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The relationship analysis of compliance consuming iron tablet with incidence of anemia on pregnant mothers in third trimester at the co-endemic areas of Bengkulu City, Indonesia

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Abstract

In developing countries generally, the incidence of anemia in pregnancy is still a major public health problem. This study aims to analyze the compliance of consuming Iron tablets with the incidence of anemia on pregnant mothers in the third trimester at Bengkulu city. This study used *cross-sectional* design, samples were third trimester pregnant mothers taken by *purposive sampling* as many as 106 pregnant mothers. Data analysis was carried out by using *chi-square* and *binary logistic regression* test. The results of *Chi-square* test on factors related to compliance, it was obtained that consumption of iron tablets, ANC services, ANC visits, and availability of iron tablets were significantly relationship with the incidence of anemia (*p-value* <0.05). While the results of *binary logistic* test stated that the availability of iron tablets was the most dominant influence on the incidence of anemia (*p-value*=0.023), OR 13.95 (95%CI: 1.438-135.459). It is expected that the local government must pay more attention to plan the need of Iron tablets based on the estimation number of pregnant mothers.

Introduction

Anemia prevalence is still very high throughout the world, estimated by 58% of pregnant mothers in developing countries having anemia, and about 50% of them suffer from iron deficiency anemia.^{1,2} Anemia is one of the indirect causes of maternal mortality when giving birth to the worst

impact for the baby born from a mother who suffer of anemia during her pregnancy will have an impact the obstructed of growth and development.

During 2013 an estimated 90,000 deaths were caused by anemia.³ Maternal mortality was reported as many as 115,000 maternal deaths each year due to iron deficiency anemia and Asia was the second highest mortality due to iron deficiency anemia. Approximately 3.6 million babies die during the neonatal period. More than a third of child deaths were estimated to be due to lack on nutrition intake of maternal during pregnancy.⁴

During pregnancy there is an increased need for iron in the body needed for enzymatic and metabolic reactions. If iron needs are not met, iron deficiency anemia can occur. In addition, the presence of infectious diseases in pregnancy can also aggravate the condition of pregnant mother, because it can reduce iron absorption. Malaria parasite infection is easy occurring on pregnant mother due to changes in the immune system and increased hormones during pregnancy. Malaria is an infectious disease that affects the health of pregnant mother which can lead to anemia, cerebral malaria, pulmonary edema, kidney failure and can even cause death. Malaria on pregnant mother can cause abortion, premature labor, low birth weight, and fetal death. There were 50% of pregnant mother infected with malaria in addition to have anemia also have low serum Iron levels. Serum Iron reduction indicated that there was a decreasing in iron reserves in the body.⁵

Iron supplements given early in pregnancy have an impact on increasing levels of hemoglobin and ferritin during pregnancy and increasing iron supply until the puerperium. Recommendation that every pregnant woman for 6 months to consume iron tablets 60 mg and folic acid 400 mg and continue the dose of Iron to 120 mg after giving birth to prevent the occurrence anemia during childbirth.³

The providing standard on iron tablets was integrated in *antenatal care* services as an effort to prevent maternal death.⁶ Measuring the compliance of consuming iron tablets is very important, because iron tablets when taken regularly for long periods can be felt the advantages. Many factors inhibit the maternal adherence in consuming iron tablets.⁷

Iron requirements during pregnancy in malaria endemic areas increased from normal needs, this was because between malaria parasites and pregnancy both require iron.⁵ Bengkulu Province was the highest malaria endemic area on the Sumatra island with the highest prevalence of malaria 9,3%

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due to vivax plasmodium infection.⁸ Based on Bengkulu's health profile data there was an increase in low birth weight cases from 40 cases (2014) and 81 cases (2015), and it was also obtained that the third reduction in iron tablet coverage was 86.6% (2016). This needs to get the attention of management of maternal and child health programs to see how much the level of compliance of pregnant mother to consume iron tablets regularly and what factors influence the anemia incidence at co-endemic area of Bengkulu City.

