



Effect of local food-based supplementary feeding on the improvement of nutritional status among pregnant women with chronic energy deficiency

Pengaruh pemberian makanan tambahan berbasis pangan lokal terhadap peningkatan status gizi wanita hamil kurang energi kronik

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Abstract

Maternal nutritional status during pregnancy plays a critical role in ensuring optimal maternal and fetal health. Improving the nutritional status of pregnant women is essential for preventing chronic energy deficiency (CED). This study aimed to evaluate the effect of a 30-day locally sourced supplementary feeding program on the nutritional status of pregnant women at the Moyo Hilir Community Health Center in Indonesia. A pre-experimental study employing a one-group pretest-posttest design was conducted with 32 pregnant women. Nutritional status indicators were assessed before and after the intervention. Data were analyzed using the Wilcoxon signed-rank test. The results demonstrated that the locally sourced supplementary feeding program significantly improved nutritional status indicators and hemoglobin levels among pregnant women following the intervention ($p = 0.001$). The mean body weight increased from 47.70 ± 6.55 kg to 49.53 ± 6.73 kg. The mean mid-upper arm circumference (MUAC) increased from 21.03 ± 0.67 cm to 23.11 ± 0.75 cm. The mean body mass index (BMI) increased from 19.57 ± 2.29 kg/m² to 21.15 ± 2.57 kg/m². Furthermore, the mean hemoglobin concentration increased from 10.67 ± 1.43 g/dL to 14.48 ± 19.47 g/dL following the intervention. In conclusion, the findings indicate that locally sourced supplementary food effectively improves the nutritional status of pregnant women with chronic energy deficiency.

Keywords: Chronic energy deficiency, nutritional status, pregnant women, supplementary feeding, women's health

Abstrak

Status gizi selama kehamilan sangat penting untuk kesehatan ibu dan janin, dan peningkatan status gizi diharapkan dapat mencegah Defisiensi Energi Kronis (KDRT) pada ibu hamil. Pemberian makanan tambahan lokal (PMT) selama 30 hari bertujuan untuk meningkatkan asupan energi dan memperbaiki indikator gizi. Penelitian ini bertujuan untuk menguji pengaruh PMT lokal terhadap peningkatan status gizi ibu hamil dengan KDRT di Puskesmas Moyo Hilir. Metode penelitian yaitu pra-eksperimental satu kelompok pretest-posttest dilakukan di Puskesmas Moyo Hilir. Pengumpulan data menggunakan total sampel 32 responden. Status gizi dinilai sebelum dan setelah intervensi PMT selama 30 hari. Data dianalisis menggunakan Uji Wilcoxon. Hasil, pemberian makanan tambahan local secara signifikan meningkatkan status gizi dan anemia pada ibu hamil setelah intervensi ($p=0,001$). Terjadi peningkatan pada berat badan dari mean ($47,697 \pm 6,5450$) menjadi mean ($49,525 \pm 6,7260$), LILA mean sebelumnya ($21,031 \pm 0,6713$) meningkat mean ($23,109 \pm 0,7485$) dan IMT dari mean ($19,572 \pm 2,2852$) menjadi mean ($21,153 \pm 2,5729$), dan status hemoglobin dari mean ($10,669 \pm 1,4270$) menjadi mean ($14,475 \pm 19,4686$) setelah intervensi.

Kesimpulan, makanan tambahan yang bersumber dari lokal memiliki pengaruh yang bermakna dalam meningkatkan status gizi ibu hamil dengan defisiensi energi kronis.

Kata Kunci: Kekurangan energi kronis, ibu hamil, kesehatan wanita, pemberian makanan tambahan, status gizi,

Introduction

Maternal mortality rates are high globally and in Indonesia, with Indonesia's maternal mortality ratio increasing to 98 per 100,000 live births in 2023 (Hoyert, 2024). Indonesia aims to reduce the maternal mortality ratio to 70 per 100,000 live births and the infant mortality rate to 12 per 1,000 live births by 2030 (Khayati et al., 2025). Maternal deaths are mainly caused by pregnancy-related hypertension, pregnancy complications, maternal nutritional problems, postpartum hemorrhage, and infection (Aulia et al., 2024).

