CORRELATION BETWEEN IRON DEFICIENCY ANEMIA IN PREGNANCY WITH THE MATERNAL AND NEONATAL OUTCOMES

Yusrawati, Zeino Fridsto

Fetomaternal Division, Department of Obstetrics and Gynecology / Dr.M.Djamil Hospital, Faculty of Medicine, Andalas University. Padang

Background

Pregnancy is a condition that increases requirements for iron to fulfill the needs of fetal, placental and enhancement in the number of erythrocytes during pregnancy. Inadequate iron stores before pregnancy due to insufficient iron intake can result in iron deficiency anemia in pregnancy. Wibowo N, Purba RT, 2006

Iron deficiency is the most nutrient deficiencies and is the biggest cause of anemia during pregnancy. About 20% of the world population known suffers from iron deficiency and 50% of individuals who suffer from iron deficiency is continues to be iron deficiency anemia. Scanlonn et all 2000

Prevalence of Iron Deficiency Anemia (IDA) varies between countries and even between regions, it is highly dependent on the pattern of nutrition and public health in the region . Andonotopo W, Arifin MT 2005 From the data in WHO estimates that 35% to 75% of pregnant women in developing countries and 18% of women in industrialized developed countries are anemic, Allen LH 2000 whereas according to the Domestic Health Survey in Indonesia in 1995 the percentage of pregnant women with anemia reached 51.3%. Wibowo N, 2006 From Domestic Health Survey 2001 on the prevalence of anemia in pregnancy is still high at around 40.1%. Amiruddin R et al 2007 Lautan J et al (2001) reported on 31 pregnant women in the second trimester were found 23 (74%) suffer from anemia, and 13 (42%) suffer from iron deficiency. Lautan J 2001 Amri S(2006) in his research in Dr. M. djamil hospital in Padang of 61 pregnant women were examined, it was found 70.5% had anemia and 29.5% had normal hemoglobin levels. Amri S 2006 Suega and colleagues in Bali says the prevalence of iron deficiency anemia in pregnancy as much as 46.2% Suega K et al 2002

Iron deficiency anemia in pregnancy may have various clinical symptoms, so that the blood test for diagnosis is important. On physical examination is often not shown any symptoms except after and longstanding very low hemoglobin values . In some studies ferritin serum levels are often used to determine the iron reserves as well as the diagnosis of iron deficiency anemia in pregnancy. Singla PN, Tyagi M, Kumar A 1997, Warouw NN, Wiriadinata 2002, Ronnenberg et all 2004

Iron deficiency anemia in pregnancy may give a bad influence for either the mother during pregnancy, childbirth or in the postpartum period and later life. During pregnancy it can increase the risk of abortion and cardiovascular complaints. In childbirth may result in prolonged labor due to uterine inertia and postpartum hemorrhage, and ultimately increase the risk of blood transfusion in the postpartum period. Breymann C 2002, Hudono ST 2005, Andonotopo 2006,. Wibowo N 2006

Iron deficiency anemia in pregnancy is also associated with low birth weight, premature delivery and perinatal mortality, but the mechanism is not clear. USPSTF 2006 In some literature

mentioned if it happen since the beginning of pregnancy, it may affect placental vascularization by disrupting angiogenesis in early pregnancy, causing premature delivery and intrauterine growth. Breymann C 2002, Andonotopo 2006, Wibowo N 2006

Various studies have been conducted to determine the risk factors for low birth weight, which can be broadly grouped into maternal factors, fetal and placenta. Among these risk factors, problems iron deficiency anemia (IDA) during pregnancy is very interesting risk factor to study, especially in developing countries like Indonesia because the prevalence is quite high. Some studies have suggested that iron deficiency anemia during pregnancy is associated with preterm delivery, low birth weight and increased perinatal mortality. Warouw NN, Wiriadinata S 2002

Given the magnitude of the adverse effects of iron deficiency anemia in pregnant women, childbirth and the fetus, it is important enough to give an attention to this problem. Based on the above, the researcher tried to do research on iron deficiency anemia in pregnancy and its relation to maternal and infant outcomes.

Design, this is an analytical study using cross-sectional research design.

