

Analysis of health promotion in preventing chronic energy deficiency (CED) among pregnant women in coastal and mountainous areas

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ABSTRACT

Background: Chronic Energy Deficiency (CED) in pregnant women is a significant public health problem, especially in coastal and mountainous areas. CED is associated with insufficient energy intake and related to social, economic, cultural, and behavioral factors. Low educational attainment, traditional belief about food taboos, and limited geographic access are major obstacles to improving nutrition for pregnant women.

Objectives: This study aims to analyze health promotion efforts to prevent CED in pregnant women, including the types of activities, implementation obstacles, and supporting their success.

Methods: This research employed a qualitative research design with a phenomenological approach. The research was conducted in the hall of the Kebumen District Health Office on May 26, 2025. The total number of FGD participants was 10 people, consisting of 2 people from the Kebumen District Health Office, 6 community health center coordinator midwives (3 from the coastal/beach area and 3 from the mountainous area) and 2 village midwives (1 from the coastal area and 1 from the mountainous area). The committee from the research team consisted of 3 people. Inclusion criteria were current involvement in maternal health-promotion or CED-prevention activities, at least six months of relevant service experience, and willingness to provide informed consent. Individuals were excluded if they declined participation, could not be interviewed during the data-collection period, or did not have direct experience with the program. Informants were selected purposive sampling. Data were collected through in-depth interviews, Focus Group Discussions (FGD), and documentation of health promotion programs.

Results: The results identified five main themes: (1) Strengthening Health Education and Counseling for Pregnant Women; (2) Implementation of Nutrition Programs and

Cross-Sector Collaboration; (3) Intensive Assistance Through Cadres and Family Support Teams (TPK); (4) Establishment of Special High-Risk Pregnant Women's Classes; (5) Strengthening Pregnancy Examination (ANC Terpadu) for Early Detection. The findings indicate that the success of health promotion programs depends on maternal participation, the quality of cadres, family and community support, and cross-sector collaboration.

Conclusions: *Integrated and sustainable health promotion efforts involving education, nutritional interventions, mentoring, and cross-sector collaboration have proven effective in preventing CED and supporting optimal maternal and fetal health.*

KEYWORD: *chronic energy deficiency; health promotion; integrated anc; pregnancy classes; pregnant women*

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INTRODUCTION

Maternal and child health issues are a major concern for improving the quality of life worldwide. Many factors influence these health issues, such as chronic energy deficiency (CED), which can occur during pregnancy (1). Pregnancy is a crucial phase in life during which a mother's nutritional needs increase significantly to support fetal growth and development. If energy and protein intake remains inadequate over a prolonged period, pregnant women are at risk of developing Chronic Energy Deficiency (CED), a form of persistent malnutrition (2). CED in pregnant women is not merely a minor nutritional issue but a serious condition that can adversely affect the health of both mother and fetus. Pregnant women with CED are at greater risk of anemia, impaired fetal growth, and giving birth to low birth weight (LBW) infants (3). The continents of Africa and Asia, particularly sub-Saharan Africa and Southeast Asia, are centers of global

poverty and chronic malnutrition, with the majority of the population living in remote or rural areas. The prevalence of chronic malnutrition rose from 777 million in 2015 to 815 million in 2020, and it is estimated that at least 120 million women (60%) living in South and Southeast Asia are affected by chronic malnutrition (1). The prevalence of CED in pregnant women in 2016 was 30.1%. Globally, the prevalence ranged from 35 to 75% during the same year. Bangladesh had the highest incidence of CED, while Indonesia ranked fourth. The results of the 2015 Nutritional Status monitoring found that the KEK data in Indonesia was 13.3%, in 2016 it was 16.2%, and in 2017 it was 17.9% (1).

Based on 2018 Riskesdas data, the prevalence of CED in pregnant women in Indonesia reached 17.3%. However, the Indonesian Health Survey in 2023 recorded a decrease to 16.9%. This figure remains above the target of 10% set by the Indonesian Ministry for 2024 (4).

Mountainous and coastal areas in Indonesia still experience many problems with the nutrition of pregnant women. The prevalence of CED among pregnant women remains a significant public health issue. Various factors contribute to CED, including maternal nutritional knowledge, dietary habits, socioeconomic conditions, and access to and the quality of antenatal care (ANC) services (2).

