant Women in Tabunganen, Barito Kuala (Batola) Regency

Characteristic	Category	Frequency (n)	Percentage (%)
Age	<20 years	6	12,5
	20-34 years	30	62,5
	>35 years	12	25
Last Education	Elementary School	16	33,3
	JHS	16	33,0
	SHS	10	20,8
	Bachelor	6	12,5
Occupation	Civil Servant	1	2,1
	Housewife	42	87,5
	Teacher	3	6,3

Characteristic	Category	Frequency (n)	Percentage (%)
Parity	Laborer	1	2,1
	Primipara	23	47,9
	Multipara	25	52,1
Trimester	Trimester 1	5	10,4
	Trimester 2	24	50,0
	Trimester 3	19	39,6
Distance to Health Facility	Close (<5 km)	1	2,1
	Medium (>5-10 km)	46	95,8
	Far (>10 km)	1	2,1
Funding Source	Social Health Insurance	48	100
	Private Insurance	0	0
	Self-funded	0	0
	Others	0	0
Economic Level	<IDR 3.500.000	42	87,5
	=IDR 3.500.000	6	12,5
	> IDR 3.500.000	0	0
Pretest Score	Good (>80)	10	20,8
	Sufficient (70-80)	38	79,2
Posttest Score	Good (>80)	28	58
	Sufficient (70-80)	20	42

Based on Table 1, most respondents were aged 20–34 years (62.5%), representing the optimal reproductive age group for pregnancy. Regarding educational background, the largest proportion of respondents had elementary school education (33.3%) and junior high school education (33.0%). The majority of respondents were housewives (87.5%). In terms of parity, slightly more than half of the respondents were multiparous (52.1%), while 47.9% were primiparous. Based on gestational age, most respondents were in the second trimester of pregnancy (50.0%), followed by the third trimester (39.6%) and the first trimester (10.4%). Regarding access to healthcare services, most respondents lived at a moderate distance from health facilities (5–10 km), accounting for 95.8% of participants. All respondents (100%) used social health insurance as their source of health financing. In terms of economic status, the majority of respondents had a monthly income below IDR 3,500,000 (87.5%).

Table 2. Pretest Scores of Pregnant Women

Pretest	Frequency	Percentage
Good (>80)	10	20,8%
Sufficient (70-80)	38	79,2%

Table 2 presents the distribution of pretest scores assessing nutrition literacy among pregnant women participating in the study. The results show that most respondents had sufficient knowledge, with 38 participants (79.2%) scoring between 70 and 80. Meanwhile, 10 respondents (20.8%) achieved good knowledge levels, defined as scores above 80.

Table 3. Posttest Scores of Pregnant Women

Posttest	Frequency	Percentage
Good	28	58%
Sufficient	20	42%

Table 3 presents the distribution of post-test scores assessing nutrition literacy among pregnant women after the nutrition literacy intervention for stunting prevention in Tabunganen, South Kalimantan. The results show that 28 respondents (58%) achieved good knowledge scores, while 20 respondents (42%) remained in the sufficient knowledge category.

The increase in the proportion of respondents with good posttest scores suggests that the nutrition literacy intervention was effective in enhancing pregnant women’s understanding of nutrition related to stunting prevention (Rizkiah, 2023). Structured education delivered during pregnancy likely improved comprehension of key topics, including balanced maternal diet, micronutrient intake, and the importance of adequate nutrition during the first 1,000 days of life. This improvement may also be attributed to the contextual relevance of the educational content, which was tailored to local conditions in Tabunganen (Saleh et al., 2025). Information aligned with locally available food sources and cultural practices can enhance learning retention and practical application, thereby strengthening nutrition knowledge outcomes. Additionally, repeated exposure to nutrition messages, interactive educational methods, and the involvement of healthcare providers may have reinforced learning and facilitated behavioral change. However, the persistence of a sufficient knowledge category among some respondents suggests that factors such as educational background, learning capacity, and access to continuous health information may influence the degree of knowledge acquisition (Ina et al., 2023)

Table 4. Score Interval of Pregnant Women

Score Interval	Frequency	Percentage
Increased	29	60%
Steady	19	40%
Decreased	0	0%

Table 4 describes the changes in nutrition literacy scores among pregnant women before and after the nutrition literacy empowerment intervention for stunting prevention in Tabunganen, South Borneo. The results show that 29 respondents (60%) experienced an increase in scores, while 19 respondents (40%) demonstrated stable scores. Importantly, no respondents showed a decrease in scores following the intervention. These findings indicate that the nutrition literacy program resulted in either improvement or maintenance of nutrition knowledge among all participants, with a majority showing measurable gains. Additionally, contextualized and culturally relevant educational approaches, combined with guidance from healthcare providers, may have facilitated learning while reinforcing previously acquired knowledge. Overall, these findings support the role of structured nutrition literacy programs in empowering pregnant women and strengthening maternal knowledge as a foundational strategy for stunting prevention (United Nations Children’s Fund, 2019).

Table 5. Paired T-Test on Pretest and Posttest of Pregnant Women

Type	Mean Difference	T-Test
Pretest-Posttest Score	2.9	2.68×10^{-10} (0.000000000268) <0.05

Table 5 presents the results of the paired t-test comparing pretest and posttest knowledge scores after the nutrition counseling intervention. The analysis showed a mean difference of 2.9 between pretest and posttest scores, indicating an increase in pregnant women's knowledge after the intervention. The difference was statistically significant ($p < 0.001$).

