

The Role of Continuity of Care (CoC) in Supporting Pregnant Women at Risk of Chronic Energy Deficiency (CED) in Improving Nutritional Status: A Case Report

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ABSTRACT

Background: Nutritional issues in pregnant women occur during the 1,000 Days of Life (HPK) period. If nutritional problems during pregnancy are not addressed, they can disrupt fetal development. The government has undertaken efforts such as providing supplementary feeding (PMT). This PMT activity should also be accompanied by nutritional education to promote behavioral change. Midwives are among the healthcare professionals who can provide comprehensive support. This support is aimed at optimizing continuous midwifery care, with the expectation of reducing the impact of Chronic Energy Deficiency (CED) on both pregnant women and their fetuses. **Methods:** This case report is compiled using a descriptive method with a case study approach. The researcher supported Continuity of Care (CoC) to one patient in the working area of the Surabaya Community Health Center, from the pregnancy period through to the postpartum period and the newborn phase. **Case Presentation:** A 20-year-old pregnant woman was identified as at risk for Chronic Energy Deficiency (CED) due to a measurement of Mid-Upper Arm Circumference (MUAC) < 23.5 cm. The woman received continuous support, including monitoring her intake of prenatal vitamins, Antenatal Care (ANC) support, counseling, and nutritional education. By the end of the pregnancy, there was an increase in her MUAC, and she was no longer at risk of CED. **Conclusion:** With support in the form of monitoring and holistic, comprehensive, and collaborative midwifery care from the beginning of pregnancy, optimal care targets can be achieved. The role of support throughout the pregnancy and postpartum period has been carried out effectively, resulting in the mother being free from the risk of Chronic Energy Deficiency (CED) and the baby not experiencing Low Birth Weight (LBW).

Keywords: maternal health; nutritional status; antenatal care; pregnancy; women; chronic energy deficiency

INTRODUCTION

A mother plays a crucial role in shaping quality human resources, so maternal health and good nutritional status during pregnancy provide a primary opportunity for successful fetal development and ensure the safety of the mother during childbirth [1]. Maternal nutritional status is a critical factor in pregnancy and requires special care because pregnant women are considered a nutritionally vulnerable group [2]. One of the ongoing health issues in Indonesia, is nutritional problems, particularly among pregnant women. Nutritional problems during pregnancy occur during the 1,000 Days of Life (HPK) period, which spans from the formation of the fetus in the womb (270 days) to the first two years of life (730 days). During pregnancy, important organs such as the brain, heart, liver, kidneys, lungs, and bones begin to form and develop. If maternal nutrition during pregnancy is inadequate, it can disrupt this development. One common nutritional issue is Chronic Energy Deficiency (CED).

According to Riskesdas data (2018), the prevalence of CED risk among women of childbearing age is 14.1%, while among pregnant women, it is 17.3%. Additionally, the prevalence of anemia among pregnant women is 48.9% [3].

Chronic Energy Deficiency (CED) is a condition where pregnant women experience long-term (chronic) deficiencies in energy and protein, leading to health issues [4]. The Ministry of Health (2023) defines pregnant women with CED as those with a Body Mass Index (BMI) < 18.5 kg/m² before pregnancy or during the first trimester (< 12 weeks) of pregnancy. Additionally, the Ministry of Health (2023) identifies at-risk pregnant women as those with an Upper Arm Circumference (MUAC) < 23.5 cm. Pregnant women with CED need increased energy and protein intake because long-term energy deficiencies must be addressed to restore normal nutritional status.

Meanwhile, more than half of pregnant women have significantly inadequate energy intake (<70% of the recommended energy intake), and around half also experience protein intake deficiencies (<80% of the recommended intake) [5].

Nutritional problems are caused by various factors. Insufficient intake of nutritious food is a direct cause of nutritional issues. Lack of knowledge, difficult access to health services, and socio-economic conditions also indirectly affect access to nutritious food and healthcare services [5]. All these direct and indirect factors are influenced by the inadequate empowerment of women, families, and human resources as primary issues [6]. Additionally, other factors that can affect the nutritional status of pregnant women with CED include dietary patterns, food consumption, economic status, health status, and individual factors such as excessive work and poor nutritional knowledge [7].