In 2023, the West Nusa Tenggara Province recorded 91 maternal deaths, primarily caused by hemorrhage and pregnancy-induced hypertension (Susenas, 2024).. show that nutritional problems are still significant, with 13.6% of pregnant women at risk of undernutrition and 48.9% experiencing anemia. Inadequate nutritional intake is a major factor with serious impacts on maternal health, newborns, and the quality of infant growth and development (Satu Data NTB, 2024).

Chronic energy deficiency (CED) in pregnant women is a public health problem that increases the risk of pregnancy and childbirth complications, such as anemia, miscarriage, postpartum hemorrhage, prolonged labor, and maternal death (Khayati et al., 2025). This condition also has serious impacts on the baby, including premature birth, low birth weight (LBW), impaired fetal growth and brain development, stunting, congenital abnormalities, and fetal death (Kamila et al., 2024).

The nutritional status during pregnancy significantly impacts the health of both the mother and baby (Harna et al., 2024). Improving nutritional status can prevent chronic energy deficiency (CED) in pregnant women and their offspring. Nutritional status was assessed by measuring upper arm circumference (MUAC), monitoring weight gain, and checking hemoglobin levels. Pregnant women were categorized as having or being at risk of CED if the UAC was < 23.5 cm, BMI < 18.5 kg/m² at the

beginning of pregnancy, or if weight gain did not meet the recommendations (Aryanti et al., 2024).

Local food-based food feeding programs have the potential to be an affordable source of nutrition, supporting food security and community economic empowerment (Harna et al., 2024). Food feeding programs, provided for 14–120 days, aim to improve the nutritional status of pregnant women with chronic energy deficiency (CED) (Mudlikah & Wiliyanarti, 2024). Although supplementary feeding has been implemented in community health centers over the past two years, studies on its impact on comprehensive nutritional status indicators height-for-age, body weight, BMI, and hemoglobin levels remain limited (Lubna et al., 2024). Therefore, this study analyzed the effect of local food-based supplementary feeding on changes in these nutritional status indicators in pregnant women with CED before and after the intervention (Anaemene et al., 2025).

The local food-based supplementary feeding program has been shown to be effective in increasing energy intake, body weight, and nutritional status indicators, including mid-upper arm circumference (MUAC) and triceps skinfold thickness (TSF), in pregnant women with chronic energy deficiency (CED). Several studies have shown that supplementary feeding significantly improves the nutritional status and increases body weight in pregnant women with CED ($p < 0.05$) (Damayanti et al., 2025). Therefore, local food-based supplementary feeding is recommended from the first to the third trimesters to meet increased nutritional needs and support fetal growth (Siti Mu'awanah, 2024).

The Moyo Hilir Community Health Center is located in the Moyo Hilir Sub-District, Sumbawa Regency, with a total population of 263 pregnant women and a sample of 32 pregnant women with chronic energy deficiency (CED). In Sumbawa Regency, the number of CED cases among pregnant women in 2022 reached 1,090 (approximately 12.5% of the 8,754 targeted pregnant women). Although this number decreased in 2023 to 1,043 cases (approximately 9.92%), the incidence of CED

among pregnant women in the Moyo Hilir Sub-District increased from 41 cases (9.13%) in 2022 to 68 cases (16.08%) in 2023 (Puskesmas Moyo Hilir, 2024).

In this study, the nutritional status of pregnant women with chronic energy deficiency (CED) was assessed using a combination of indicators, including body weight, body mass index (BMI), upper arm circumference, and hemoglobin levels, to provide a comprehensive picture of nutritional status. Body weight and BMI were used to assess mothers' responses to the food feeding intervention program using local food ingredients (Nur, 202). Mid-upper arm circumference (MUAC) serves as an indicator of improvements in long-term energy reserves. Hemoglobin testing helps detect anemia, which often accompanies CED, allowing the effectiveness of local food-based supplementary feeding to be thoroughly evaluated concerning maternal and fetal health (Erina et al., 2025).

