The relationship between nutritional status and incidences of iron deficiency anemia in 3rd-trimester pregnant women in the co-endemic areas of Bengkulu City, Indonesia

By Mohammad Zulkarnain

The relationship between nutritional status and incidences of iron deficiency anemia in 3rd-trimester pregnant women in the co-endemic areas of Bengkulu City, Indonesia

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Abstract

Iron deficiency in pregnant women can lead to premature birth and LBW babies. This study aimed to determine the relationship between nutritional status and the incidence of Iron Deficiency Anemia in the 3rd trimester pregnant women in the co-endemic area of Bengkulu City. This study was a cross-sectional study with a total sample of 108 respondents who met the inclusion criteria. The sampling technique was carried out by purposive sampling. Data obtained through interviews and questionnaires. Data was analyzed by using chi-square test and multiple logistic regressions. The results showed that pregnant women who had <23.5 cm of MUACwere 30.6% and 22.2% and mothers experienced Iron Deficiency Anemia were 22.2%. There was a significant relationship ($p<0.05$) between nutritional status and the incidence of Iron Deficiency Anemia in pregnant women. Educational factor was the most influential factor that influence the incidence of Iron Deficiency Anemia (OR = 10.303, 95% CI 2.95-35.89). It can be concluded that pregnant women with poor nutritional status have the opportunity to experience Iron Deficiency Anemia.

Introduction

Women who are pregnant or breastfeeding are the most vulnerable population to malnutrition and other nutritional disorders, including anemia. Anemia in pregnancy can increase the risk of miscarriage, premature labor, babies with low birth weight, morbidity and mortality. According to the World Health Organization (2001) about 50% of all types of anemia were caused by iron deficiency. According to data from Riskesdas 2013, anemia that occurs in pregnant women in Indonesia was 37.1%, 36.4% of pregnant women in urban areas and 37.8% of pregnant women in rural areas. Data from the Bengkulu Health Office in 2015 found that iron deficiency anemia incidences in pregnant women were 1,398 cases and in 2016 were 1,162 cases.[1,2]

Besides nutritional status, anemia in pregnant women can also be caused by infectious diseases that can reduce iron absorption, for example in malaria infections.[3] One of the malaria-causing parasites is Plasmodium Vivax which can live and multiply in human blood cells and has the ability to relapse after infection or after treatment. In a long time, the parasite develops and causes recurrent infections that have an impact on the use of iron by parasites for the multiplication process which results in pregnant women having a higher risk of anemia (Hb<11g / dl) or severe anemia (Hb<7g / dl). Previous studies showed a significant relationship between malaria infection and the incidences of anemia in pregnant women in the 3rdTrimester in the city of Ambon ($p = 0.001$). The results of microscopic examination of malaria on 55 pregnant women with a history of having been infected with malaria found that 3.6% of pregnant women suffering from malaria. All pregnant women who were infected with malaria 100% had anemia, as well as pregnant women with negative malaria, 90.5% had anemia.[4-7]

According to Poespoprodjo in 2008 pregnant women with malaria in high malaria transmission areas had a moderate to severe prevalence of between 1-20% where the infection will worsen the degree of anemia experienced by pregnant women.[4] Based on the Bengkulu Health Profile 2014, the results of the slide examination were found that 4,666 were positive for malaria (14%). In 2015, the result of the examination was found that 2,631 positive for malaria (9%). Based on these data, it showed a decrease in malaria prevalence. One of the causes of LBW, in addition to infectious diseases, was poor nutritional status which affects anemia in pregnancy.

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Materials and Methods

This research was an analytical research using cross-sectional design. The location of the study was conducted in the city of Bengkulu, which was one of the malaria endemic areas. The population in this study was the third trimester pregnant women at the time of the study and were domiciled in the city of Bengkulu and recorded in the Community Health Center in 2018. A total sample of 108 respondents was chosen by purposive sampling. Data collection was done by interviewing respondents to find out age, parity, ANC, birth spacing, and education, taking blood, fecal sampling, measuring MUAC, height and weight. Health personnel in this study were assigned to check patients. Before conducting research, informed consent was given to patients and fillng out the identity form. The researcher took the data directly to the research subject by examining blood specimens carried out by competent laboratory personnel.

