



Conference Paper

The Analysis of Chronic Energy Malnutrition and Iron Intake with Anemia in Preconception Women of Childbearing Age in Terbanggi Besar Subdistrict, District of Central Lampung

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Abstract

The prevalence of anemia among women of childbearing age (WCA) in Lampung Province in 2011 was 25.9%. Anemia in WCA usually continues until the pregnancy that may increase the risk of complications in pregnancy and childbirth. This study aimed to determine the relationship of chronic energy malnutrition and iron intake with anemia in preconception women of childbearing age. The was an observational analytic study using a cross-sectional design. The survey conducted in Terbanggi Besar subdistrict, district of Central Lampung from August to November 2016. Samples were 183 preconception women of childbearing-aged 20- to 40-years-old, taken with sampling cluster techniques. Chronic energy malnutrition data assessed by measurement of the mid-arm circumference, iron intake obtained through 2x24h food recall, and anemia by measuring hemoglobin levels through blood tests. Data were analyzed using chi-square test and Fisher exact test. The results showed that 26.8% of respondents suffered from anemia, 44.3% chronic energy malnutrition, and 95.7% less iron. The results showed that chronic energy malnutrition had a significant correlation ($p = 0.02$) with anemia, and iron intake did not correlate ($p = 0.53$) with anemia. Respondents with chronic energy malnutrition were 2.3 times more likely to have anemia than those without chronic energy malnutrition. There was a significant relationship between chronic energy malnutrition with anemia in preconception women of childbearing age in Terbanggi Besar sub district district of Central Lampung.

Keywords: Anemia, chronic energy malnutrition, iron intake, women of childbearing age preconceptions

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1. Introduction

World Health Organization (WHO) defines anemia as a condition in which an individual suffers a decrease of hemoglobin (Hb) and hematocrit (Ht) concentration as well as the number of red blood cells to below the average level of the cut-off point by age and gender [1]. Anemia is a symptom caused either by blood loss, the decreased production of erythrocytes, the increased destruction of erythrocytes or the combination of all three mechanisms [2].



Anemia is more prevalent in women than men as it reports that Women of Childbearing Age (WCA) suffering from anemia reaches 45.7% in Southeast Asia. In Indonesia, the WCA affected by anemia reached 33.1% during 1993-2005 [1]. Also, Indonesia's Health Profile reported that the prevalence in WCA in Lampung province reached 25.9% [3].

Women of Childbearing Age are the most susceptible to iron-deficiency anemia, anemia caused by the blood loss during menstruation. The anemic condition of the WCA often continues when they are pregnant that can increase the risks of complication on pregnancy and birth delivery such as maternal mortality, preterm delivery, low birth weight, prenatal mortality, as well as the increased risk of antepartum and postpartum bleeding [4].

Women of Childbearing age often suffer from a chronic energy deficiency and anemia. Anemia defined as a condition in which the hemoglobin concentration is below 11gr/ml. Its primary cause of women is usually due to the insufficient iron intake. Iron needs increase during pregnancy and breastfeeding (physiological changes), and blood loss. The possibility of anemia developed from these three factors can climb dramatically when the reserved of iron cannot accommodate the increase in iron needs. Women of Childbearing Age are the most susceptible from anemia because they do not have sufficient iron intake and reserve for the needs increase and the loss of it [5]. According to Mahirawati study, iron-deficiency anemia caused by the imbalance in the needs of the body for growth and the loss of blood, as well as the insufficiency of iron from the diet. Besides metal, the nutrient needed to develop hemoglobin synthesis is folic acid [6].

Other causes of anemia in Women of Childbearing Age are blood loss, inadequate iron intake, the increase of body's physiologic needs, malabsorption, insufficient iron reserve, insufficient nutrient intake, hemoglobinopathy, medicine, and other factors such as lifestyle and health behavior. Individual's eating behavior, for example, is one of health behavior that affects an individual's health status [5, 7]. A study conducted by Gutmaningsih showed that there was a significant correlation between health status and anemia prevalence [8].

In Central Lampung regency, anemia is one of the most common health problems along with Vitamin A deficiency, chronic energy deficiency, and health problems caused by iodine deficiency [9].

2. Methods

This study was observational research with cross-sectional design study approach. It conducted in Terbanggi Besar district of Central Lampung regency from August to November 2016. The population of this study was all women who categorized as the Women of Childbearing Age in Central Lampung. Based on the calculation of sample size formula, there were 183 as the minimum number of sample in this study. We use the independence analytic categorical variable type of sample size with a reliability score of 95% and power of the test 80%, and cluster sampling as the sampling method. The samples taken from 8 sub-districts in Terbanggi Besar, Central Lampung. The inclusion criteria for example were: Women of Childbearing Age between the age of 20 and



40, administered as a resident in the studied area and agreed to participate in the research. On the other hand, the exclusion criteria were: patient of chronic infectious diseases, women on a diet or weight loss program, women in pregnancy, and women in menopause. The independent variable in this study chronic energy malnutrition (CEM) and iron intake while the dependent variable was anemia prevalence.