One of the government strategies to accelerate the improvement of maternal nutrition is through Supplementary Feeding (PMT). PMT is prioritized for pregnant women experiencing or at risk of CED. PMT activities need to be accompanied by nutritional and health education to facilitate behavioral changes, such as supporting breastfeeding, providing education and counseling on feeding, and promoting cleanliness and sanitation for the family. Other efforts to improve health and nutritional status among pregnant women are carried out through Integrated Antenatal Care (ANC), including measuring nutritional status (weighing and measuring height/length, measuring Upper Arm Circumference (MUAC), providing Iron Supplements (TTD), counseling on nutrition, and educating pregnant women on the importance of consuming nutritious food during pregnancy [5].

According to Simbolon (2019), one of the efforts needed to improve the nutritional status of pregnant women with CED is providing nutritional education through healthcare support. During the support process, the caregiver can provide attention, convey messages, motivate, encourage, offer solutions, provide services/assistance, give advice, refer, mobilize, and collaborate with the family [4]. Research by Adfar et al. (2022) shows the effectiveness of support for pregnant women with CED in improving nutritional status. Therefore, Continuity of Care (CoC) activities are conducted so that healthcare providers, especially midwives, can deliver continuous midwifery care through education and support throughout pregnancy, childbirth, and the postpartum period, thereby reducing the impact of CED on both the mother and the fetus [8].

METHODS

This case report is compiled using a descriptive method with a case study approach. The researcher supported Continuity of Care (CoC) to one patient in the working area of the Surabaya Community Health Center, from the pregnancy period through to the postpartum period and the newborn phase.

CASE PRESENTATION

The subject of this case report is a 20-year-old Javanese woman. At the beginning of the support, provided through home visits, the subject was diagnosed with a first pregnancy (G1P0000) at 19/20 weeks gestation with risks of Chronic Energy Deficiency (CED), mild anemia, and a height < 145 cm. The subject was undergoing routine prenatal care at a community health center (Puskesmas) in Surabaya. Her menstrual history included a last menstrual period (LMP) on March 3, 2023, and an estimated due date (EDD) of December 10, 2023. Obstetric history indicated this was her first pregnancy, with no history of miscarriage. This pregnancy was planned by the mother and her husband. There was no history of hypertension or diabetes mellitus before pregnancy and no family history of these conditions. The subject is a housewife. Her husband and parents provided full support during the pregnancy. The subject does not smoke, use certain medications, or consume alcohol. There are no cultural factors in her living environment that could affect her health during pregnancy.

The subject's first antenatal care visit was at 9/10 weeks gestation at the community health center. During the first trimester, the subject reported nausea and occasional vomiting, leading to a reduced appetite. Her eating pattern was 2-3 times a day with small portions, including rice, side dishes, and vegetables. She more frequently consumed bread and potatoes due to nausea from eating too much rice. At 144 cm tall and 46 kg in weight, her Body Mass Index (BMI) was 22.2 kg/m² in the first trimester, indicating normal BMI. However, the Mid-Upper Arm Circumference (MUAC) measurement was 23 cm, suggesting a risk of CED. Vital signs and physical examination were within normal limits. According to the Poedji Rochjati Risk Score Card (KSPR), her pregnancy was classified as high risk with a score of 6 (initial score of 2 plus a height score of 4). The subject received Supplementary Feeding (PMT) in the form of milk and biscuits from the health center due to her risk of CED. Additionally, she was provided with multivitamins (laduni) and calcium lactate and received nutritional counseling.

The next antenatal care visit was at 16 weeks gestation. During the second visit, the subject underwent integrated antenatal care. Triple screening results were non-reactive, and her hemoglobin level was 10.4 g/dl, indicating mild anemia. The subject still experienced occasional nausea. Although her eating pattern had not changed significantly, she was now regularly consuming the biscuits and milk provided by the health center. The initial support visit occurred at 19/20 weeks gestation. During this visit, an assessment and education were provided. The education focused on nutrition and managing nausea and vomiting by eating small, frequent meals and avoiding strong-smelling or nauseating foods. The caregiver also reminded her to consistently take the multivitamin laduni and provided proper consumption instructions. The caregiver continued to follow up with the subject through home visits and telehealth.

Nausea started to subside by 23/24 weeks of pregnancy, and the subject began to tolerate rice. This improvement was noted during the second home visit. Her eating pattern increased to 4-5 times a day with small portions, and she continued to consume biscuits and milk. MUAC measurement at the second visit was 26 cm, indicating that the PMT provided by the health center was effective, and the subject was no longer at risk of CED. However, the subject was not consistently taking laduni. During this visit, education emphasized the importance of taking laduni as recommended (1x1 capsule). Additionally, the caregiver used the Maternal and Child Health (KIA) book as an educational tool regarding daily activities and care for pregnant women.