In coastal areas, challenges such as limited dietary diversity, low educational background, and cultural influences contribute to prevalence of CED in pregnant women. Research shows that health education is essential because most mothers lack understanding of nutritional needs during pregnancy (5). Meanwhile, mountainous areas face different obstacles, including limited access to health facilities and health workers. As a result, pregnant women receive less nutrition education and routine nutritional status monitoring. Previous studies noted that direct assistance and counseling are very effective in increasing mothers' understanding of CED prevention in remote areas (6).

Limited dietary diversity and inadequate maternal nutrition for pregnant women can influence babies' birth weight. In 2022, 1 in 10 women aged 15-49 years who had given birth in the past two years in Kebumen Regency delivered a baby weighing under 2.5 kg. The infant mortality rate was 16.85 per 1,000 live births, indicating approximately 17 babies per

1,000 live births will not reach one year of age (7). The incidence of KEK in the Kuwarasan Community Health Center's work area as of December 2024 was 74 people, or 15.3%. The highest incidence of KEK pregnant women was in Harjodowo, Banjarnegara, and Gunungmujil villages. This represents a 1.8% increase from the 13.5% incidence in December 2023 (8). Several studies have shown a relationship between nutritional status and anemia during pregnancy with postpartum events and birth weight. A study showed that pregnant women with anemia had an 11.253 times greater risk of hemorrhage during childbirth than women who delivered vaginally without anemia (9).

Health promotion efforts are a key step for preventing CED because they focus on increasing knowledge and promoting behavioral change of pregnant women. Health promotion programs, such as nutrition counseling, prenatal classes, and leaflets have been shown to improve mothers' understanding of nutritional needs and the risks associated with CED. This finding is supported by research showing that structured counseling can significantly increase knowledge (10). In addition to counseling, mentoring programs for pregnant women are an effective health promotion strategy. Such programs include nutritional monitoring, education on nutritious foods, family counseling, and strengthening social support. A previous study stated that mentoring can improve

adherence to nutritious food consumption among pregnant women with CED (11). Health promotion also includes community-based interventions, such as strengthening the role of integrated health post (Posyandu) cadres, prenatal classes, and monitoring through maternal and Monitoring of upper arm circumference in pregnant women (LILA). Health cadres play a crucial role in directly conveying information, especially in areas with limited health workers. A Previous study shows that mothers' nutritional knowledge is closely related to the incidence of CED, highlighting the strategic role of health cadres in improving such knowledge (12).

Therefore, this study aims to analyze various health promotion efforts implemented to prevent CED among pregnant women in coastal and mountainous areas. This analysis will identify the types of health promotion activities, implementation barriers, and factors contributing to program success. The findings are expected to inform future health promotion program improvements.

MATERIALS AND METHODS

This study employed qualitative research with a phenomenological approach. The study was conducted at the Kebumen Regency Health Office, Central Java. This study focuses on KEK CED in pregnant women. The research was conducted in the hall of the Kebumen District Health Office on May 26, 2025. It

was attended by all invited stakeholders from both the local health office and the community health centers representing each coastal and mountainous region/area. The total number of FGD participants was 10 people, consisting of 2 people from the Kebumen District Health Office, 6 community health center coordinator midwives (3 from the coastal/beach area and 3 from the mountainous area) and 2 village midwives (1 from the coastal area and 1 from the mountainous area). The committee from the research team consisted of 3 people. Participants were selected through purposive sampling. Inclusion criteria were current involvement in maternal health-promotion or CED-prevention activities, at least six months of relevant service experience, and willingness to provide informed consent. Individuals were excluded if they declined participation, could not be interviewed during the data-collection period, or did not have direct experience with the program.

Data were collected using several techniques, including (1) in-depth interviews: conducted using a semi-structured guide that included questions on the implementation of health promotion, community participation, supporting factors, and obstacles; (2) focus Group Discussions (FGD): involving health workers and cadres to discuss the implementation of promotional activities and obstacles in the field; and (3) documentation: including reports on community health center

activities, nutritional data for pregnant women, and archives of health promotion programs from the Health Office. This study received research ethics approval from the Research Ethics Commission of STIKES Tri Mandiri Sakti Bengkulu (Approval No. 001752/KEPK STIKES TMS BENGKULU/2025).

RESULTS AND DISCUSSION

Theme 1: Strengthening Health Education and Counseling for Pregnant Women

This theme describes the implementation of health education and counseling for pregnant women as a health promotion strategy.