The chronic energy malnutrition (CEM) data obtained by conducting the anthropometric test; that was the arm circumference measurement by using a tape measure. Those whose the arm circumference was <24.9 cm were categorized as suffering from CEM, while those with ≥ 24.9 cm classified in a healthy condition.

The iron intake measured by using 2x24h food recall during weekdays and weekend. The estimated food intake compared to the average score of Recommended Dietary Allowance (RDA)-equivalent with Nutrient Adequacy Ratio (NRA)-of Indonesian people that classified according to their age. Those who scored $<80\%$ of AKG were considered inadequate intake, 80-110% AKG were deemed to be adequate intake, and $>110\%$ AKG were found to be excessive intake. During the data collection for iron intake, the subjects were required to remember and list all foods and beverages they consumed within 24 hours. The measurement of subjects' food intake was conducted by measuring iron content in foods and drinks in the last 24 hours. After that, the average score of two-day iron intake taken. We used food model methods to collect food intake data.

The anemia prevalence was diagnosed by measuring hemoglobin concentration using hemoglobin photometer test strip. It was defined as anemia if blood hemoglobin level < 12 gr%, and not as anemia if blood hemoglobin level ≥ 12 gr%.

In collecting the data, we assisted by four enumerators who had been previously briefed and trained. Then, the data statistically analyzed by using chi-square and Fisher's exact test with reliability 95% ($p<0.05$). This study conducted after the letter of ethical research clearance from the Ethics Committee of Medical Faculty of Lampung University with number 1913/UN26/8/DL/2016 issued.

3. Result

The result (table 1) revealed that there were 49 people (26.8%) suffered from anemia while the rest 134 people did not. Also, there were 81 people (44.3%) in chronic energy malnutrition, while the rests had good nutritional status or in other words, not suffering from chronic energy deficiency. Most of the subjects had low iron intake, reaching 175 people (95.6%) while eight people had it sufficient.

The anemia prevalence in preconception WCA in this study reached 26.8% (49 people). This prevalence was relatively higher from the report of Indonesia's Health Profile where anemia prevalence in WCA in Lampung Province reached 25.90% [2]. From this result, it was clear that 26.8% preconception WCA in Terbanggi Besar district tended to have low immunity and productivity level. Also, anemia prevalence in WCA managed to continue to pregnancy period that increased the risk of complication on pregnancy and birth delivery. This condition increased the possibility of maternal mortality as well as preterm delivery, low birth weight, and prenatal mortality [4].



TABLE 1: The association of chronic energy malnutrition and iron intake with anemia in women of childbearing age.

Variable	Anemia				Total		χ^2	OR	p-value	95% CI				
	Yes		No		n	%								
	n	%	n	%										
Chronic Energy Malnutrition														
Yes	29	15.8	52	28.4	81	44.3	5.24 ^a	2.3	0.02*	1.17-4.45				
No	20	10.9	82	44.8	102	55.7								
Iron Intake														
Less Intake	48	26.2	127	69.4	175	95.6	.870 ^b	2.6	0.64	0.31-22.07				
Sufficient	1	0.5	7	3.8	8	4.4								

^a=chi square analysis
^b=fisher exact test analysis
* =significant ($p<0.05$)

The result also showed that chronic energy malnutrition (CEM) prevalence reached 44.3% (81 people). The CEM prevalence in women between the ages of 18-19 was relatively high and surpassed the number of CEM in non-pregnant WCA nationally because according to Basic Health Research (*RISKESDAS*) in 2013, CEM prevalence in pregnant women between the ages of 15-49 in Indonesia reached 24.2% while in non-pregnant women of the same ages reached 20.8%. In total, CEM prevalence in all age levels and pregnancy condition (pregnant and non-pregnant) from 2007-2013 increased. CEM prevalence in pregnant women and WCA between the age of 15-49 in Lampung province reached 21.3% dan 17.6 % respectively, where the highest incidence was in Central Lampung that reached 52.6% [10].