The third home visit occurred at 27/28 weeks gestation. By this time, the subject reported no discomfort related to pregnancy. She was pleased to have recently undergone a 4D ultrasound at an Ob/Gyn clinic, which showed a male fetus with a placenta located in the right fundus, adequate amniotic fluid, a fetal heart rate of 155 beats per minute, and an estimated fetal weight (EFW) of 849 grams. The subject noted that the fetal weight was not consistent with gestational age, so the doctor advised increasing her intake of balanced nutrition. Additionally, she received extra folic acid (1x400 mcg), calcium lactate (1x500 mg), DHA (1x1 capsule), and iron supplements (2x1 tablet). The caregiver provided nutritional education, advising the subject to consume high-protein foods, follow the doctor's recommendations for supplements, and stimulate the baby by talking to it. The subject was happy to report that the baby responded by moving when stimulated.

During the ANC visit at 32/33 weeks gestation, the subject experienced lower abdominal pain. The caregiver explained that this was normal as the fetus's lowest part was beginning to enter the pelvis. The caregiver also provided education on rest and reminded the subject to take vitamins as recommended. An ultrasound at the health center confirmed that the fetal weight was appropriate for gestational age. At 35/36 weeks, the subject was referred to the hospital due to concerns that the lowest part of the fetus had not yet engaged in the pelvis, raising the risk of cephalopelvic disproportion (CPD). The subject felt anxious about the hospital's recommendation for a cesarean delivery. The caregiver provided psychological support through WhatsApp and recommended doing third-trimester exercises to help the fetus descend. The subject decided to continue her care at her chosen Independent Midwife Practice (TPMB) and was reassured that she had done her best regardless of the delivery method.

During the fourth home visit, at 39/40 weeks gestation, the subject began experiencing occasional contractions. The caregiver reminded her of the signs of labor previously discussed in early third-trimester visits. The subject prepared for delivery and completed the necessary paperwork. At the last ANC visit, her weight was 61.2 kg, indicating a weight gain of 15.2 kg during pregnancy.

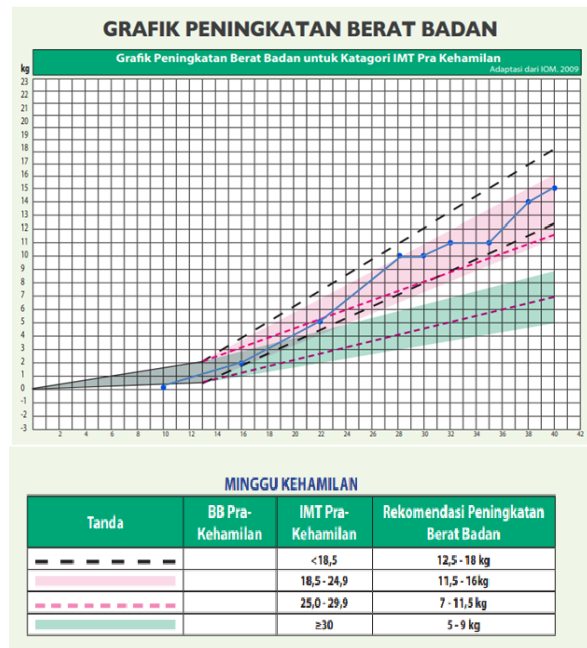


FIGURE 1: Graph of Weight Gain Throughout Pregnancy.

On December 9, 2023, the subject complained of more frequent contractions and the discharge of blood-tinged mucus. During this condition, support was provided through telehealth. The caregiver offered psychological support by calming the subject during the labor observation process. The subject proceeded to the Independent Midwife Practice (TPMB) where she had planned to give birth. Upon examination, a small part of the fetus was palpable at the lowest part. With the consent of the mother and family, the TPMB referred the mother for delivery at the hospital.

At the hospital, observations were made, and a cesarean section was planned for December 10, 2023. Before the surgery, a complete laboratory test was performed, revealing the subject's hemoglobin level to be 10.3 g/dl. The baby was delivered via cesarean section at term, weighing 2745 grams and measuring 47 cm in length. The baby cried immediately after birth and showed no congenital abnormalities.

DISCUSSION

Chronic Energy Deficiency (CED) is a condition where pregnant women suffer from a prolonged (chronic) deficiency of energy and protein, leading to health issues [4]. CED occurs because the body lacks one or more essential nutrients. Factors contributing to nutrient deficiencies include insufficient intake of nutrients, low quality of nutrients, or both. Additionally, nutrients consumed may fail to be absorbed and utilized by the body [9]. Chronic energy deficiency refers to an intake of energy that is less than the energy required and persists over a certain period. Dietary patterns play a crucial role in the occurrence of CED. Indonesian dietary patterns generally have low sources of heme iron (animal-based) and high sources of non-heme iron (plant-based) [10].

