



## Factors Related to Chronic Energy Deficiency in Pregnant Mothers in the Konawe District, Indonesia

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### Abstract

**Background:** Chronic energy deficiency (CED) can have serious health consequences in both the mother and the baby. The aim of this study was to determine factors associated with CED in pregnant women.

**Methods:** This cross-sectional study was done on 115 pregnant women referred to two health centers in the Konawe District (Indonesia) in 2021. After determining the prevalence of CED, data on different demographic and socioeconomic characteristics including family income, nutritional status, adherence to Fe tablet consumption and food availability were collected using questionnaires. Relationship between the variables and prevalence of CED was assessed using the Chi-square test at significance of 0.05.

**Results:** The prevalence of CED was 36.5% among pregnant women. The prevalence of CED was significantly associated with family income ( $P=0.001$ ), nutritional status ( $P=0.001$ ), adherence to Fe tablet consumption ( $P=0.007$ ) and food availability ( $P=0.002$ ). The logistic regression test showed that family income had the strongest association with the prevalence of CED (OR=2.197; 95% CI: 1,248-3.868).

**Conclusion:** The prevalence of CED is higher in pregnant women with low income, poor nutritional status, and limited access to food and poor adherence to Fe tablet consumption. We suggest increasing food security at the family level by providing information to women in preconception stage through counseling, flip charts and posters.

### ARTICLE HISTORY

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### Highlights:

#### What is current knowledge?

The incidence of CED often occurs in pregnant women CED can have a negative impact on the fetus in the womb

#### What is new here?

The study proved that the incidence of CED was significantly related to family income, nutritional status, adherence to Fe tablet consumption and family food availability.

### Introduction

Maternal mortality rate is one of the key indicators of public health status (1). It refers to the number of maternal deaths due pregnancy complications relative to the total number of births (2). Maternal mortality is a major health problem in many countries, including Indonesia. Chronic Energy Deficiency (CED) is one of the most common maternal health problems in Indonesia (3). It is common among pregnant women who suffer from chronic food shortages and various health problems (2). A large number of pregnant women are still suffering from nutritional disorders, especially malnutrition, CED and nutritional anemia (4). Upper Arm Circumference (UAC) is a type of anthropometric measurement used to assess the risk of CED in women of childbearing age, which include adolescents, pregnant women, breastfeeding mothers and couples of reproductive age (EFA). While the UAC threshold in WUS with a risk of CED is 23.5 cm, and if it is less than 23.5 cm, the woman has CED (5).

Asian and African countries, especially the sub-Saharan Africa and Southeast Asia, are center of poverty and chronic malnutrition because most of their population lives in remote/rural areas. The rate of chronic malnutrition increased from 777 million in 2015 to 815 million in 2018. In addition, it has been estimated that at least 120 million women living in South and Southeast Asia have CED (6).

Based on Indonesia Basic Health Research (BHR) in 2013, there was an increase in the proportion of WUS with CED with the proportion of pregnant women aged 15-19 years with CED from 33.5% in 2010, increasing to 38.5% in

2013 and decreasing in 2018 by 17.3% and based on the Indonesian Health profile that the incidence of CED in pregnant women in 2019 was 17.9% (7).

Monitoring nutritional status in Southeast Sulawesi (Indonesia) indicated that the risk of CED in pregnant women increased from 17% in 2016 to 22.38% in 2017 (8). According to BHR, the prevalence of CED in pregnant women living in Southeast Sulawesi was 28.0% in 2018, which increased by 0.7% in 2019 (9). Overall, evidence indicates that the incidence of CED in pregnant women is increasing in the Southeast Sulawesi Province, Indonesia (10).

It is known that CED during pregnancy can lead to serious complications for both the mother and the fetus. In addition, CED increases the risk of maternal complications including anemia, bleeding, maternal weight does not increase typically, and attacks of infectious disease, premature delivery, Postpartum hemorrhage and caesarian section (11). It can also affect fetal growth and lead to miscarriage, abortion, stillbirth, neonatal death, congenital disabilities, fetal anemia, intra-partum asphyxia and low birth weight (12).

Usually, the main cause of CED in pregnant women begins before pregnancy, because the needs of pregnant people are higher than women who are not pregnant (13). The causes of CED can be divided into direct and indirect causes (14). The direct causes consist of nutritional intake and infection (15). Indirect causes consist of obstacles to the utility of nutrients, poor nutritional status, low body weight, poor socioeconomic status, low education level and poor nutrition education, inadequate food availability, poor hygiene, the number of underprivileged children. Too much, early pregnancy, low income, trade and distribution that is not smooth and uneven, poor diet, administration of Fe tablets. Indirect causes of CED are also known as multi-factorial causes (14), (16). Furthermore, the immune system is weakened during pregnancy, which increases susceptibility to viral infections, especially in CED pregnant women. The aim of study was to determine the factors associated with CED in pregnant women.

### Methods

This cross-sectional study was done on pregnant women referred to the Anggaberri and Soropia health centers in the Konawe District (Indonesia) between January and February 2021. Overall, 115 pregnant women were randomly selected. After explaining the study objectives, written informed consent was taken from all participants. The Health Research Ethics Commission of Haluoleo University granted ethical clearance for the study (ethical code: 29/KEPK-IAKMI/IV/2021).