Chi-square test revealed that chronic energy deficiency prevalence had a significant correlation with anemia prevalence in pre-conception Woman of Childbearing Age (p -value < 0.05 , 95% Confidence Interval: 1.17-4.45). The analyses also revealed that the odds ratio was 2.3; meaning that the subject who suffered from chronic energy deficiency were 2.3 times more susceptible to anemia compared to those who did not suffer from the chronic energy malnutrition. Also, *Fisher's exact* test showed that iron intake not significantly correlated with anemia prevalence in preconception Women of Childbearing Age (p -value > 0.05 ; Confidence Interval: 0.31-22.07).

The study conducted by Gutmaningsih and Thompson mentioned that Body Mass Index (BMI) positively correlated with hemoglobin concentration [8, 11]. Nutritional status obtained from the balance of measurement between nutrient intake and dietary needs. There were three types of nutritional deficiency: qualitative deficiency, quantitative deficiency, and the combination of both weaknesses.

The lower the nutritional status of individuals is, the higher their risk to suffer from anemia. If the foods consumed by individuals have proper nutrition, they will have good nutritional status. On the other hand, if the foods they consumed have low diet, they will probably have a nutritional deficiency that can lead to anemia, because anemia

prevalence was directly affected by individuals' daily eating behavior of low iron foods besides the existence of infectious trigger factor [12].

We assumed that preconception WCA who became respondents in this research had met the standard of quantitative nutrient intake. From the interview on types of input, most of the respondent had sufficient and even higher energy intake or macronutrient. The foods consumed mostly contained high carbohydrate and fat.

The studies conducted by Anari et al. in Iran and by employing 316 adult women between the age of 18-65 as respondents showed that there was no significant correlation between BMI and Hb concentration ($p=0.580$) that was also similar with the research conducted by Mendonca et al. with $p=0.82$ [13, 14]

The study showed that 95.6% of the subjects (175 people) had a low iron intake. It inferred that almost all respondents had a risk of anemia, especially iron-deficiency anemia. Iron is needed to produce hemoglobin, protein in the red blood cells carrying oxygen throughout the body. Some of the hemoglobin increases are obtained from reserved metal and absorbed iron [14].

There are two kinds of iron in the foods; the first is heme iron, and the last is non-heme iron. Heme iron can be found in animal protein from our diet, while non-heme iron can be found in plant-based foods (beans, fruits, vegetables, grains, and tofu) and dairy products (milk, cheese, and eggs). However, dairy products contain deficient iron [13].

The leading causes of anemia in women are the insufficient iron food intake; iron needs increase during pregnancy and breastfeeding (physiology changes), and blood loss. The possibility of anemia developed from these three factors can climb dramatically when the reserved iron cannot fulfill the increase of iron needs. Women of Childbearing Age are the most susceptible from anemia because they do not have sufficient iron intake and reserve for the needs increase and the loss of it [5]. According to Mahirawati, iron-deficiency anemia caused by the imbalance in the needs of the body for growth and the loss of blood, as well as the insufficiency of iron from the diet. Besides metal, the nutrient needed to develop hemoglobin synthesis is folic acid [6].

Women of Childbearing Age are susceptible to anemia because, within this period, the needs of iron increases developed from growth, menstruation, diet, and eating behavior that is inappropriate to the rules of nutrition science. In pregnant women, the impact of anemia can be observed from the high rates of maternal morbidity and mortality, fetal morbidity and death, and low birth weight. The leading cause of maternal mortality is postpartum and placenta previa that developed from iron-deficiency anemia [15].

Insufficient iron intake in WCA was mostly because they consumed vegetables which had an iron that was difficult to be absorbed and white meat like fish and chicken instead of red meat that is iron-rich like beef and lamb. From the interview, we also obtained information that the WCA who became respondents often drank tea that actually could prevent iron absorption.

Iron needs have a strong correlation with anemia prevalence because anemia is a form of adaptation from physiology changes during pregnancy that developed from increasing demands of iron for fetus growth, insufficient iron intake from the daily foods consumed, and low reserved iron tendency in women. Menstruation will also increase

iron needs in the body. Iron deficiency can principally overcome by changing eating behavior because of primarily anemia caused by insufficient iron intake from foods and low bioavailability of iron consumed. Therefore, increasing food quality is one of the alternatives for a long-term plan [16].

4. Conclusion

Chronic energy malnutrition describes inadequate of nutritional status in individuals, and it is the higher their risk to suffer from anemia. Anemia was affected by individuals' daily eating behavior of low iron foods besides the existence of an infectious trigger factor. The anemic condition of the Women of Childbearing Age often continues when they are pregnant that can increase the risks of complication on pregnancy and birth delivery such as maternal mortality, preterm delivery, low birth weight, prenatal mortality, as well as the increased risk of antepartum and postpartum bleeding.

We believe that to increase the quality of life in women of childbearing age, in facts they become pregnant women, the chronic energy malnutrition and anemia in the women must reduce.

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