Given the limited research on the impact of locally sourced food feeding programs on the nutritional status of pregnant women with chronic energy deficiency (CED), this study emphasizes the use of affordable local foods that align with the target group's culture and eating habits, while also supporting program sustainability. Unlike the national food feeding program, which prioritizes processed foods or standard fortification, the local food feeding program is considered more contextual and sustainable. Therefore, this study aimed to analyze the impact of local food-based supplementary feeding on improving the nutritional status of pregnant women with CED in the Moyo Hilir Health Center area.

Methods

This study was conducted in the Working Area of Moyo Hilir Health Center in Berare Village, Moyo Hilir District, Sumbawa Regency, from January to March 2025. A pre-experimental design with a one-group pretest-posttest approach was used. The researcher analyzed the characteristics and examined the effects of the variables after treatment. The intervention consisted of a 30-day locally sourced, supplementary feeding program. Participants received ready-to-eat supplementary foods once daily, comprising snack-based meals six days per week and a nutritionally balanced complete

meal once a week. Assessment/measurement was conducted before and after providing the food feeding program by weighing the children, measuring their height, measuring their mid-upper arm circumference (MUAC), and checking their hemoglobin levels.

Population and sample

The population is defined as the complete set of all elements or individuals to be studied or analyzed. The study subjects were pregnant women with chronic energy deficiency (CED), with a total population of 32 pregnant women with CED during January–February 2025 in the working area of the Moyo Hilir Community Health Center. Sampling was conducted using a total sampling technique, in which all members of the population were included, resulting in a sample size of 32 pregnant women with chronic energy deficiency (CED) in the working area of the Moyo Hilir Community Health Center.

The inclusion criteria were as follows:

- (a) Pregnant women diagnosed with chronic energy deficiency (CED) with mid-upper arm circumference (MUAC) <23.5 cm;
- (b) Residing in the working area of the Moyo Hilir Community Health Center.

The exclusion criteria were applied to anticipate potential dropouts and included pregnant women who were not at home during the supplementary feeding distribution or who were unwilling to participate as respondents. The dropout criteria included women who gave birth before the completion of the study or relocated during the study period.

Data Collection Techniques

Data were collected using an observational technique through direct observation of the study participants at the research site. Measurements were conducted before the provision of Supplementary Food and after the intervention. Data collection procedures included measuring body weight (BW), height, mid-upper arm circumference (MUAC), and hemoglobin (Hb) levels, as well as calculating body mass index (BMI) before and after the local food-based supplementary feeding intervention. Height was measured only once, before the intervention.

Data Processing and Analysis

Data processing was conducted using the SPSS computer system following several stages: data collection, editing, coding, tabulation, data entry, and data cleaning.

Univariate analysis was used to describe the frequency distribution and percentage of each variable. This analysis aimed to examine the relationship between the dependent variable, nutritional status, and the independent variable, the food feeding program.

Bivariate analysis was performed to assess the significant effect of the food feeding program on nutritional status using appropriate statistical tests based on the type of data and variables analyzed.

Statistical data analysis of the study data was performed using univariate analysis to determine the mean and standard deviation of body weight, upper arm circumference, body mass index, and hemoglobin levels before and after the intervention. Then, an analysis was conducted to determine differences in measurements before and after the intervention using the non-parametric Wilcoxon Signed-Rank test, as the data were paired and not normally distributed.

Ethical Approval

This study was approved by the Health Research Ethics Committee of the Health Polytechnic of the Ministry of Health Mataram (approval number: DP.04.03/F. XL VIII.14/66/2025).

Result and Discussion

Supplementary feeding was specifically targeted at pregnant women with chronic energy deficiency (CED) and was administered for 14–120 days. The supplementary feeding consisted of ready-to-eat complete meals or snacks made from locally sourced food with balanced and varied menus containing animal protein, calcium, carbohydrates, vitamins, and minerals. The intervention was delivered through home visits conducted by community health cadres or health workers on 32 pregnant women with chronic energy deficiency (CED).