... the department still provides health promotion counseling, right? (L2, 26 May 2025)

... What health promotion programs have you implemented so far, ma'am? There are classes for pregnant women. Yes. There are also conduct programs at integrated health posts (Posyandu), such as those... (L3, May 26, 2025)

... Health promotion activities are usually carried out through large-scale educational campaigns on Instagram, at the District Health Office (DKK), or at the Community Health Center ... (L4, May 26, 2025)

Prenatal classes and counseling at integrated health posts (Posyandu) are routinely held by health offices and community health centers (Puskesmas) to

increase mothers' knowledge about nutrition, pregnancy care, and the importance of regular health check-ups. In addition to face-to-face sessions, education is also delivered through social media and digital platforms, enabling pregnant women who don't regularly attend these activities to receive important information about pregnancy health. Thus, this combined strategy enables broader, more effective, and more accessible health promotion for pregnant women in various settings. The implementation of prenatal classes and health education has been proven to be an effective strategy in increasing mothers' knowledge about pregnancy, nutrition, and childbirth preparation.

For instance, research in the Seyegan Community Health Center (Puskesmas) area, Yogyakarta, found a significant increase in participants' knowledge following prenatal classes, as reflected by higher post-intervention knowledge scores. These findings support the interview results indicating that prenatal classes are part of the routine health service/community health center outreach efforts (13). Beyond improving knowledge, prenatal classes also improve mothers' attitudes and preparedness for childbirth, infant care, and maternal health. A quasi-experimental study showed that nutrition education for pregnant women in prenatal classes increased their knowledge of healthy eating patterns, nutritional needs, and the risks of malnutrition during pregnancy (14). In

addition to face-to-face methods, health promotion approaches have become increasingly diverse, including social media, leaflets, and community-based outreach to reach mothers who may not regularly attend health posts (posyandu) or classes. This is especially important in remote areas or areas with limited mobility. Studies in several locations have shown that combining face-to-face education and information or promotional outreach media increases mothers' knowledge and awareness of nutritional intake, the role of supplements, and the importance of prenatal care (ANC) (15).

However, the success of education and outreach programs depends heavily on the active participation of mothers and the sustainability of the program. Although prenatal classes and outreach are available, their effectiveness may be limited if mothers do not participate or lack interest. Therefore, a strategy that provides education and encourages active participation, accessibility of information, both in-person and digital, and family and community support is needed to enable the constant acceptance and implementation of the education program. This aligns with literature emphasizing that health promotion needs to be integrated into routine services and combined with a community approach to be truly effective (16).

Theme 2: Implementation of Nutrition Programs and Cross-Sector Collaboration

This theme describes the implementation of nutrition programs and cross-sector collaboration as an effort to prevent Chronic Energy Deficiency (CED) in pregnant women.

...At schools, for example, we implement the Nutritious Action Movement. In addition to socialization and education, the program includes three physical activity initiatives: exercising together, having breakfast together, and taking iron supplements together... (L6, May 26, 2025)

...For CED, we provide supplementary feeding (PMT), locally prepared supplementary feeding (local PMT), and formula milk through the nutrition program (L7, May 26, 2025)

The nutrition program is implemented through the provision of supplementary feeding (PMT), the use of local PMT, and formula milk for pregnant women at risk of CED. In addition, collaborative activities, such as the "nutrition action" movement in schools involve education, physical activity, shared breakfasts, and the distribution of iron tablets to improve mothers' understanding and adherence to nutritional intake. This strategy demonstrates the importance of cross-sector collaboration among community health centers, schools,

midwives, and integrated health post (Posyandu) cadres, to strengthen promotive and preventive efforts in preventing CED. Implementing nutrition programs through supplementary feeding (PMT) for pregnant women has proven to be an important strategy for improving nutritional status and preventing CED. For instance, a scoping review study in Indonesia showed that PMT for pregnant women with CED positively influences nutritional status improvements (17). The implementation of PMT and nutrition services requires the distribution of food or supplements and cross-sectoral collaboration between community health centers (Puskesmas), midwives, integrated health post (Posyandu) cadres, and the community. For example, in the case of the Pattalassang Community Health Center during the COVID-19 pandemic, the PMT program for pregnant women continued to be implemented, involving nutrition workers, village midwives, and integrated health post (Posyandu) cadres, despite constraints on human resources (18).