After the data were collected then the data were analyzed using univariate, bivariate and multivariate. Univariate analysis was used to obtain an overview of each independent variable and dependent variable. Bivariate analysis was conducted to see the relationship of independent variables (age, parity, birth distance, ANC, education, nutritional status, malaria and worm diseases) to the dependent variable (Iron Deficiency Anemia). The type of statistical test used was the chi-square test. Multivariate analysis used in this study was multiple logistic regression because the dependent variable was categorical in scale. The final result of the analysis was determining the variables that were most related based on the largest OR value in the final modeling.

Results and Discussion

Univariate analysis

Frequency distribution of the dependent variable and the independent variables can be explained in the Table 1.

Based on Table 1, it was found that, out of 108 third trimester pregnant women there were 24 mothers (22.2%) who had Iron Deficiency Anemia, 75 mothers (69.4%) had a normal nutritional status, 63 mothers (58.3%) had arisky parity, 92 mothers (85.2%) had a birth spacing that was not risky, 75 mothers (69.4%) made ANC visits according to standards in health services, 100 mothers (92.6%) did not havea history of malaria, based on laboratory examinations of 108 pregnant women, it was obtained that 100% of mothers were negative from worm diseases.

Other characteristics

The characteristics of respondents included age, education and IMT can be described as follows.

Age

Based on Figure 1, it showed that the majority of third trimester pregnant women age was in the range of 20-35 years by 81%.

Education

Based on Figure 2, it showed that the majority of third trimester pregnant women had a high school education of 45.37%.

BMI

Based on Figure 3, it showed that the majority of third trimester pregnant women had a Body Mass Index in the normal category of 54.68%, but there was still underweight nutritional status based on BMI category at 7.41%.

Bivariate analysis (Chi-Square)

Cross table analysis between independent variables and dependent variables can be explained as in Table 2.

Table 2 showed that the proportion of pregnant women with abnormal nutritional status and had anemia were 13 respondents (39.4%), based on the results of statistical tests, it was found that p-value was 0.009 (<0.05) which meant there was a meaningful relationship between nutritional status and the incidence of Iron Deficiency Anemia in pregnant women.

The proportion of pregnant women with a risky age and had anemia were 5 respondents (25%), the results of statistical tests showed that p-value was 0.769 (> 0.05) which meant there was no significant relationship between age and the incidence of Iron Deficiency Anemia in pregnant women third trimester.

The proportion of pregnant women with risky parity and experienced anemia were 12 respondents (19%), based on the results of statistical tests at alpha 5% it was found that p-value was 0.481 (> 0.05) which meant there was no significant relationship between parity and the incidence of Iron Deficiency Anemia in third trimester pregnant women.

The proportion of pregnant women with riskybirth spacing and had anemia

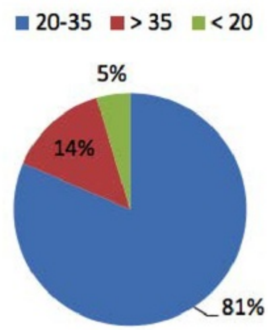

Figure 1. Age of the women.

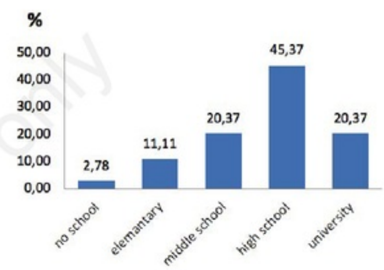

Figure 2. Education level.

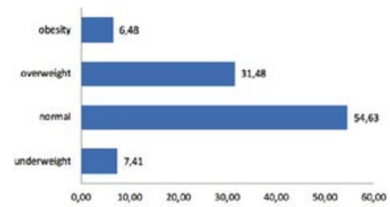

Figure 3. BMI (%) of the women.

Table 1. Frequency distribution of independent variables and dependent variable.