Results

During the study obtained 175 full-term normal delivery and 38 respondents who experienced anemia. All the respondents done the examination towards iron deficiency anemia include hemoglobin, MCV, peripheral blood slides, and ferritin levels, we were obtained 19 respondents who met the study criteria, of which 13 respondents (68.4%) with ferritin levels <12 ug / l and 6 respondents (31.6%) with ferritin levels ≥ 12 ug / l. Respondents who met the criteria followed the delivery with partograf and mother and infant outcomes recorded include uterine inertia, post partum hemorrhage, Apgar scores and birth weight.

Table 1. Age Frequency Distribution Based on Ferritin Levels

Age (year)	Group				P
	Ferritin< 12		Ferritin≥12		
	f	%	f	%	
<21	1	7,6	2	33,3	
21-35	11	85,8	3	50	
>35	1	7,5	1	16,7	
Total	13	100	6	100	
Mean± SD		28,92± 6,47		26,5 ± 6,18	0,453

Based on table 1, Of most age groups from age with ferritin levels <12 ug / l and group Ferritin ≥ 12 ug / l is between 21-35 years. The average maternal age group at Ferritin <12 ug / l was 28.92 ± 6.47 years. The group in ferritin ≥ 12 ug / l had average of maternal age was 26.5 ± 6.18 years. In the statistical tests, no significant difference in both groups (p> 0,05).

Table 2. Frequency distribution of Parity Based Ferritin Levels

Parity	Group				P
	Ferritin< 12		Ferritin≥12		
	f	%	f	%	
1	3	27,2	3	50	
2	3	27,2	2	33,3	
3	7	45,6	1	16,7	
Total	13	100	6	100	
Mean±SD		2,23± 0,97		1,67 ± 0,81	0,219

Based on Table 2, the highest parity group of Ferritin <12 ug / l is multigravid III (45.6%) and group Ferritin ≥ 12 ug / l were primigravida (50%). Maternal parity group average of Ferritin <12 ug / l was 2.23 ± 0.97. The group in Ferritin ≥ 12 ug / l had average of maternal age was 1.67 ± 0.81. In the statistical tests, no significant difference in both groups (p> 0,05).

Table 3. Frequency Distribution of Anemia Based on Ferritin Levels

Anemia	Group				P
	Ferritin< 12		Ferritin≥12		
	f	%	f	%	
Mild	7	53,8	4	66,6	
Moderate	6	36,2	2	33,4	
Total	13	100	6	100	
Mean±SD		9,02± 0,85		9,4 ± 0,66	0,219

Based on Table 3, most types of anemia in the group Ferritin <12 ug / l and group Ferritin ≥ 12 ug / l is mild anemia. From maternal hemoglobin level group average of Ferritin <12 ug / l was 9.02 ± 0.85 years. In the group of Ferritin <12 ug / l levels of maternal hemoglobin average was 9.4 ± 0.66 years. In the statistical tests, no significant difference in both groups (p> 0,05).

Mother outcomes:

Table 4. Correlation between Uterine inertia with Iron Deficiency Anemia

Uterine inertia	Ferritin<12		Ferritin≥12			
	f	%	f	%	f (%)	
Yes	0	0	1	16,7	1	5
No	13	100	5	83,3	18	95
Total	13	100	6	100	19	100
			P (Fisher) = 0,316			

Based on Table 4, the percentage of uterine inertia in respondents with higher ferritin levels ≥ 12 ug / l compared with ferritin levels <12 ug / l (16.7%: 0%). This difference was not statistically significant (p> 0,05).

Table 5. Correlation between Post Partum Hemorrhage with Iron Deficiency Anemia

Post Partum Hemorrhage	Ferritin<12		Ferritin≥12			
	f	%	f	%	f (%)	
Yes	1	7,6	1	16,7	2 15	
No	12	92,4	5	83,3	17	85
Total	13	100	6	100	19	100
			P (Fisher) = 1			

Based on Table 5, the percentage of post partum hemorrhage was higher in respondents with ferritin levels ≥ 12 ug / l compared with ferritin levels <12 ug / l (16.7%: 7.6%). This difference was not statistically significant. (p> 0,05).

Neonatal outcomes:

Table 6. Correlation between Apgar Score with Iron Deficiency Anemia

Apgar score	Ferritin<12		Ferritin≥12			
	f	%	f	%	f	(%)
<7	3	21,4	1	16,7	4	20
≥7	10	78,6	5	83,3	15	80
Total	13	100	6	100	20	100
			P (Fisher) =1			

Based on Table 6, the percentage of neonatal asphyxia was higher in respondents with ferritin levels <12 ug / l compared with ferritin levels ≥ 12 ug / l. (23%: 16.7%). Tendency can be seen in higher incidence of neonatal asphyxia on levels of ferritin <12 ug / l, but this difference was not statistically significant (p> 0,05).