Prevalence of anemia as a public health problem was classified into three categories: severe problems (>40%), moderate (20.0-39.9%), mild (5.0-19.9%) and normal ($\leq 4.9\%$). Anemia in pregnancy was assessed by hemoglobin levels <11 g/dL in the first and third trimesters, or <10 g/dL in the second trimester. The increasing acceleration of plasma volume which disproportionate to the red blood cells volume occurs on the sixth week of pregnancy and reaches its top on 24th weeks and continues to increase until 37th weeks. Iron deficiency anemia begins with depletion of iron deposits (ferritin) and increased absorption iron that described by increasing iron binding capacity. In a further stage of depletion of iron stores, reduced transferrin saturation, reduced amount of protoporphyrin which is converted to heme, and will be followed by a decrease in serum ferritin levels. Finally, anemia occurs with its characteristic that is low Hb levels.⁹ Iron deficiency is a result of long-term iron imbalance so that iron reserves in the form of hemosiderin and iron ferritin are progressively reduced and no longer meet the need for normal iron adequacy. When the prevalence of iron deficiency anemia reaches 20-30% in all age groups and sexes, during pregnancy supplementation is recommended as the main strategy and is considered more effective and efficient to overcome micronutrient deficiencies (especially iron). Compliance in consuming iron tablets is the compliance of pregnant mother in carrying out the advice of health workers to consume iron tablets according to dosage and drinking schedule. The compliance in this study showed on pregnant mothers' compliance in consuming iron tablets, including the compliance on the number of tablets consumed, how to consume iron tablets and when taking iron tablets.¹⁰ Pregnant mother who are disobey in consuming iron tablets have a risk of anemia 4,250 times compared to pregnant mother who are complied in consuming iron tablets.¹¹

The standard of ANC service received by pregnant mother is 10T. Examination of hemoglobin levels and administration of iron tablets is part of ANC services.¹² Completeness of facilities and infrastructure in health facilities should be able to support all prenatal care services needed by pregnant women. Suggestions for ANC visit is minimum 4x during pregnancy are expected to detect anemia in pregnant mother, so that women with Hb levels below normal from the start of the pregnancy visit must have received iron tablets.¹³ From 93% who obey consuming iron tablets, only 53% of pregnant mother know the benefits.¹⁰

Materials and Methods

The design of this study used *cross-sectional* design. This study was conducted on seven Public Health Centre from March

to July 2018 with the highest number of 2nd trimester pregnant mothers. The population in this study were all pregnant mothers of third trimester in the working area of 7 public health centre namely Ratu

Table 1. Characteristics of research respondents.

Variable	N	%
Maternal Age		
<20 years	4	3.8
20-35 years	87	82.1
> 35 years	15	14.2
Gestational age		
≥ 28 weeks (7 months)	35	33
≥ 32 weeks (8 months)	38	38
≥ 36 weeks (9 months)	33	31
Anemia based on pregnancy age		
≥ 28 weeks (7 months)	22	37
≥ 32 weeks (8 months)	18	31
≥ 36 weeks (9 months)	19	32
Education		
Had no formal education	5	4.7
Elementary	11	10.4
Junior high school	30	28.3
High school	40	37.7
College	20	18.9
Number of Children		
New pregnant	30	28.3
1 person	34	32.1
2-3 people	40	37.7
4-5 people	2	1.9
Health Insurance		
Yes	106	100
Medical record book		
Yes	106	100
Wormy		
Negative	106	100

Table 2. Frequency distribution.

