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Intakes of Energy, Protein, Iron, and Folic Acid in Pregnant Women Chronic Energy Deficiency at Sobo Health Center, Banyuwangi City, East Java, Indonesia

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ABSTRACT

Chronic Energy Deficiency (CED) a prevailing nutritional concern in Indonesia, particularly among pregnant women. Inadequate dietary intake is closely linked to malnutrition in this demographic, often resulting in low-birth-weight babies. Therefore, this study examines the intake of energy, protein, iron, and folate among pregnant women with CED. This study involves 15 pregnant women with CED from the Sobo Health Center, Banyuwangi. Data collection methods included completing socio-demographic and anthropometric form, upper arm circumference measurements using a LiLA tape, and 2x24-hour food recall assessments. The findings reveal that all participants exhibited inadequate dietary intake to meet their nutritional requirements during pregnancy. Every participant experienced severe energy deficits, along with inadequate iron and folic acid intakes. Additionally, 46.7% of the participants were presented with severe protein deficiencies. In conclusion, inadequate intake of energy, protein, iron, and folic acid in pregnant women with CED, indicates a concerning pattern of nutritional insufficiency. These findings highlight the urgent need for targeted interventions and support systems to address the nutritional needs of pregnant women with CED to maintain maternal and fetal health.

INTRODUCTION

In developing countries such as Indonesia, nutrition remains a significant public health concern[1–5]. Among the various nutritional challenges, Chronic Energy Deficiency (CED) stands out as a critical issue, particularly affecting pregnant women[6–8]. CED in pregnant women is characterized by a prolonged deficiency in energy intake and is often accompanied by other health complications[9], making it a major contributor to adverse pregnancy outcomes such as low birth weight[10] and high maternal mortality[11]. The state of CED is Upper Arm Circumference (UAC), with a critical measurement threshold set at <23.5 cm[12], This condition poses severe risks to both maternal [8,13–15], and fetal[16] health, as insufficient nutritional intake can lead to complications during pregnancy and childbirth. The maternal mortality rate in Indonesia is alarmingly high, at 305 maternal deaths per 100,000 live births, highlighting the urgent need to address nutritional deficiencies[17].

Health interventions by the Indonesian government aim to mitigate these risks through regular health services provided during each trimester of pregnancy[18]. For instance, the government

provides health services during the first, second, and third trimesters of pregnancy, with pregnant women required to participate in these services at least once per trimester[19]. Despite these efforts, the prevalence of CED among pregnant women remains high.

The World Health Organization (WHO) reports that a global prevalence of 73% for CED in pregnancy, with a higher incidence in the third trimester. This information was provided by the Indonesian Ministry of Health in 2018. The data from WHO also indicates that anemia CED are directly linked to over 35% of maternal deaths in underdeveloped countries, with mothers experiencing CED representing the largest majority of these cases[20].

In Indonesia, the prevalence of CED among pregnant women increased from 14.8% in 2017 to 17.3% in 2018, far exceeding the government's target of 12.2%[17]. According to statistics from Basic Health Research 2018. In East Java, the prevalence of CED among pregnant women is 19.59% while in Banyuwangi, it stands at 5%[20]. Preliminary data from a study conducted in the Sobo Health Center Working Area of Banyuwangi City in 2022-2023 revealed a higher prevalence. Out of 702 pregnant women, 7.12% of them experienced CED, indicating a significant public health issue within this specific area.

This study aims to examine the intake of essential nutrients, including energy, protein, iron, and folic acid, among pregnant women with CED in the Sobo Health Center area. By identifying these nutritional deficiencies, the study highlights the need for targeted nutritional interventions to improve maternal and fetal health outcomes in regions severely affected by CED.