Table 7. Correlation between LBW with Iron Deficiency Anemia

LBW	Ferritin<12		Ferritin≥12 %		f	
	f	%	f	%	f	(%)
SGA	3	21,4	1	16,7	4 20	
AGA/LGA	10	78,6	5	83,3	15	80
Total	13	100	6	100	19	100
			P (Fisher) =1			

Based on Table 7, from LBW group have higher percentage of respondents with ferritin levels <12 ug / l compared with ferritin levels ≥ 12 ug / l. (21.4%: 16.7%). Tendency in higher incidence can be seen in neonatal asphyxia on levels of ferritin <12 ug / l, but this difference was not statistically significant. (p> 0,05).

Sample Characteristics

Based on table 1, most of the age group at Ferritin <12 ug / l and group Ferritin ≥ 12 ug / l is between 21-35 years. The average maternal age group Ferritin <12 ug / l was 28.92 ±6.47 years. In the group of Ferritin <12 ug / l on average maternal age was 26.5 ± 6.18 years. In the statistical tests, no significant difference in both groups (p> 0,05).

Based on Table 2, the highest parity group Ferritin <12 ug / l is multigravid III (45.6%) and group Ferritin ≥ 12 ug / l were primigravida (50%). Maternal parity group average Ferritin <12 ug / l was 2.23 ± 0.97. Ferritin in the group ≥ 12 ug / l on average maternal parity was 1.67 ± 0.81. In the statistical tests, no significant difference in both groups (p> 0,05).

Based on Table 3, most types of anemia in the group Ferritin <12 ug / l and group Ferritin ≥ 12 ug / l is a mild anemia. Maternal hemoglobin level group average Ferritin <12 ug / l was 9.02 ± 0.85 g / dl. Ferritin in the group ≥ 12 ug / l of maternal hemoglobin levels average was 9.41 ± 0.06 years. In the statistical tests, no significant difference in both groups (p> 0,05).

Comparability test conducted in this study to groups Ferritin <12 ug / l with a group Ferritin ≥ 12 ug / l in the variables maternal age, parity and the number of degrees of anemia. Obtained both groups had balanced so that the research can proceed.

Frequency of Iron Deficiency Anemia

In this study, the prevalence of Iron Deficiency Anemia as many as 13 people (68.4 %) with ferritin levels < 12 ug / l . There were 6 cases with ferritin levels > 12 ug / l (31.6 %) . This 6 cases is the possibility of anemia due to other factors such as thalassemia and other chronic diseases , but in this case no further testing such as hemoglobin electrophoresis . Specific laboratory tests that can differentiate microcytic hypochromic anemia in thalassemia is iron deficiency with hemoglobin electrophoresis examination to check the hemoglobin A2 in patients with thalassemia will increase (β-thalassemia) . Anemia due to chronic diseases or inflammatory process may appear as hypochromic and microcytic . Warouw (2005) obtained 5 pregnant women (16.7 %) who suffer from anemia , there are 3 women (10 %) with ferritin levels above > 12 ug / l . Likelihood of anemia in these cases is a megaloblastic anemia such as anemia due to folic acid deficiency during pregnancy folic acid requirements are also increasing . [Warouw 2005]

Lautan et al (2001) reported on 31 pregnant women in the second trimester iron deficiency anemia was found about 23 people (74%). [Lautan 2001] Abadi A (2006) mentions nearly 95% of anemia in pregnancy is iron deficiency anemia. [Abadi A 2006] Seefried (1995), which get in the prevalence of iron stores in the body of the patients ranged from 35% University of Zurich, while that manifests as iron deficiency anemia was 10%. [Seefried 1995] Rosline et al (2001) reported iron deficiency anemia in pregnant women 13.5%. Carvajal found the prevalence of iron

deficiency anemia is 39.2%.[Carvajal 2002] Riswan (2003) reported that iron deficiency anemia in the third trimester as much as 30%.[Riswan 2003]

The difference in the prevalence of iron deficiency anemia in this study may be due to the sampling method used where samples are pregnant patient in labor at term, whereas in another study conducted in early trimester. Besides, the pattern of nutrition and public health between different regions would provide different results.