Table 1. Distribution of age, parity, education, and occupation of pregnant women with chronic energy deficiency receiving supplementary feeding (n= 32)

Characteristics	Frequencies	
	n	%
Age		
At risk (<20 or >35 years)	7	22
Not at risk (20–35 years)	25	78

Parity		
At risk (1 or >3)	18	56
Not at risk (2–3)	14	44
Education		
No formal education	0	0
Elementary school	1	3
Junior high school	5	16
Senior high school	17	53
Higher education	9	28
Occupation		
Employed	8	25
Unemployed	24	75

Based on Table 1, of the 32 respondents included in the study, the majority (78%) were classified as being in the non-risk age group, namely aged 20–35 years, while 22% of respondents were categorized as being in the risk age group, defined as those aged under 20 or over 35 years.

The majority of respondents (56%) had high-risk parity, that is, their first pregnancy or more than three children, which can deplete maternal nutrient reserves owing to repeated pregnancies and short birth intervals, thereby contributing to chronic energy deficiency (CED) (Fibrila et al., 2022). From an educational perspective, most respondents had completed high school (53%) and higher education (28%); however, CED was still found, indicating that education level does not always directly affect nutritional practices. Other factors, such as economic conditions, food availability, and eating habits, are suspected to play more significant roles (Chekol Abebe et al., 2022).

Most respondents were unemployed (75%), a condition related to limited access to nutritious food and an increased risk of chronic energy deficiency (CED). Although they had more time to manage their diet, financial constraints remained a barrier to fulfilling their nutritional needs. In general, respondents were of a non-risk age, had at least a high school education, but the majority were unemployed, and more than half had high-risk parity (Maryuni, 2024). These findings emphasize the need for sustainable nutritional interventions, reproductive health education, pregnancy spacing management, and family support to prevent and address CED in pregnant women, considering that CED is chronic and requires a long-term approach, not just curative measures (Tummolo et al., 2023).

Based on the results of this study and previous research findings, it is concluded that age, parity, education, and occupation are factors that influence the occurrence of Chronic Energy Deficiency (CED) in pregnant women.

The Effect of local food-based supplementary feeding Ingredients on Improving Nutritional Status in Pregnant Women with Chronic Energy Deficiency (CED)

The analysis of this research data aimed to assess changes in the nutritional status and hemoglobin levels of respondents before and

after the intervention, including body weight, mid-upper arm circumference (MUAC), body mass index (BMI), and anemia status, by comparing the averages using appropriate statistical tests. Providing balanced energy-protein (BEP) nutritional supplements during pregnancy has the potential to improve maternal and infant outcomes, as evidenced by increased birth weight and reduced risk of stillbirth and small-for-gestational-age infants(Ciulei et al., 2023).

The results of the analysis are presented in Table 2 to illustrate the changes quantitatively.

Table 2. The effect of local supplementary feeding on body weight, MUAC, BMI, and hemoglobin

Variabel	Body weight ,MUAC, BMI, Hemoglobin				P Value
	Before		After		
	Mean	SD	Mean	SD	
Body weight category					
Underweight (<45 kg)					
Normal (≥45 kg)	47,697	6,5450	49,525	6,7260	0,001
MUAC Category					
CED (MUAC < 23.5 cm)					
Normal (MUAC ≥ 23.5 cm)	21,031	0,6713	23,109	0,7485	0,001
BMI Category					
Underweight (< 18.5 kg/m ²)					
Normal (≥ 18,5 Kg/m2)	19,572	2,2852	21,153	2,5729	0,019
Hemoglobin Status					
Anemia (Hb < 11 g/dL)					
Non-anemia (Hb ≥ 11 g/dL)	10,669	1,4270	14,475	19,4686	0,001

Overall, the results in Table 2 show that the administration of local food-based supplementary feeding has a significant effect (P<0.05) on improving the nutritional and hemoglobin status of pregnant women, including indicators such as body weight, Upper Arm Circumference (UAC), Body Mass Index (BMI), and hemoglobin status.

The Effect of Local Food-Based Supplementary Feeding on Body Weight

Local food-based supplementary feeding is effective in improving energy and nutrient intake, thereby contributing to increased body weight in pregnant women. Locally sourced food is generally rich in energy, protein, and micronutrients, which help meet the increased metabolic demands of pregnancy, particularly among women at risk of chronic energy deficiency (CED)(Fitriani et al., 2024).