MATERIALS AND METHODS

The study received approval from the National and Political Unity Agency and Informed consent was obtained from all participants before data collection.This cross-sectional descriptive observational study was conducted from November 2022 to May 2023 to assess the intake of energy, protein, iron, and folic acid in pregnant women with Chronic Energy Deficiency in the Sobo Health Center of Banyuwangi City. Sobo Community Health Center serves seven sub-districts, including Sourcerejo, Kebalenan, Tamanbaru, Penganjuran, Tukangkayu, and Sobo. The study population consisted of all 29 pregnant women with Chronic Energy Deficiency in this area; however, due to time gaps, some respondents had given birth by the time of data collection. In February 2023, confirmation with the health center indicated that there were 15 pregnant women with Chronic Energy Deficiency remaining. The sampling method used was purposive sampling, focusing on specific inclusion criteria. These criteria included pregnant women diagnosed with CED who could undergo weight and height measurements and were available during the data collection period.

Primary data collection involves obtaining information directly from the source through interviews conducted by researchers. This method includes filling out a socio-demographic and anthropometric form, capturing details such as name, age, weight, height, upper arm circumference, address, and gestational age measurements by researches. Individuals with an Upper Arm Circumference (UAC) measurement of less than 23.5 cm is classified as having CED.[12] Nutrient intake was assessed through 2x24 hour food recall interviews. Then the nutritional calculations are carried out using NutriSurvey software. Secondary data, obtained from the Sobo Health Center in Banyuwangi City, serves as supporting information. Data were analyzed using IBM Statistical 22 Product version. Descriptive statistics, including percentages, were used to describe the distribution of groups with different nutritional intakes and nutritional status.

RESULTS

Socio-demographic and Anthropometric Characteristics of Participants

Table 1. Distribution of Socio-demographic and Anthropometric Characteristics of Participants

Age (Years)	n	%	Mean	Min-Max
18	2	13.3	25,67	18 – 35 th
21	1	6.7		
23	3	20.0		
25	2	13.3		
27	4	26.7		
33	2	13.3		
35	1	6.7		
Total	**15**	**100**		

The study on pregnant women with CED revealed that the majority of them, comprising 26.7%, were 27 years old. The age range varied from 18 until 35 years, with a mean age of 25.67. Concerning gestational age, the highest number of participants, 33.3%, were at 9 weeks gestation. The mean gestational age was 15.07, ranging from 8 to 33 weeks. The research findings indicate that the largest proportion of respondents, 40%, had an Upper Arm Circumference of 22 cm, totaling 6 pregnant women. The mean Upper Arm Circumference was calculated as 21.63, ranging from 20 to 23 cm.

Macro- and Micro-nutrients Intakes

Table 2. Distribution of Nutrients Intakes of participants with CED (n=15)

Intake category	N	%
Energy intake		
Weight deficit	15	100

Moderate deficit	0	0
Mild deficit	0	0
Normal	0	0
Over	0	0
Protein intake		
Weight deficit	7	46.7
Moderate deficit	2	13.3
Mild deficit	2	13.3
Normal	4	26.7
Over	0	0
Iron intake		
Inadequate	15	100
Adequate	0	0
Folic acid intake		
Inadequate	15	100
Adequate	0	0

Based on Table 2, the findings indicate that all respondents had energy intake in the weight deficit category. The average energy intake was 1156.05 kcal, ranging from 806.4 kcal to 1667.3 kcal (data not shown). Regarding protein intake, the majority of respondents (46.7%) fell into the weight deficit category, followed by 13.3% in the moderate deficit category, 13.3% in the mild deficit category, and 26.7% in the normal category. The average protein intake was 48.65 grams, ranging from 32.6 grams to 81.85 grams (data not shown).

All respondents had iron (Fe) intake below the recommended level. The average Fe intake was 6.52 mg, ranging from 3.35 mg to 9.5 mg (data not shown). Similarly, all respondents had a folic acid intake categorized as less than recommended. The average folic acid intake was 126.33 mcg, ranging from 68 mcg to 365.3 mcg (data not shown).

DISCUSSION

The results of the study showed that all 15 pregnant women with CED had a deficit in energy intake. According to the researchers in this study, the food consumed by participants, as reported in the 2x24-hour food recall, often lacked complete meals with side dishes, vegetables, or fruit, and the portions tended to be small, with some participants consuming only 1 to 2 ladles of rice. Energy sourced from foods with carbohydrate is essential for pregnant women as it affects the baby's weight gain. Many metabolic changes in the body of pregnant women and the growth of the fetus and placenta are fulfilled through carbohydrate intake[21]. Energy needs are minimal at the beginning

of the first trimester but increase in the second trimester. Consuming foods such as rice, corn, wheat, potatoes, sweet potatoes, and cassava can be a source of energy[22].