According to the literature is the problem of iron deficiency is the most nutritional deficiency and is the biggest cause of anemia in pregnancy.[Scanlonn et al 2000] Prevalence of Iron Deficiency Anemia (IDA) varies between countries and even between regions, it is highly dependent on the pattern of nutrition and public health patterns in the region.[Andonotopo W 2005]

Mother outcomes

Correlation Between Iron Deficiency Anemia with Uterine Inertia

Based on Table 4 are not found in the incidence of uterine inertia iron deficiency anemia (ferritin levels <12 ug / l). From the research data obtained from 19 respondents, there is one case of uterine inertia experienced with ferritin levels> 12 ug / l (case no 3).

In the above case occurred uterine inertia were assessed by cardiotocography then performed using the accelerated delivery of oxytocin. In this case also occurred post partum hemorrhage.

Malhotra M (2002) concluded that severe anemia associated with prolonged labor and an increase in labor induction. Malhotra M and Notobroto(2002) examine factors that influence the occurrence of anemia in pregnancy and its association with the likelihood of complications in pregnancy and childbirth. Complications caused by anemia is the predominant occurrence of infectious disease at the time of childbirth, followed by uterine inertia and postpartum hemorrhage.[Notobroto 2003]

Based on the research that has been done was not a significant association between uterine inertia with iron deficiency anemia. According to the literature, hypotonic uterine inertia is a uterine contraction disorder with the weak / inadequate of the power to perform the opening of the cervix. Here uterine contraction strength is weak and sparse frequency. It can be seen in people who generally unfavorable circumstances such as iron deficiency anemia.[Wiknjosastro 2006] The lack of blood flow or the smaller blood vessels in the anemia caused fewer or no innervation. But it turns out that including the uterine muscles are very contractile smooth muscle to the surrounding circumstances through local feedback control system and controls the blood flow leading to the local area. Lack of oxygen in the local network, the excess carbon dioxide and hydrogen ion concentration increases will cause vasodilation. In addition, many other factors that influence smooth muscle contraction such as calcium ions as well as some vital hormones that affect muscle contraction such as norepinephrine, epinephrine, acetylcholine, angiotensin, vasopressin, oxytocin, serotonin and histamine. Particular hormone norepinephrine, vasopressin and angiotensin stimulation has a very strong influence, so that this hormone can cause smooth muscle spasm for several hours.[Guyton 1993]

Correlation Between Iron Deficiency Anemia with Post Partum Hemorrhage

Based on Table 5, the incidence of postpartum hemorrhage in respondents with iron deficiency anemia (ferritin levels <12 ug / l) by 1 person (7.6%) and 1 case with ferritin levels ≥ 12 ug / l (16.7%). Cases with high ferritin (case No. 3) had also accompanied by uterine inertia. Of the 20 respondents there were two cases of post partum hemorrhage which is 2 cases of moderate anemia (cases No. 3 and 14). Cases of postpartum hemorrhage at moderate anemia occurs in Dr. M. Djamil Hospital Padang. The management of postpartum hemorrhage are uterotonic administration and blood transfusion.

Feerasta SH (2000) get 2 factors associated with the incidence of uterine atony and postpartum hemorrhage is gestational diabetes and prolonged second stage, but did not get the relationship between high parity, age, accelerated delivery and antenatal anemia.[Feerasta SH 2000]

Singh K (1998) in his research do not get the difference between the incidence of postpartum hemorrhage anemia with non-anemic group. There is a tendency that the incidence of postpartum hemorrhage was higher in severe anemia (16.7%) compared to moderate anemia (12.2%) and mild anemia (7.5%), but this trend was not statistically significant ($p = 0.4$).[Singh K 1998] Abadi A (2006) mentions the risk of maternal iron deficiency anemia include fatigue, risk of postpartum blood loss, predisposing to infection and poor wound healing. [Abadi A 2006]

Not significance of this study due to other factors, such as age and parity. In this study, only 2 cases obtained over the age of 35 years and the study is limited to MP III. Okkuchi et al (2003) obtain a multivariate analysis from the age> 35 years is an independent risk factor for the occurrence of postpartum hemorrhage at vaginal delivery (OR 1.5, 95% CI 1.2-1.9).[B-Lynch 2006] Tsu reported advanced age (> 35 years) was associated with a relative risk of 4 (95% CI 1.3 to 7.3) post partum hemorrhage.[B-Lynch 2006] Research by Munim (2000) and Ijaiya (2003) obtain a positive relationship between the grande multipara with postpartum hemorrhage.[B-Lynch 2006]