The Ministry of Health (2023) indicates that CED risk in pregnant women can be identified by one or more

characteristics such as Mid- Upper Arm Circumference (MUAC) < 23.5 cm and a Body Mass Index (BMI) < 18.5 kg/m² before pregnancy or during the first trimester (<12 weeks) [5]. The risk of CED in the subject was identified during the first ANC visit at the health center, with a MUAC measurement of 23 cm. Yusriani and Budiono (2021) explain that factors associated with CED in pregnant women include parity, pregnancy spacing, average energy intake, education level, family income, and dietary taboos [11]. Among these variables, dietary taboos are the most influential. Oktavia et al. (2021) also identify that inadequate food variety, small portion sizes, and food taboos contribute to CED. Although the subject did not have cultural practices affecting health during pregnancy, labor, and postpartum, including dietary restrictions, the significant decrease in portion and frequency of meals at the beginning of pregnancy could be a risk factor for CED [12].

The subject had a hemoglobin level of 10.4 g/dl, indicating mild anemia. Anemia during pregnancy refers to a deficiency of iron in the blood. Pregnant women are considered anemic if hemoglobin levels are <11 g% in the first and third trimesters or <10.5 g% in the second trimester. Anemia in pregnant women is a serious condition that requires attention from all healthcare providers [13]. According to Sastri et al. (2023), there is a significant relationship between anemia and CED occurrence (p-value = 0.000). CED is more common in pregnant women with poor adherence to iron tablet consumption, which was the case for this subject [13, 14]. CED in women leads to iron deficiency, which can be a factor in anemia. If arm circumference indicates poor nutrition, anemia can become more severe [9].

The conditions of CED risk and mild anemia in the subject need attention during pregnancy. To address these conditions, continuity of care was provided through personal education and counseling with home visits and telehealth. According to Sandall et al. (2016), the continuity of care model has more benefits compared to other care models. Caregivers can monitor physical, psychological, spiritual, and social conditions throughout pregnancy and postpartum [15]. Additionally, caregivers can provide individual education and counseling. During this continuity of care, the subject received education and counseling related to nutrition.

It is essential for mothers at risk of CED to understand that insufficient nutrient intake can affect fetal growth [16]. Counseling can also improve food intake in pregnant women with CED [17]. Personal counseling and education can increase motivation and self-efficacy for optimal maternal and fetal health [18].

During the second home visit, the MUAC measurement was 26 cm, indicating that the subject was no longer at risk of CED. The initial problem of inadequate meal portions had started to be resolved. CED management for the subject was initiated upon identifying the risk, including providing supplementary feeding (PMT) in the form of milk and biscuits. Additionally, the management at the health center included routine ANC and nutritional counseling [5]. The subject regularly consumed the milk and biscuits provided by the health center since they were first received. Besides providing education, the caregiver also reminded the subject to attend routine ANC visits at the health center.

The CED issue for the subject was resolved with PMT and improved eating patterns, but anemia was still not fully addressed. The subject received multivitamins including folic acid (400 mcg) and iron (30 mg), but did not consume them regularly. The caregiver reminded the subject to take them consistently and educated on the best time to take them to minimize nausea. Iron tablets should ideally be taken at night to reduce nausea [19].

Additionally, the caregiver provided education on proper iron tablet consumption as it affects iron absorption in the blood. Iron tablets can be taken with vitamin C to maximize absorption, thus increasing hemoglobin levels in the blood, such as from fresh fruits, vegetables, and fruit juices. It is also important to avoid foods containing polyphenols, such as tea, coffee, and grains, as they can inhibit iron absorption [19, 20]. During pregnancy, the subject gained 15.2 kg. In the first trimester, the BMI was normal, so the recommended weight gain during pregnancy was 11.5 – 16 kg. The caregiver evaluated weight gain during each visit using the Maternal and Child Health (MCH) book. According to the MCH book, the subject's weight gain was within the recommended curve, indicating that the weight gain was appropriate and suggesting improved nutritional intake.

TABLE 1: Recommendations for Weight Gain During Pregnancy by Institute of Medicine (IOM) 2022.