Collaboration and implementation of nutrition programs that involve communities and utilizing local foods can strengthen family food security and improve the intake of pregnant women. A study on locally sourced PMT (Food-Based Nutrition) demonstrated how nutrition interventions through education and the provision of local foods can improve nutritional access for pregnant women and toddlers, particularly in areas with limited resources (19).

Although many nutrition programs have been implemented, evaluations show that success is not always consistent. An evaluation study of PMT and nutrition programs for pregnant women found that, despite the provision of PMT distribution and education, challenges such as non-compliance with consumption, family eating habits, or maternal health conditions continued to hinder the achievement of optimal results. This indicates that nutrition interventions must be accompanied by intensive mentoring, continuous education, and regular monitoring to ensure changes in knowledge and behavior, and to ensure sustainable improvement in maternal and fetal nutritional status (20).

Theme 3: Intensive Assistance through Cadres and Family Support Teams (TPK)

This theme describes an intensive assistance through health cadres and the Family Support Team (TPK) as a promotive strategy in preventing Chronic Energy Deficiency (CED) in pregnant women.

...the Community Health Center also provides mentoring through health cadres. We conduct direct home visits as a team to support pregnant women by providing health education and assessing their health status. Each village has a Family Assistance Team that conducts regular visits to pregnant women ... (L5, May 26, 2025)

Support is provided directly in pregnant women's homes by the community

health center team, along with health cadres and the Community Empowerment Team (TPK). This program aims to provide nutrition education, monitor maternal health, and support adherence to the CED prevention program. This strategy enables more intensive supervision, early detection of nutritional problems, and the provision of personalized information and support, ensuring that pregnant women receive more focused and continuous attention.

Intensive support from cadres, both through integrated health posts (Posyandu) and local support teams, plays a significant role in supporting the health of pregnant women, particularly regarding health monitoring, nutrition education, and childbirth preparation. For instance, a study of cadre training and support in Kabasaran Village, Bogor, found that after training, cadre skills in anthropometric measurements and early detection of pregnancy risks increased significantly (scores from ~47.7% to ~77.6%). This indicates that trained cadres can provide better supervision and education to pregnant women (21). The role of cadres extends beyond measurement and monitoring to providing direct education to mothers on balanced nutrition, pregnancy nutritional needs, and prevention of malnutrition or CED. A study in the community service journal shows that empowering posyandu cadres to support pregnant women and toddlers can improve maternal nutritional fulfillment and support

stunting prevention, which has implications for maternal and fetal health (22).

In times when access to healthcare may be limited, such as during a pandemic, cadre support becomes crucial. A study on cadre-assisted support for pregnant women and the use of maternal and child health (KIA) handbooks during the pandemic showed that this approach helped maintain the continuity of antenatal care services and safe delivery preparation, even when formal services were disrupted (23).

However, the effectiveness of mentoring depends highly on the quality of the cadres, their training, and the commitment of the community. A literature review shows that the success of mentoring pregnant women is largely determined by the readiness of the cadres, the participation of the mothers, and the support of the social environment to ensure optimal program implementation (24).

Theme 4: Establishment of Special Classes for High-Risk Pregnant Women

This theme explains the formation of special classes for pregnant women for high-risk groups as a promotive and preventive strategy in preventing Chronic Energy Deficiency (CED).

....We established a special class for high-risk pregnant women. We bring them together because, if they are combined with women experiencing normal pregnancies, the program may not achieve optimal outcomes. Therefore, we provide a

separate class specifically for high-risk pregnancies... (L1, May 26, 2025)

Classes for high-risk pregnancies are designed separately from those for normal-risk pregnancies to ensure more focused and effective education and interventions. These classes provide intensive and relevant material for high-risk conditions, such as anemia management, weight and MUAC monitoring, and the early detection of pregnancy complications. This approach allows midwives and healthcare workers to provide individualized counseling, conduct repeated screenings, and develop appropriate follow-up plans for each mother, enabling optimal prevention of CED and pregnancy complications. The establishment of special pregnancy classes for high-risk groups provides an opportunity for more in-depth education and focused interventions. These classes focus on general topics (basic nutrition and danger signs) and on topics relevant to at-risk mothers, such as anemia management, weight and MUAC monitoring, pregnancy-related hypertension detection, and rapid referral planning. This more intensive approach allows midwives and health workers to conduct repeated screenings, provide individual counseling, and develop appropriate follow-up plans for each mother. Evidence from evaluations of high-risk pregnancy classes in several locations have shown an increase in mother's knowledge and preparedness to manage pregnancy complications (25).