Neonatal Outcomes

Correlation Between Iron Deficiency Anemia with Asphyxia Neonatorum

From Apgar score distribution causing inability for statistical processing is done by grouping of mild, moderate and severe asphyxia. Analysis by dividing this group on asphyxia with 1-minute Apgar score <7 and vigorous baby (healthy baby) with Apgar score ≥ 7.[Nelson 1996]

From table 7, neonatal asphyxia incidence of iron deficiency anemia (ferritin levels <12 ug / l) as much as 3 cases (21.4%) and the ferritin levels ≥ 12 ug / l is 1 case (16.7%). Obtained from the analysis of case 2 case is a mild anemia (case no 1 and 2) and 2 more cases of a moderate anemia (No18 and 20 cases). Three cases obtained with ferritin levels <12 ug / l (case No. 1,18 and 20) and 1 case with ferritin levels of 29.18 ug / l (case no 2). Tendency can be seen in the neonatal asphyxia on iron deficiency anemia, but was not statistically significant. Many of the factors that affect the Apgar score of newborns include long and mode of delivery. Weakness of this study is not able to get rid of the above variables.

Research by Lao et al (2000) obtain a high ferritin levels associated with preterm delivery and neonatal asphyxia and there was no difference Apgar score in lower ferritin levels. [Lao et al 2000]

Research conducted by Budwiningstijastuti (2004) states in X2 analysis found that anemia in third trimester pregnant women increases the incidence of low 1-minute Apgar score RR = 1.805 (95% CI: 1.29 to 2.53). After multiple logistic regression analysis of the independent variables: anemia, mode of delivery, fetal presentation, preeclampsia, parity, the first stage of a long, prolonged second stage of gestation and obtained results that anemia in third trimester pregnant women was not statistically increased incidence of low 1-min Apgar scores (p = 0,56). The incidence of 5-minutes Apgar score, with X2 analysis obtained RR = 1.11 (95% CI: 0.46 to 2.65) and after multiple logistic regression analysis with the independent variables obtained that anemia in third trimester pregnant women does not increase incidence of low 5-minute Apgar score (p = 0,24). Budwiningstijastuti 2004

Runa U (1995) reported 102 women in stage 1 labor, high hemoglobin concentration values associated with better Apgar score and risk reduction asphyxia. Runa U 1995 Preziosi (1997) reported that pregnant women treated with iron or placebo, Apgar score was higher in women treated with iron. Preziosi 1997 Bakhtiar gain of neonatal anemia group had an increased risk of a low Apgar score 1.7 times compared to non-anemic group. Bakhtiar 2007

In this study found no relationship between iron deficiency anemia with neonatal asphyxia. This could be due to compensatory mechanisms of the condition of the mother whose fetus had iron deficiency anemia. According to the literature, in the absence of supplemental iron, hemoglobin concentration and hematocrit dropped quite large when the mother's blood volume increases. However, the production of fetal hemoglobin will not be disturbed, because the placenta to obtain iron from the mother to the fetus in sufficient quantities to produce normal hemoglobin levels despite his mother suffered severe iron deficiency anemia. Sterr PJ 2000, Cunningham FG et al 2001

Fetal hypoxia causes of neonatal asphyxia due to a disruption of gas exchange and O2 transport from mother to fetus so that there is interference in the O2 supply. This disruption can take place due to chronic conditions or maternal abnormalities during pregnancy. Chronic disorders in pregnancy may be poor nutrition and chronic diseases such as anemia. In this case the effect on the fetus caused by impaired oxygenation and lack of provision of nutrients associated with impaired placental function. Aminullah A 2005 Furthermore, reducing oxygenation umbilical uterine contractions, suppress cardiovascular and central nervous system, resulting in low Apgar scores and post-birth hypoxia in the delivery room. Hypoxia that occurs after birth can result from severe anemia, which is to lower the oxygen content of blood to critical levels, due to heavy bleeding or hemolytic disease. Kliegman RM,1996

Correlation Between Iron Deficiency Anemia with Low Birth Weight

From table 7, Small baby for gestational age in iron deficiency anemia (ferritin levels <12 ug / l) as much as 3 cases (21.4%) and the ferritin levels ≥ 12 ug / l is 1 case (16.7%). Obtained from the analysis of case 2 case is a moderate anemia (case No. 4 and 14) and 2 more cases are mild anemia (case no 2 and 16). Three cases obtained with ferritin <12 ug / l (case No. 4,14 and 16) and 1 case with ferritin levels of 29.18 ug / l (case No. 2). Trend can be seen with the Small baby for gestational age on iron deficiency anemia, but was not statistically significant.