The analysis results showed an increase in the body weight of pregnant women after the intervention, with the mean rising from 47.697 kg ±6.5450 to 49.525 kg ±6.7260, and the difference was statistically significant (p = 0.001). This increase indicates a positive response to nutritional intervention in pregnant women with Chronic Energy Deficiency (CED), which is generally caused by low energy and protein intake (Meilinasari et al., 2024), making

the provision of supplementary food important in supporting the growth of maternal and fetal tissues (Hill & Hill, 2024).

Pregnant women with Chronic Energy Deficiency (CED) in this study, hyperemesis gravidarum can worsen nutritional status due to decreased energy and protein intake. An initially low nutritional status makes the response to nutritional interventions more noticeable. The provision of Supplemental Food (SF) compensates for nutritional deficits caused by hyperemesis and supports the formation of maternal tissue, increases blood plasma volume, and promotes fetal growth, which collectively can lead to weight gain as an indicator of improved nutritional status(Maslin & Dean, 2022).

The Effect of Local Food-Based Supplementary Feeding on MUAC

The provision of local food-based supplementary feeding programs had a positive

impact on increasing MUAC measurements, indicating that this intervention was effective in improving the nutritional status of pregnant women with chronic energy deficiency (CED). The increase in MUAC following the intervention indicated that the nutritional intake provided through supplementary feeding was sufficient to meet the additional energy requirements of pregnancy (Dasmaseela et al., 2025). According to this study, the average MUAC score increased from $21,031 \pm 0,6713$ cm before the intervention to $23,109 \pm 0,7485$ cm after the intervention. This increase in MUAC indicates an improvement in Chronic Energy Deficiency (CED) status and is statistically significant ($p < 0.000$).

The locally sourced supplementary feeding program provided in this study comprised snacks and side dishes with a diverse and nutritionally balanced menu, supplying key nutrients such as animal protein, calcium, carbohydrates, vitamins, and minerals. Supplementary feeding was designed to meet the nutritional needs of pregnant women with an intake of approximately 500 kcal, a minimum of 30 g of protein, and 20 g of fat, using fresh ingredients without preservatives and low sugar, salt, and fat. A balanced nutritional composition, including iron and B-complex vitamins, plays an important role in supporting maternal health and fetal growth (Di Prima et al., 2022). In addition to their nutritional value, locally sourced supplementary feeds are easily accessible, culturally appropriate, and sustainable because they utilize food sources available within the community (Dasmaseela et al., 2025).

The Effect of Local Food-Based Supplementary Feeding on BMI

These findings suggest that local food-based supplementary feeding can improve the nutritional status of mothers and reduce the prevalence of chronic energy deficiency (CED) among pregnant women. The improvement in BMI was achieved as the nutritional composition of the supplementary feeding effectively met the increased energy and nutrient requirements during pregnancy, thereby supporting healthy maternal weight gain (Lubna et al., 2024). This previous study is similar to the results of the analysis in Table 2, which shows an increase in the average category of BMI < 18.5 kg/m² from $19,572$ kg/m² $\pm 2,2852$ before the intervention to $21,153$ kg/m² $\pm 2,5729$ after the intervention.

The increase in the BMI of pregnant women following the local food-based supplementary feeding intervention indicates successful recovery from energy deficits in women with CED, supported by energy sufficiency and high adherence to consumption patterns that conform to local dietary patterns. The statistically significant increase in BMI ($p = 0.019$) confirmed that the change was a direct impact of the intervention. However, because BMI primarily reflects changes in body weight, these results need to be confirmed using other nutritional indicators to comprehensively assess improvements in nutritional status (Champagne, 2022).

These findings suggest that the improvement in nutritional status was a direct result of the supplementary feeding intervention. The energy, protein, and micronutrient content of local food-based supplementary feeding helped meet the nutritional requirements of pregnant women, thereby increasing body mass and improving CED status. Additionally, the use of locally sourced food may enhance adherence because of its accessibility and cultural compatibility with local dietary patterns (Brouwer et al., 2022).

The Effect of Local Food-Based Supplementary Feeding on Hemoglobin

The hemoglobin levels of pregnant women increased significantly after the intervention, from an average of 10.67 g/dL before the intervention to 14.48 g/dL after the intervention ($p < 0.000$). In line with this, in previous studies, the provision of supplementary feeding made from local food ingredients was associated with a decrease in anemia prevalence from 44% to 31%, effectively increasing hemoglobin levels and improving the nutritional status of pregnant women with chronic energy deficiency (Nyamete et al., 2024).