This study used a quantitative pretest-posttest design with a sample of 48 pregnant women selected by purposive sampling in Tabungnen, Barito Kuala Regency. The majority of respondents were aged 20-34 years (62.5%) and were dominated by mothers with low education, namely elementary and junior high school (50%). Most respondents were housewives (87.5%) and multipara (52.1%). Access to health facilities was considered relatively easy with 95.8% of respondents having a medium distance to health facilities. All respondents (100%) used BPJS as a source of health financing and the majority were in the economic category below the UMR (87.5%). Based on the pretest results, most respondents had a "Sufficient" knowledge category (79.2%). After the nutrition literacy intervention, there was a significant increase in knowledge with 58% of respondents reaching the "Good" category in the posttest, while the "Sufficient" category decreased to 42%. Additionally, 60% of respondents showed an increase in knowledge scores. The Paired T-Test showed a mean difference of 2.9 between pretest and posttest scores with a p-value of 0.000000000268 (< 0.05), indicating a statistically significant increase in pregnant women's knowledge after the counseling intervention. Although the initial knowledge of the majority of respondents was categorized as "Sufficient," the results indicate that the nutrition literacy intervention was associated with an improvement in pregnant women's knowledge after the counselling session. Improved nutrition knowledge among pregnant women may support better dietary practices and healthier behaviours during pregnancy, which are important components of stunting prevention efforts.

The significant improvement in pregnant women's knowledge after the nutrition literacy intervention can be explained by several interrelated factors. The counseling intervention likely clarified misconceptions and strengthened previously fragmented information, enabling respondents to integrate new knowledge more effectively (Black et al., 2020). The sociodemographic characteristics of the respondents may also have influenced the learning process during the intervention. Most participants were housewives with relatively similar socioeconomic backgrounds and limited formal education. These characteristics may have shaped how participants received and understood the nutrition counselling; however, this study did not perform subgroup analyses to statistically examine the relationship between sociodemographic factors and knowledge improvement. Therefore, this observation should be interpreted cautiously. This condition may have increased receptivity to simple, practical, and contextually relevant information delivered during counseling sessions (Kavle & Landry, 2018). The pretest–posttest design itself may have enhanced learning through a reinforcement effect. Exposure to the pretest questionnaire likely sensitized respondents to key nutrition concepts, making them more attentive during the intervention and more capable of recognizing correct

answers during the posttest. The counseling approach emphasized preventive messages related to stunting, which are highly relevant in communities with economic limitations and reliance on public health insurance. This relevance may have increased motivation and cognitive engagement, leading to better retention of information (Sirajuddin et al., 2021).

The nutrition literacy questionnaire used in this study assessed pregnant women's knowledge across several core domains relevant to stunting prevention, including basic maternal nutrition concepts, such as the importance of balanced diets during pregnancy; macronutrient knowledge, including sources of protein, carbohydrates, and fats necessary for fetal growth; micronutrient awareness, particularly iron, folic acid, iodine, and calcium, which are essential during pregnancy (Haryanti et al., 2024). The questions most frequently answered correctly by respondents generally involved basic and practical nutrition knowledge, such as identification of protein-rich foods commonly consumed in the local setting, the importance of eating a balanced diet during pregnancy, the role of iron tablets in preventing anemia during pregnancy. These questions are likely easier to answer correctly because they are closely linked to routine antenatal counseling messages commonly delivered at primary healthcare facilities. Pregnant women are often repeatedly exposed to information about iron supplementation and balanced diets during routine ANC visits, even before the intervention (Adam et al., 2024).

The high rate of correct responses may be related to the educational methods used during the intervention. The nutrition counselling session was delivered through lecture-based explanations supported by printed educational materials, such as leaflets, which helped reinforce key nutrition messages through visual representation and repetition. In addition, interactive question-and-answer sessions were conducted during counselling to clarify participants' understanding of commonly misunderstood topics related to maternal nutrition and stunting prevention. These educational strategies may have contributed to improved comprehension among participants (Mukty et al., 2025).

Several limitations should be acknowledged in interpreting the results of this study. First, the study used a pretest–post-test design without a control group, which limits the ability to attribute changes in knowledge solely to the intervention. External factors, such as exposure to information from health workers or media outside the study, may also have contributed to knowledge improvement. Second, the sample size was relatively small and selected through purposive sampling, which may limit the generalizability of the findings to other populations or regions with different sociodemographic characteristics. Third, the study focused only on knowledge outcomes and did not assess changes in actual dietary practices or nutritional status. Improved knowledge does not always translate into behavioural change, particularly in communities with economic constraints. In addition, the use of a pretest–posttest design may introduce a testing effect, where participants perform better in the posttest simply because they have previously been exposed to the same questions (Prendergast & Humphrey, 2022).

CONCLUSION

This study found that nutrition literacy counselling was associated with improved knowledge of stunting prevention among pregnant women in Tabunganen, Barito Kuala Regency, South Kalimantan. The pretest–post-test analysis showed an increase in knowledge scores following the intervention, with more respondents achieving a good knowledge category after counselling. Although the study assessed knowledge outcomes only, improved nutrition literacy may support healthier dietary awareness during pregnancy, particularly within the first

1,000 days of life, which is a critical period for child growth and development. Therefore, integrating nutrition literacy counselling into routine antenatal care may help strengthen maternal knowledge as part of broader community-based stunting prevention efforts. Therefore, integrating structured and context-specific nutrition education into routine antenatal care is recommended to support stunting prevention efforts in similar high-risk areas. Future studies are also needed to evaluate long-term behavioural changes and dietary practices among pregnant women, as well as to assess the effectiveness of nutrition literacy interventions using controlled study designs and larger sample sizes

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