Scanlon (2000) in his study mentioned iron deficiency anemia is not associated with the incidence of small babies from pregnancy. Scanlon 2000 The same was obtained by Goldenberg who get a negative relationship between ferritin levels with low birth weight and a positive relationship with premature delivery. Goldenberg 1996

Singh K incidence SGA found almost the same between the anemic and non anemic. There is a great tendency to smaller infants with decreased hemoglobin levels, but was not statistically significant. SGA higher incidence with increasing degrees of anemia, but also statistically insignificant. Singh K 1998

Brabin and Pifer (1997) found severe anemia (<7gr%) is responsible for approximately 10% of low birth weight. Brabin dan Pifer 1997 Sterr (2000) get severe anemia (hb <8 g%) associated with the birth of small baby (premature labor and Fetal Growth Restriction). Sterr 2000

Hou et al (2000) to get the mother to the fetus asymmetric fetal growth retardation (FGR) had ferritin levels higher than the corresponding gestational age at 25 weeks (38 vs. 20.2 ug / l, p <0.1) and 36 weeks (21 vs 13.3 ug / l) and symmetric FGR mothers had lower ferritin levels at 36 weeks (8.3 ug / l). Hou concluded that high maternal ferritin levels associated with asymmetric FGR, and low ferritin levels are associated with Symmetric FGR. Hou 2000

Ronnenberg (2004) found iron deficiency anemia (hb <12 g%, ferritin <12 ug / l) was associated with a reduction of 242 g birth weight. Low ferritin levels (<12 ug / l) and high (≥ 60 ug / l) were significantly associated with low birth weight (106 g and 129 g). Risk of low birth weight and Fetal Growth Hampered significantly higher in women with moderate anemia than non-anemic women as controls (OR 6.5 p = 0.009). Ronnenberg 2004

Abadi A (2006) mentions the relationship between hemoglobin levels and fetal risks such as increased risk of IUGR 2-fold at hemoglobin level <9 g%, 2.7 relative risk of preterm delivery and small for gestational age infants with IUGR on hemoglobin 3.5 and <8.5 g% and ferritin <10 ug / l. Abadi A 2006

From the above studies it was concluded that moderate and severe anemia is responsible for low birth weight and fetal growth restriction. Research data obtained from the majority of respondents (60%) were mild anemia. This factor perhaps is the reason of not significant of this research.

According to the literature, the influence of maternal anemia on fetal growth associated with oxygen reduction occurs chronically. Furthermore, severe maternal anemia, if it occurs from early gestation causes placental weight reduction and structural abnormalities of the placenta. Placental weight associated with peripheral villous surface area that determines the transport of nutrients from mother to fetus. This explains the mechanism of severe maternal anemia affect fetal growth. In addition, maternal anemia is a marker of nutritional, social and environmental indirectly that affect fetal growth. Singla PN 1997

Limitations of Research

There are several weaknesses of this study that may affect the results of the study, there are:

1. The study design was cross-sectional. The results are contradictory, of course, needs to be proven with a better design, the cohort or clinical research.

2. Assessment of uterine inertia is supposed to do with cardiotocography that can not be done at the health center because the tools are not available, so the assessment is done manually by partograf.
3. Sampling was conducted in women with low-risk group, such as parity ≤ 3 which can affect the results of the research, such as the incidence of postpartum hemorrhage.
4. In this study, there are variables that are not excluded as long, mode of delivery and helper factors that may affect the results of such research Apgar score.

Conclusion

1. The prevalence of mothers who gave birth with iron deficiency anemia based on ferritin levels in this study as much as 68.4%.
2. Incidence of postpartum hemorrhage of 7.6%, low birth weight and neonatal asphyxia, respectively by 21.4%.
3. There was no significant association between uterine inertia, postpartum hemorrhage, neonatal asphyxia and low birth weight with iron deficiency anemia.

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