The improvement in hemoglobin status is likely associated with the nutrient composition of the supplementary feeding, which included protein, iron, folic acid, and vitamin C, all of which play essential roles in erythropoiesis. Vitamin C enhances the absorption of non-heme iron from locally sourced foods and optimizes hemoglobin synthesis. Pregnant women with chronic energy deficiency (CED) typically have low energy and nutrient reserves; therefore, the provision of supplementary feeding helps meet daily energy and nutrient requirements,

enabling the body to increase red blood cell production and improve their anemia status (Kshirsagar & Kakade, 2024).

Physiologically, pregnant women with chronic energy deficiency (CED) require additional energy and macronutrients, such as carbohydrates, proteins, and fats, to support fetal growth, increased blood volume, and heightened metabolic activity. The locally sourced food used in the local food-based supplementary feeding intervention provided nutrients that were easily absorbed and directly contributed to increased body mass. These findings are consistent with previous evidence demonstrating that nutritional supplementation during pregnancy effectively improves maternal body weight (Soofi et al., 2022).

Overall, supplementary feeding sourced from local food ingredients significantly improved the nutritional status of pregnant women with chronic energy deficiency (CED), particularly in terms of weight (BB), body mass index (BMI), and hemoglobin (Hb) levels. These findings reinforce the effectiveness of supplementary local food ingredients in improving the nutritional status of pregnant women with chronic energy deficiency (CED). However, despite statistically significant changes in hemoglobin levels, the number of pregnant women classified as anemic increased slightly after the intervention. This study has several limitations, including the increase in the number of pregnant women with anemia after the intervention, indicating the presence of other factors that have not been fully controlled, such as iron intake from other sources, adherence and frequency of supplementary feeding consumption, and maternal health conditions that are not directly related to nutritional intake. Additionally, the relatively small number of respondents limits the power of the analysis and the generalizability of the study results. Therefore, further research is recommended to use a larger sample size and consider more comprehensive control of confounding variables (Brouwer et al., 2022).

Conclusion

Overall, the provision of locally sourced food-based supplementary feeding effectively improved the nutritional status of pregnant women with chronic energy deficiency (CED),

particularly in terms of body weight, body mass index (BMI), and hemoglobin (Hb) levels.

This intervention can be recommended as a strategy to strengthen the local food feeding program Policy at Community Health Centers to improve nutrition for pregnant women, integrated with the KIA, Nutrition, and Health Promotion programs into a community movement involving cadres, PKK (Family Welfare Movement), and local food MSMEs. However, although the changes in hemoglobin levels were statistically significant, the number of pregnant women classified as anemic increased slightly after the intervention. This result may be influenced by other factors, such as iron intake, frequency and compliance with food feeding program consumption, maternal health conditions unrelated to food intake, and the small number of respondents in the study. Therefore, future studies should increase the sample size.

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References

- Anaemene, D., Olubiyi, E., Olutayo, K., Oly-Alawuba, N., & Ademiluyi, D. (2025). Effect of two nutritional based strategies on the weight and CD4 status of underweight persons living positive in a South-Western town, Nigeria. *NIPES Journal of Science and Technology Research*, 7(1), 255–264.
- Aryanti, F. D., Luailiya, N., Misrochah, N., Patmawati, N. K., Christiana, E. B., & Hasanah, M. (2024). Penilaian status gizi, edukasi dan pengenalan inovasi pangan sebagai upaya pencegahan stunting pada ibu hamil di Desa Rejosari Kabupaten Demak. *Jurnal Pengabdian KOLABORATIF*, 2(2), 56–69. <https://doi.org/10.26623/jpk.v2i2.9613>
- Aulia, D., Siswadi, A. G. P., & Abidin, F. A. (2024).