High-risk pregnancy classes also

serve as a platform for regular monitoring, facilitating the early detection of nutritional problems or pathological conditions. Through more frequent meetings and regular anthropometric and blood pressure measurements, health workers can identify declining nutritional status (e.g., CED) or anemia more quickly and initiate interventions (e.g., provision of PMT, referrals, or deworming). Field studies have shown that high-risk class-based interventions are correlated with better ANC compliance and a reduced incidence of pregnancy-related complications than standard antenatal services (25). An interactive educational approach through group discussions has been shown to improve pregnant women's nutritional knowledge and understanding of health recommendations while strengthening social support among mothers. This method facilitates active engagement, enhances information retention, and improves adherence to nutritional practices and prenatal care (26).

However, the implementation of high-risk pregnancy classes faces operational challenges: limited trained personnel, midwife workload, low maternal participation (due to time, work, or transportation), and insufficient funding for PMT or special teaching materials. Addressing these challenges requires supportive policies, such as training for cadres or TPK, allocation of village funds for PMT, flexible schedules (evenings or weekends), and

integration of rapid referrals with referral facilities. Program evaluations show that with cross-sectoral support and regular monitoring, high-risk classes can effectively function as a preventive strategy to reduce pregnancy complications in the community (27).

Theme 5: Strengthening Pregnancy Check-ups (Integrated ANC) for Early Detection

This theme describes strengthening pregnancy check-ups (integrated ANC) as an early detection strategy for health risks in pregnant women, including the prevention of Chronic Energy Deficiency (CED) and anemia.

.... For anemia prevention, we implement integrated antenatal care (ANC), and we always encourage our colleagues to provide intensive support to pregnant women... (L7, May 26, 2025)

Integrated ANC services are designed to facilitate the early detection of conditions such as anemia and nutritional deficiencies in pregnant women. In addition to routine checkups, the program emphasizes intensive support from health workers to ensure that pregnant women receive nutrition education, health monitoring, and prompt intervention if risks are identified. This strategy ensures that prenatal care extends beyond routine examinations by serving a proactive effort to improve maternal and fetal health and effectively prevent CED. The implementation of

integrated ANC plays a crucial role as an early detection of various pregnancy risks. For instance, research in the Buaran Community Health Center (Puskesmas) area shows that integrated ANC enabled the early identification of conditions such as anemia among pregnant women, allowing timely intervention. Thus, ANC is not simply a routine examination but a proactive effort to maintain maternal and fetal health throughout pregnancy (28). The quality of ANC implementation also significantly influences pregnancy outcomes. A study conducted at the Ambacang Community Health Center (2024) emphasized that the success of ANC is measured by the number of visits, aspects of input, process, output, and the level of satisfaction of pregnant women. When these aspects are met, including nutritional status checks, blood pressure, nutritional counseling, and monitoring of fetal nutrition and health, the potential for complications can be significantly minimized (29).

In addition to detecting maternal risks, integrated ANC also contributes to the prevention of child developmental issues, including stunting. According to research in several regions, standard ANC visits are associated with a reduction in stunting in toddlers. Therefore, ANC services improve maternal and fetal health during pregnancy and have a long-term impact on child health and development (30). Maternal health education and literacy are also essential components of integrated ANC. Studies

show that increasing maternal awareness of the importance of ANC through health education and counseling can improve adherence to visits and increase the chances of early detection of complications. Therefore, ANC programs should adopt a holistic approach: medical examinations, nutritional counseling, health education, and monitoring, including childbirth preparation (31).

CONCLUSION AND RECOMMENDATION

This qualitative study identified five linked health-promotion strategies for preventing CED among pregnant women in coastal and mountainous areas: health education and counselling; nutrition programs and cross-sector collaboration; cadre and family-support assistance; targeted classes for high-risk pregnant women; and integrated ANC for early detection. Their scientific significance lies in showing that CED prevention depends on an integrated implementation system that combines knowledge, access, monitoring, social support, and timely intervention. Programs should therefore adapt delivery to local geography, strengthen cadre and family capacity, maintain targeted support for high-risk women, and integrate nutrition monitoring with ANC. Future implementation should use flexible outreach and digital or community-based channels where appropriate and evaluate participation, continuity, and nutritional outcomes across settings.

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