Variable	Measure result	Sample Number	
		n	%
Anemia	Anemia	59	55.7
	Not Anemia	47	44.3
Compliance in consuming Iron tablets	Disobey	85	80.2
	Obey	21	19.8
Knowledge of Anemia and Iron tablets	Less	86	81.1
	Good	20	18.9
Mothers' attitude in consuming Iron tablets	Less	64	60.4
	Good	42	39.6
ANC Service (10 T)	Below average	89	84
	Average	17	16
ANC Visit	Below average	33	31.1
	Average	73	68.9
Counseling from Health Worker	No	58	54.7
	Yes	48	45.3
Pregnant mother class	No	81	76.4
	Yes	25	23.6
Available of Iron tablets	Insufficient	93	87.7
	Sufficient	13	12.3
Malaria History	Yes	8	7.5
	No	98	92.5
Total		106	100

Agung, Sawah Lebar, Beringin Raya, Lingkar Timur, Nusa Indah, Bentiring and Padang Serai Public Health Center. Sampling taken by *pupovise sampling technique* with 106 respondents.

The data collected with questionnaires include data on characteristics of pregnant mothers, compliance consuming the iron tablets, knowledge of iron tablets, attitudes, health worker counseling, maternal classes and availability iron tablets. Data on ANC visit and ANC services using *checklist*. Measurement of hemoglobin levels, helminthiasis and malaria were done by laboratory examination.

Univariate analysis was used to see the characteristics of pregnant mothers including age, education, number of children, membership of Jamkesmas, ownership of KIA books and wormy status and variables in this study.

The multivariate analysis that used in the study was used *multiple logistic regression test* to determine the independent variables were the most dominant influence on the dependent variable in the final modeling. This study has been approved by the Research Ethics Committee from Public Health Faculty of Sriwijaya University.

Results

Based on the geographical condition of Bengkulu City, it was obtained that all pregnant mothers in this study were able to easily access the nearest health services, and the most did not work, while the rest worked as household helpers (Table 1). Most respondents aged between 20-35 years, gestational age ≥ 32 weeks (8 months), gestational age of anemia was ≥ 28 weeks (7 months) as many as 22 (37%) people. All respondents had health insurance, medical record book and negative worms.

Based on Table 2, it was obtained as many as 59 people (55.7%) mothers who suffered from anemia, and only 19.8% mothers who obeyed consuming iron tablets. 47.2% mothers had less knowledge about anemia and iron tablets. Most mothers (84%) received ANC services below average (10T).

Based on Table 3, the results of Chi-square test on factors related to compliance, it was obtained that consumption of iron tablets, ANC services, ANC visits, and availability of iron tablets were significant relationship with the incidence of anemia (p-value < 0.05).

Based on Table 4, the most dominant variable influencing the incidence of iron deficiency anemia was the availability of Iron tablets with a value of $p = 0.023$ and

OR 13.995 (95% CI: 1.438 - 135.459), meaning that the third trimester pregnant mothers who were insufficient of Iron tablets availability had chance 14 times more experiencing in anemia compared to third trimester pregnant mothers who had sufficient the Iron tablets.

Discussion

The results of multivariate binary logistic regression test showed that compliance in consuming iron tablets is not the dominant factor to influence the incidence of anemia. The results of the study obtained that almost all subjects (98.9%) consumed iron tablets, but only 27.5% obeyed to consume. Pregnant mothers who weren't obedient in consuming iron tablets had a risk of suffering from anemia 4,250 times compared to pregnant mother who were obedient in consuming iron tablet.

Bivariate analysis showed there was significant relationship between ANC services with the anemia incidence (p value = 0.035). Pregnant mothers who received below average ANC services were 3.7 times to experience anemia compared to groups of pregnant mothers who received average ANC services (10T). Multivariate binary logistic regression test showed that ANC services affected the incidence of iron deficiency anemia on pregnant mothers p value = 0.047, OR = 3.40 (95% CI: 1.01-11.30), meaning that mothers who received below average ANC services 10T was 3.4 times to experience iron deficiency anemia than mothers who received average ANC services (10T). Quality ANC services and accordance to standard were conducted as an effort to detect early risk since the beginning of pregnancy expected to the pregnant mothers and health officers to conduct various activities such as counseling about good nutrition during pregnancy, information on

Table 3. Relationship between independent and dependent variables.