- Gambaran gaya hidup sehat dewasa Indonesia dalam perspektif sosiodemografi. *Journal of Psychological Science and Profession*, 8(2), 168–176.
- Badan Pusat Statistik. (2024). *Persentase bayi usia kurang dari 6 bulan yang mendapatkan ASI eksklusif menurut provinsi (persen)*, 2024. <https://www.bps.go.id/id/statistics-table/2/MTM0MCMY/persentase-bayi-usia-kurang-dari-6-bulan-yang-mendapatkan-asi-eksklusif>
- Chekol Abebe, E., Ayalew Tiruneh, G., Asmare Adela, G., Mengie Ayele, T., Tilahun Muche, Z., Behaile T/Mariam, A., Tilahun Mulu, A., & Asmamaw Dejenie, T. (2022). Levels and determinants of prenatal breastfeeding knowledge, attitude, and intention among pregnant women: A cross-sectional study in Northwest Ethiopia. *Frontiers in Public Health*, 10, Article 920355. <https://doi.org/10.3389/fpubh.2022.920355>
- Ciulei, M. A., Smith, E. R., Perumal, N., Jakazi, C. S., Sudfeld, C. R., & Gernand, A. D. (2023). Nutritious supplemental foods for pregnant women from food insecure settings: Types, nutritional composition, and relationships to health outcomes. *Current Developments in Nutrition*, 7(6), 100094. <https://doi.org/10.1016/j.cdnut.2023.100094>
- Damayanti, M., Aminin, F., Mukodri, D. M. L., Saputri, N. A. S., Ikhwan, Z., Jasda, A., Jannah, R., Safitri, T., Putri, S. I., & Cintiani, J. C. (2025). Penguatan gizi ibu hamil melalui pemberian makanan tambahan lokal: Asistensi berbasis komunitas bagi ibu hamil dengan kekurangan energi kronis (KEK) di Kota Batam. *J-ABDI: Jurnal Pengabdian Kepada Masyarakat*, 5(1), 121–130.
- Dasmasela, M. K., Hardinsyah, H., Dewi, M., Ekayanti, I., & Indrayana, I. (2025). Local food-based supplementation and behavior change communication improve mid-upper arm circumference (MUAC) in pregnant women: A community-based intervention study. *Journal of Health and Nutrition Research*, 4(3), 1122–1133. <https://doi.org/10.56303/jhnresearch.v4i3.592>
- Di Prima, S., Nguyen Dinh, D., Reurings, D. D., Wright, E. P., Essink, D., & Broerse, J. E. W. (2022). Home-grown school feeding: Implementation lessons from a pilot in a poor ethnic minority community in Vietnam. *Food and Nutrition Bulletin*, 43(3), 271–302. <https://doi.org/10.1177/03795721221088962>
- Erina, T., Arisanti, A. Z., & Wulandari, R. C. L. (2025). Literature review: The relationship between chronic energy deficiency (CED) and the incidence of anemia in pregnant women. *Viva Medika: Jurnal Kesehatan, Kebidanan dan Keperawatan*, 18(1), 27–39. <https://doi.org/10.35960/vm.v18i1.1389>
- Fibrila, F., Herlina, H., Ridwan, M., & Harnanto, A. M. (2022). Faktor dominan penyebab kejadian kekurangan energi kronik pada ibu hamil. *Jurnal Medikes (Media Informasi Kesehatan)*, 9(1), 1–16. <https://doi.org/10.36743/medikes.v9i1.338>
- Fitriani, F., Yarmaliza, Y., & Farisni, T. N. (2024). Analyzing the level of knowledge, food consumption diversity, and nutritional intake on chronic energy deficiency among pregnant women in stunting prevention. *European Journal of Medical and Health Sciences*, 6(2), 62–66. <https://doi.org/10.24018/ejmed.2024.6.2.1939>
- Harna, H., Rahmawati, R., Irawan, A. M. A., & Sa'pang, M. (2024). Prevalence and determinant factors of chronic energy deficiency (CED) in pregnant women. *AcTion: Aceh Nutrition Journal*, 9(1), 65–73. <https://doi.org/10.30867/action.v9i1.1443>
- Hill, D. J., & Hill, T. G. (2024). Maternal diet during pregnancy and adaptive changes in the maternal and fetal pancreas have implications for future metabolic health. *Frontiers in Endocrinology*, 15, Article 1456629. <https://doi.org/10.3389/fendo.2024.1456629>
- Hoyert, D. L. (2024). *Health E-stat: Maternal mortality rates in the United States, 2022*. National Center for Health Statistics. <https://www.cdc.gov/nchs/data/hestat/maternal-mortality/2022/maternal-mortality-rates-2022.htm>
- Khayati, N., Punami, C. T., & Sevtiyani, I. (2025).