Analysis of protein intake revealed that 46.7% of participants had a severe deficit in protein intake. The researchers noted that this deficiency could possibly be attributed to a lack of understanding among pregnant women regarding their protein needs.Protein Intake showed that respondents with Chronic Energy Deficiency nutritional status were 7 people (46.7%) for the severe deficit category protein intake (46.7%), moderate deficit category protein intake for 2 people (13.3%), light deficit category protein intake for 2 people (13.3%), normal protein intake for 4 people (26.7%), and for the over category there was none. With an average protein intake of 48.65 grams for the lowest protein intake of 32.6 grams and the highest of 81.85 grams. According to researchers, the intake of potassium respondents is mostly in a weight deficit condition. This may be caused by mothers who do not know what to eat to meet their protein needs due to a lack of understanding of these needs.

Protein can be obtained from two sources, animal and vegetable. Animal protein sources are generally recommended for consumption by pregnant women due to their higher absorption rates and bioavailability. Examples of animal protein sources from livestock and fisheries products[23]. Pregnant women who lack protein are at increased risk of experience fetal growth and developmental disorders, maternal health complications, and may face challenges during labor[24]. Protein plays a crucial role in building cellular tissues, essential for the proper functioning of the fetus[25].

All respondents were found to have iron intake categorized as deficient. The researchers attributed this to inadequate iron-rich food consumption and the avoidance of foods that contain high iron content, exacerbated by the consumption of coffee, tea, and chocolate, which can impair iron absorption. When consuming foods rich in iron, it's important to note that animal foods such as meat, fish, and poultry have higher absorption rates compared to vegetable sources[26]. Additionally, it is advisable to avoid substances that can impair iron absorption, such as coffee, tea, and chocolate[27]. These food contain polyphenols and tannins, which can hinder the body's ability to form hemoglobin and utilize iron effectively[28].

Similarly, all participants had inadequate folic acid intake. The researchers found that this deficiency may be attributed to the assessment method, which solely relied on evaluating food intake. However, it's important to note that in addition to dietary sources, pregnant women should also supplement their folic acid intake to ensure adequate levels during pregnancy. Neural tube defects and other congenital defects can be prevented by ensuring adequate folic acid intake during pregnancy[29]. Foods rich in folic acid, such as milk, potatoes, tomatoes, peas, spinach, and cereals, are beneficial for pregnant women[30]. Additionally, folic acid supplements can help meet the

increased folic acid needs of pregnant women[31]. However, many participants appear to lack understanding about foods and supplements containing folic acid, as evidenced by their limited consumption of foods high in folic acid. Some pregnant women may also avoid drinking pregnancy milk due to reasons, such as nausea.

In pregnant women with CED, insufficient intake of macronutrient like protein and energy, as well as micronutrients such as iron, can lead to additional issues like nutritional anemia. These nutrients, particularly iron, are vital for the formation of hemoglobin and new cells[32]. When CED is identified through low UAC, it typically indicates that a daily diet lacking in calories, protein, and essential micronutrients, like iron and folic acid. Pregnant women must ensure adequate folic acid intake to meet their nutritional needs. Folic acid deficiency is associated with adverse outcomes such as low birth weight, placental separation, and neural tube abnormalities. Severe folic acid deficiency can exacerbate CED and lead to anemia[33].

CONCLUSION

All respondents, namely 15 pregnant women with nutritional status of Chronic Energy Deficiency had a weight deficit energy intake with an average energy intake of 1156.05 kcal for the lowest energy intake of 806.4 kcal and the highest of 1667.3 kcal. With an average protein intake of 48.65 grams for the lowest protein intake of 32.6 grams and the highest of 81.85 grams. Fe intake averaged 6.52 mg for the lowest Fe intake of 3.35 mg and the highest 9.5 mg. Folic acid intake of 126.33 mcg for the lowest folic acid intake of 68 mcg and the highest of 365.3 mcg.

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