Demographic and maternal characteristics of the subjects including weight, age, education level, employment status, income level, nutritional status, adherence to Fe tablet consumption, food availability and CED were recorded. An upper arm circumference (UAC) of less than 23.5 cm confirmed CED in the subjects.

Data were described using mean, standard deviation, frequency and percentage. Statistical analysis of data was carried out in SPSS version 16.0 using the chi square test and logistic regression. All statistical analyses were carried out at significance of 0.05.

## Results

The mean age of subjects was 27.5±9.86 years. According to the results, the prevalence of CED was 36.5% among pregnant women. The frequency of CED was higher in subjects aged 20-35 years (71.4%), unemployed women (48.2%) and those with low education level (61.5%) (Table 1).

Based on the results of the chi-square test, the prevalence of CED was associated with family income level, nutritional status, adherence to Fe tablet consumption and food availability (Table 2).

As shown in table 3, the most important factor associated with the CED prevalence was family income (OR= 2.197; CI 95%: 1.248-3.868).

Table 1. Frequency distribution of demographic characteristics of women with and without CED

Variable	Non-CED	CED
<b>Age (Year)</b>		
20-35	59 (89.4)	7 (10.6)
<20 and >35	14 (28.6)	35 (71.4)
<b>Education level</b>		
High	58 (76.3)	18 (23.7)
Low	15 (38.5)	24 (61.5)
<b>Employment status</b>		
Employed	30 (93.8)	2 (6.2)
Unemployed	43 (51.8)	40 (48.2)
<b>Weight in pregnancy</b>		
Normal according to IOM	51 (80.9)	12 (19.1)
Abnormal according to IOM	22 (40.2)	30 (59.8)

Table 2. Relationship of CED in pregnant women with different socioeconomic variables

Variable	Non-CED	CED	P-value
<b>Family income</b>			0.001
High	42 (89.3)	5 (11.7)	
Middle	5 (62.5)	3 (37.5)	
Low	26 (43.3)	34 (56.7)	
<b>Nutritional Status</b>			0.001
Overnutrition	31 (91.2)	3 (8.8)	
Normal	39 (62.9)	23 (37.1)	
Malnutrition	3 (15.8)	16 (84.2)	
<b>Adherence to Fe Consumption</b>			0.007
Yes	50 (73.5)	18 (26.5)	
No	23 (48.9)	24 (51.1)	
<b>Food availability</b>			0.002
High	49 (75.4)	16 (24.6)	
Low	24 (48.0)	26 (52.0)	

Table 3. Multivariate analysis of association of the variables with CED prevalence in pregnant women

Variable	B	df	P	OR	OR at 95% CI	
					Lower	Upper
Malnutrition status	-1.724	1	<0.001	.178	.075	.423
Low family Income	.787	1	.006	2.197	1.248	3.868
Non-adherence to Fe consumption	.760	1	.148	2.138	.764	5.980
Low food availability	.636	1	.191	1.889	.728	4.903
Constant	-.820	1	.547	.441		
<b>R Square = 45,5%</b>						

CI: Confidence Interval; OR: Odds Ratio

## Discussion

We found a significant association between family's socioeconomic status and the prevalence of CED in pregnant women. The economic status of a household is an indicator of access to adequate food supplies. Similar to our findings, a previous study on the relationship of socioeconomic status with the prevalence of CED showed that limited family income affects the health status of the family as well as access to nutritionally adequate food (11).

We also observed a relationship between nutritional status and the prevalence of CED. Malnutrition during pregnancy affects the fetal growth and reduces the chance of live birth (17). Inadequate dietary intake before and during pregnancy is significantly associated with CED and malnutrition in pregnant women.

In our study, the majority of pregnant women with CED were unemployed. Since homemaker pregnant mothers may have more responsibilities that are physically demanding such as housecleaning, they may require more nutritional needs (18).

The frequency of CED was higher in subjects who had poor adherence to Fe tablet consumption. The need for energy, vitamins and minerals in pregnant women increases due to the physiological changes during pregnancy, especially at the end of the second trimester, where there is a hemodilution process that causes an increase in blood volume and affects the concentration of blood hemoglobin (19). Consistent with our findings, a study reported a significant relationship between adherence to Fe consumption and prevalence of CED in pregnant women (20). Similarly, another study found an association between non-adherence to iron tablet consumption and chronic protein-energy deficiency (21).

Since the present study had a cross-sectional design, it was not possible to establish a cause-and-effect relationship. We used an interviewer-administered questionnaire to collect the data, which may introduce bias in answers, especially in cases of the questions related to nutrition and income status. It is recommended to conduct future studies with a case-control design.

## Conclusion

The prevalence of CED is higher in pregnant women with low income, poor nutritional status, low access to food and poor adherence to Fe tablet consumption. We suggest increasing food security at the family level by providing information to women in preconception stage through counseling, flip charts and posters.

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## Ethical statement

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## Conflict of interest

The authors declare that there is no conflict of interest.

## Author contributions

All authors equally contributed to preparing this article.

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