BMI before pregnancy	Weight Gain during 1 st Trimester	Weekly Weight Gain during 2 nd & 3 rd Trimester	Total Weight Gain (Single Pregnancy)	Total Weight Gain (Multiple Pregnancy)
Underweight (<18.5kg/m ²)	1-3 kg	0.5 kg	12.5 – 18 kg	
Normal (18.5 – 24.9kg/m ²)	1-3 kg	0.4 kg	11.5 – 16 kg	17 – 24 kg
Overweight (25.0 – 29.9kg/m ²)	1-3 kg	0.3 kg	7 – 11.5 kg	14 – 23 kg
Obese (>30 kg/m ²)	0.2-2kg	0.2 kg	5 – 9 kg	11 – 19 kg

Chronic Energy Deficiency (CED) in pregnant women can lead to intrauterine growth retardation (IUGR) and low birth weight (LBW). In this case, the subject had an ultrasound examination at 27/28 weeks of gestation, which revealed an estimated fetal weight (EFW) of 849 grams, indicating a small gestational age (SGA) and suspected IUGR. If CED in pregnant women is not addressed, the occurrence of IUGR and LBW will persist in subsequent generations, leading to intergenerational stunting issues. LBW and stunting increase the risk of degenerative diseases such as heart disease, diabetes mellitus, stroke, and others. The cumulative impact of low intelligence resulting from LBW and stunting will negatively affect the quality of human resources. Meanwhile, the increase in the prevalence of degenerative diseases will lower life expectancy, increase medical expenses, and reduce productivity [4].

Evaluation with another ultrasound at 35/36 weeks showed that the fetal EFW was appropriate for gestational age. The management involved collaboration with the village midwife, health cadres, and nutritionists at the health center to provide education and support to improve the nutritional intake of the CED mother. Counseling, education, and information (KIE) were also provided to the mother's husband and family as an essential aspect of the support system [21].

A baby with low birth weight (LBW) is born with a birth weight under 2500 grams regardless of gestational age [22]. The subject delivered at term with a normal birth weight of 2745 grams and a length of 47 cm. The subject was free from CED risk by the mid-second trimester and showed continuous weight gain until the end of pregnancy. This indicates that the management of CED and the role of the accompanying support during pregnancy were optimal, resulting in a healthy baby with normal birth weight. The support was provided from the early second trimester until the postpartum period. The outcome showed that the subject was free from CED and delivered a healthy baby with no LBW. This indicates that the ongoing support had a positive impact on improving the mother's nutritional status, especially for those with CED. This support aligns with the research conducted by Simbolon et al. (2022), which states that nutritional support for pregnant women with CED and anemia is effective in improving average nutritional intake [4]. Adfar et al. (2022) also noted the effectiveness of support for pregnant women with CED in improving nutritional status [8]. Furthermore, support for pregnant women can enhance maternal knowledge [14].

In this support process, the mother's macro-nutritional status was adequately met, as evidenced by the LILA condition and optimal weight gain during pregnancy. However, the mother's hemoglobin level at the end of pregnancy was 10.3 gr/dl, indicating mild anemia. This represents a limitation of the support process. While the macro-nutritional status was met, the micro-nutritional status was not fully addressed. Therefore, further management is needed to address the mild anemia experienced by the mother. Another

limitation of the support process was the irregular frequency of home visits, which were not conducted every month. This occurred due to the supporter's clinical practice and the considerable distance to the mother's home.

CONCLUSIONS

Pregnant women with Chronic Energy Deficiency (CED) or with other nutritional deficiencies require special attention because these conditions can disrupt the pregnancy process, and labor, and result in low birth weight (LBW) occurrences. The government has made efforts to address this through the Provision of Nutritional Supplement Programs (PMT). However, providing PMT must be accompanied by nutritional education to induce changes in the attitudes and behaviors of pregnant women toward improving their nutritional intake. Support for pregnant women, or Continuity of Care activities, involves monitoring the course of pregnancy and postpartum care for women with CED or other nutritional risks. With holistic, comprehensive, and collaborative midwifery care and monitoring from the early stages of pregnancy, optimal care targets can be achieved. The role of support throughout pregnancy and postpartum has been performed optimally, ensuring that the mother is free from CED risk and the baby does not experience LBW.

Recommendations for future support processes include optimizing each step comprehensively. There is a need to enhance the nutritional status of the mother, including both macronutrients and micronutrients, particularly for women at risk of CED or who also suffer from anemia. Additionally, regular monthly home visits are necessary to ensure the mother's condition is well-monitored and to achieve optimal outcomes. Therefore, the distance between the supporter and the mother needs to be considered.

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