Variable	Anemia, n (%)		p value
	Yes	No	
Compliance			
Disobey	53(62.4)	32(37.6)	0.011
Obey	6(28.6)	15(71.4)	
Knowledge			
Less	50(58.1)	36(41.9)	0.415
Good	9(45)	11(55)	
Attitude			
Less	40(62.5)	24(37.5)	0.121
Good	19(45.2)	42(54.8)	
ANC Services			
Below average	54(60.7)	35(39.3)	0.035
Average	5(29.4)	12(70.6)	
ANC Visit			
Below average	24(72.7)	9(27.3)	0.030
Average	35(47.9)	38(52.1)	
Counseling			
No	36(62.1)	22(37.9)	0.206
Yes	23(47.9)	25(52.1)	
Pregnant mother class			
No	47(58)	34(42)	0.515
Yes	12(48)	13(52)	
Availability of Iron tablets			
Insufficient	58(62.4)	35(37.6)	0.001
Sufficient	1(49.1)	12(92.3)	
Malaria History			
Yes	3(5.2)	5(10.4)	0.462
No	56(57.1)	42(42.9)	

Table 4. Models of Multiple Logistic Regression.

Variable	SE	OR (95%CI)	p value
Compliance in Consuming the Iron tablets	0.682	1.397 (0.367 - 5.314)	0.624
ANC Service	0.614	3.392 (1.018-11.307)	0.047
Availability of Iron tablets	1.160	13.954 (1.438 - 135.459)	0.023
ANC Visits	0.501	1.881 (0.705 - 5.018)	0.207

the importance of the benefits of consuming Iron tablets, and improving counseling about the harmful effects of anemia.¹⁴ Education and information about the importance of Iron tablets need to be done to the maximumly when pregnant mother get ANC services. Supervision from cadres or health workers in providing iron tablets to pregnant mother in order to consume regularly was very necessary. So the complication cases and even maternal and baby mortality during pregnancy and childbirth can be reduced, one of them through standard ANC services.

There was a significant relationship between the availability of iron tablets and incidence of anemia with (*p value* = 0.001) OR = 8.10 (95% CI: 1.26-53.65). It showed that pregnant mother who had insufficient iron tablet had an opportunity of 8.10 times for anemia. Multivariate binary logistic regression test results also showed that iron tablet availability was the dominant factor influencing the incidence of anemia on pregnant mothers (*p value* = 0.023). Iron consumption <30 tablets/month caused anemia on pregnant mothers 3 times compared to pregnant mothers by consumption of Iron tablets >30 tablets/month obtained results of pregnant mothers who received/consumed the Iron tablets <30 tablets/month had a chance of 2,286 times to suffer from anemia compared to pregnant mothers who consumed Iron tablets > 30 tablets/month. The health facility that provide the antenatal care is expected to have an estimated need for iron tablets every year so that the supply will be sufficient. The local government began to monitor and evaluate the supply of Iron tablets that should be received by every pregnant mother in an effort to prevent the occurrence of iron deficiency anemia

There was a significant relationship between ANC visits with the incidence of anemia with (*p value* = 0.03) PR: 1.51 (95% CI: 1.10-2.08) meaning that pregnant mothers who had below average ANC visits had 1.5 times chance to experience anemia compared to groups of pregnant mothers who ANC visited was average. Based on the results of multivariate binary regression logistic tests, it showed that ANC visits

became confounding variables between compliance to consume of iron tablets with the incidence of iron deficiency anemia. The compliance increasing of pregnant mothers consuming iron tablets on the second visit was 78.48% and the third visit was 79.13%.¹⁵ Preventing the occurrence effects of anemia was very important, it is recommended that all pregnant mothers have their ANC visits regularly.

Conclusions

The conclusion of the study was that there was a significant relationship among maternal compliance consuming the Iron tablets, ANC services, ANC visits and availability of Iron tablets with the incidence of anemia. The most dominant variable affecting the incidence of anemia was the availability of iron tablets.

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