No	Variable	Measurement results	Number of sample n	%
1.	IDA	0. Iron Deficiency Anemia	24	22.2
		1. No Iron Deficiency Anemia	84	77.8
2.	Nutritional Status	0. Abnormal	33	30.6
		1. Normal	75	69.4
3.	Parity	0. Risky	63	58.3
		1. Not risky	45	41.7
4.	Birth Spacing	0. Risky	16	14.8
		1. Not risky	92	85.2
5.	ANC Visits	0. Not according to standards	33	30.6
		1. According to standards	75	69.4
6.	Malaria History	0. No history	8	7.4
		1. Have history	100	92.6
7.	Worm Diseases	0. Positive	0	0
		1. Negative	108	100

were 2 respondents (12.5%), the results of the statistical test at alpha 5% found that the p-value was 0.515 (> 0.05) which meant there was no significant relationship between birth spacing with the incidence of Iron Deficiency Anemia in third trimester pregnant women.

The proportion of pregnant women who visited ANC not according to standard and had anemia were 7 respondents (21.2%), the results of statistical tests showed thatp-value was 1.000 (> 0.05) which meant there was no significant relationship between ANC visits with incidence of Iron Deficiency Anemia in third trimester pregnant women.

The proportion of pregnant women with low education age and had anemia were 19 respondents (39.6%), the results of statistical tests at 5% alpha found thatp-valuewas 0.000 (<0.05) which means there is a significant relationship between education and the incidence of Iron Deficiency Anemia in third trimester pregnant women. Respondents with low education had a 4.7 times probability (95% CI 1.194-11.790) to experience Iron Deficiency Anemia compared to highly educated respondents.

Multivariate analysis

Multivariate analysis method used in this study was ENTER. Variables that have *p*> 0.05 were Variables that have p > 0.05 were excluded gradually, starting from variables with the biggest value.

Based on Table 3, the variables of age, birth spacing, parity, ANC visit and malaria history were confounding variables because the difference in OR value was > 10%. While there were 2 variables that influence the occurrence of Iron Deficiency Anemia in pregnant women in the third trimester as follows:

A variable that have the most dominant influence on the incidence of Iron Deficiency Anemia in third trimester pregnant women was education with p value = 0.000 and OR 10.303 (95% CI: 2.957-35.899). This meant that third trimester pregnant women with a low education were 10.3 times more likely to experience Iron deficiency Anemia compared to pregnant women who are highly educated.

The variable that affect the incidence of Iron Deficiency Anemia in third trimester pregnant women after education was nutritional status with p value 0.004 and OR 6.012 (95% CI: 1.765-20.472). This meant that a third trimester pregnant woman who had an abnormal MUAC size was six times more likely to experience Iron Deficiency Anemia than a third trimester pregnant woman who has a normal nutritional status.

The probability model that can be constructed from the equation of the binary logistic regression model was as follows:

P(x) = 1 / (1 + e-y)

The probability of an Iron Deficiency Anemia incidence in the third trimester pregnant woman if she had an abnormal MUAC size and had low educated was:

Y = -2.617 + (-1.794) (1) + (-2.332) (1)
= 6.743
P(x) = 1 / (1 + 2.718 – $^{6.743}$)
= 0.998

Based on the results of the calculations above, it can be concluded that pregnant women with abnormal MUAC size and had poor education, the probability of the occurrence of Iron Deficiency Anemia was 99.8%.

Discussion

The results of this study indicated that education was the most dominant factor influencing the incidence of Iron Deficiency Anemia with EXP B of 10.303 (P-value 0.000; 95% CI 2.957-35.899) which meant that third trimester pregnant women with low education were 10.3 times more likely to experience Iron deficiency Anemia incidences was compared to pregnant women who were highly educated after being control by MUAC, age, parity, birth spacing, ANC Visit and History of Malaria.

The level of education will influence a person to make decisions about an action, mothers who were highly educated will be open-minded and easily accept the entry of new information so that it will add good knowledge and can affect the fulfillment of nutrition during pregnancy. The low level of

Table 2. Bivariate analysis table.