- Maternal mortality in Indonesia: What is the difference between 2019–2023? A health profile-based, geographical analysis. *BIO Web of Conferences*, 193, Article 00014. <https://doi.org/10.1051/bioconf/202519300014>
- Kshirsagar, N. S., & Kakade, S. V. (2024). Nutritional interventions in the prevention and treatment of anemias: A clinical review. *Obstetrics & Gynaecology Forum*, 34(3).
- Lubna, S., Kariny, E. J. A., Dari, W., & Sulistiawati, Y. (2024). The effect of supplementary feeding (PMT) of red bean extract on the body weight of pregnant women with chronic energy deficiency (CED) in the working area of Way Urang Health Center, South Lampung Regency. *Jurnal EduHealth*, 15(4), 1237–1247.
- Maryuni, M. (2024). *Wanita dan kesehatan keluarga* (N. Sulung, Ed.). Get Press Indonesia. <https://repository.binawan.ac.id/3485/1/Wanita%20dan%20Kesehatan%20Keluarga.pdf>
- Maslin, K., & Dean, C. (2022). Nutritional consequences and management of hyperemesis gravidarum: A narrative review. *Nutrition Research Reviews*, 35(2), 308–318. <https://doi.org/10.1017/S0954422421000305>
- Meilinasari, M., Marbun, R. M., Sa'diah, M. K., Rabbani, F. D., & Mulyo, G. P. E. (2024). The relationship between energy, nutrient intake, and occupational status with chronic energy deficiency (CED) in pregnant women. *Media Penelitian dan Pengembangan Kesehatan*, 34(3), 492–503.
- Mudlikah, S., & Wiliyanarti, P. F. (2024). Supplementation with sweet corn for weight gain in pregnant women. *MEDISAINS: Jurnal Ilmiah Ilmu-Ilmu Kesehatan*, 22(3), 157–161. <https://doi.org/10.30595/medisains.v22i3.24490>
- Nyamete, F., Majaliwa, N., & Chove, L. (2024). Food-based intervention for boosting micronutrient status and health: A comprehensive review. *World*, 8(1), 23–34.
- Puskesmas Moyo Hilir. (2024). *Laporan Puskesmas tahun 2023*. Puskesmas Moyo Hilir.
- Salwa Syifa Kamila, N., Maulina, R., Sumiyarsi Sukamto, I., Nugraheni, A., & Nilam Sari, A. (2024). Hubungan antara pengetahuan ibu hamil trimester pertama dan niat menyusui secara eksklusif di Puskesmas Grogol. *Journal of Midwifery Science and Women's Health*, 4.
- Satu Data NTB. (2024). *Data ibu hamil usia 15–49 tahun dengan kekurangan energi kronis (KEK)*. Pemerintah Provinsi Nusa Tenggara Barat. <https://data.ntbprov.go.id/dataset/9f1f4427-32d0-4bf2-a36b-0edc69452fb2/show>
- Soofi, S. B., Khan, G. N., Ariff, S., Ihtesham, Y., Tanimoune, M., Rizvi, A., Sajid, M., Garzon, C., de Pee, S., & Bhutta, Z. A. (2022). Effectiveness of nutritional supplementation during the first 1000 days of life to reduce child undernutrition: A cluster randomized controlled trial in Pakistan. *The Lancet Regional Health – Southeast Asia*, 4, Article 100035. <https://doi.org/10.1016/j.lansea.2022.100035>
- Tummolo, A., Carella, R., De Giovanni, D., Paterno, G., Simonetti, S., Tolomeo, M., Leone, P., & Barile, M. (2023). Micronutrient deficiency in inherited metabolic disorders requiring diet regimen: A brief critical review. *International Journal of Molecular Sciences*, 24(23), 17024. <https://doi.org/10.3390/ijms242317024>