Variables	IDA Incidences Yes, n (%)	No, n (%)	p value
Nutritional Status			
Abnormal	13 (39.4)	20 (60.6)	0.009
Normal	11 (14.7)	64 (85.3)	
Age			
Risky	5 (25.5)	15 (15.6)	0.769
Not Risky	19 (21.6)	69 (78.4)	
Parity			
Risky	12 (19.0)	51 (81.0)	0.481
Not Risky	12 (26.7)	33 (73.3)	
Birth Spacing			
Risky	2 (12.5)	14 (87.5)	0.515
Not Risky	22 (23.9)	70 (76.1)	
ANC Visit			
Not according to standards	7 (21.2)	26 (78.8)	1.000
According to standards	17 (22.7)	58 (77.3)	
Education			
Low	19 (39.6)	29 (60.4)	0.000
HIgh	5 (8.3)	55 (91.7)	
Malaria History			
Have history	3 (37.5)	5 (62.5)	0.373
No history	21 (21.0)	79 (79)	

Table 3. Final Result of Logistic Regression Modeling Table.

Variables	SE	*OR (95%CI)*	*p* value
Nutritional status	0.625	6.012 (1.76– 20.47)	0.004
Age	0.740	1.561 (0.36– 6.64)	0.547
Parity	0.610	0.42 (0.12– 1.40)	0.162
Birth spacing	1.038	0.265 (0.03– 2.20)	0.200
ANC visit	0.653	0.402 (0.112– 1.444)	0.162
Malaria history	1.090	5.369 (0.63-45.44)	0.123
Education	0.637	10.303 (2.95–35.89)	0.000

mother's education will inhibit the acceptance of information so that knowledge about the need of iron and nutrition during pregnancy becomes limited and has an impact on the incidence of iron deficiency.[8,9,10]

This was consistent with my interview with several respondents. Pregnant women who were highly educated were easy to receive information related to the incidence of anemia and understand that the nutritional intake was important in the fulfillment of nutrition during pregnancy while pregnant women with low education, especially mothers who were not in school, had a little difficulties to receive information about the incidence of anemia and lack of understanding of nutritional intake need which increases during pregnancy.

The results of this study were in line with previous study which stated the majority of pregnant women with moderate anemia were 70%, while severe anemia was 5.2%. Among the number of samples studied, 147 pregnant women were illiterate and had different rates of anemia. So that in this study the level of education has a significant relationship with the incidence of anemia with a p-value (0.00).[11]

Based on the results of multivariate analysis, variable that affect the incidence of anemia deficiency in pregnant women in the third trimester after education was nutritional status with p value 0.004 and OR 6.01 (95% CI: 1.765-20.472). That was, pregnant women in the third trimester who hadan abnormal nutritional status were likely to experience 6.01 times of Iron Deficiency Anemia than those of Trimester III pregnant women who had a normal nutritional status after being controlled by education, age, parity, birth distance, ANC visit, and malaria history.

Maternal nutritional status was measured through the diameter of the upper arm, reflected the energy reserves because it provided an overview of the state of muscle tissue and the layer of fat under the skin, the size of the upper arm diameter that was small indicated a lack of energy and calories (KEK) during pregnancy.[1] If during pregnancy, the mother experiences KEK,it shows a long time energy deficiency which eventually affects the current physiological conditions associated with the formation of HB which is not optimal in the process of synthesis of erythrocytes. So that if this continues to be ignored and lasts for a long time it can lead to anemia. The study conducted in Malawi in 2000 also showed that out of 150 pregnant women, 32% had iron deficiency and one or more micronutrients. There was a close correlation between nutritional status and the incidence of iron deficiency anemia.[12]

Based on the results of the study it was found that the variables of age, parity, birth spacing, ANC visit and malaria history were confounding variables so that these variables were disturbing in assessing the relationship between nutritional status and the incidence of Iron Deficiency Anemia.

Conclusions

Based on the results of this study it could be concluded that the level of education could affect the incidence of Iron Deficiency Anemia, the lower the mother's education, the higher the probability of mothers experiencing Iron Deficiency Anemia, so that it was important for pregnant women to pay more attention and check their pregnancies regularly by visiting ANC (Antenatal Care) so that it could detect early lack of nutritional status and the incidence of anemia in pregnant women.

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