No Correlation Between Anemia in Third Trimester Pregnant Women and Preeclampsia/Eclampsia in Dr. Seotomo Hospital Surabaya

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ABSTRACT

Based on the latest survey data, Indonesia's Maternal Mortality Rate (MMR) is 305/100,000 live births. One of the the most common cause of Maternal Mortality Rate is Preeclampsia. Globally, preeclampsia is still a problem associated with MMR. 10% of pregnant women worldwide experience preeclampsia, and it is the cause of 76,000 maternal deaths and 500,000 infant deaths each year. According to World Health Organization (WHO), it is reported that the global prevalence of eclampsia is 0.3%, causes of maternal death ranged from 1.5 percent to 25 percent. In addition to other vascular disorder, anemia considered high with prevalence of 49.8% in Indonesia. There have not been many significant studies on the effect of anemia with the incidence of preeclampsia and eclampsia. This study aims to explore the correlation between risk factor of anemia and the incidence of preeclampsia and eclampsia in Dr. Soetomo Hospital Surabaya, Indonesia. This research was carried out with cross-sectional studies with total samples 0f 141 pregnant woman in Dr. Soetomo Hospital Surabaya, Indonesia. Age characteristics taken are 18-35 years old. Primigravida (33.33%), multigravida (66.70%). Hb < 11 g/dL (40.40%), > 11 g/dL (59.60%). Patients with anemia and preeclampsia/eclampsia (30.60%), without preeclampsia/eclampsia (69.40%). Patients without anemia with preeclampsia (52.20%), without preeclampsia/eclampsia (47.80%). The results of Chi Square analysis found no significant correlation between anemia with the prevalence of preeclampsia (p=0.062) at Dr. Soetomo Hospital, Surabaya, Indonesia.

Keyword: Preeclampsia, Eclampsia, Anemia, Characteristics, Risk Factors.

1. Introduction

Maternal mortality is still a problem in many parts of the world, including Indonesia. Based on the latest survey data, Indonesia's Maternal Mortality Rate (MMR) is 305/100,000 live births (SUPAS 2015) which is the third highest in ASEAN and the second highest in the South East region Asian Nation Regional Organization (WHO, 2013). The most common causes of maternal death in Indonesia are hypertension, pre-eclampsia, eclampsia, bleeding, and infection. (Litbangkes, 2016).

Globally, preeclampsia is still a problem, 10% of pregnant women worldwide experience preeclampsia, and it is the cause of 76,000 maternal deaths and 500,000 infant deaths each year. Based on research by the United States Agency for International Development (USAID) in 2016, 99% of maternal deaths are related to low and middle-income countries. In Indonesia, the prevalence of preeclampsia has increased every year from 2014-2016. In 2014 the prevalence of preeclampsia was 24.44% from 711 deaths per 100,000 live births, in 2015 it increased to 26.34% from 619 deaths per 100,000 live births, while in 2016 it also increased to 27.08% from 602 deaths per 100,000 live births.

According to secondary analysis data by the World Health Organization (WHO), it is reported that the global prevalence of eclampsia is 0.3%. Data from each country show that the prevalence of this disease varies and is related to the socio-economic status of each region. In Indonesia, eclampsia are the causes of maternal death ranged from 1.5 percent to 25 percent while infant mortality was between 45 percent to 50 percent.

Preeclampsia has quite an impact on renal function. Preeclampsia may be complicated by seizures: eclampsia. The greatest compromise occurs with the development of the HELLP syndrome (hemolysis, elevated liver enzymes and low platelet count). The HELLP syndrome, alongside preeclampsia, accounts for most maternal deaths associated with hypertension. The process is completely reversed by the delivery of the fetus and placenta, but intrauterine growth retardation and premature delivery pose major threats to the fetus.

Aside from preeclampsia, eclampsia, the incidence of anemia in Indonesia is still quite high. According to Riskesdas data (2018), the prevalence of anemia in Indonesia is 48.9% with the proportion of anemia in the age group 15-24 years and 25-34 years (Kemenkes RI, 2018). Globally, anemia affects 1.62 billion people (95% CI: 1.50–1.74 billion), which corresponds to 24.8% of the population Anemia is a serious global public health problem that particularly affects young children and pregnant women. WHO estimates that 42% of children less than 5 years of age and 40% of pregnant women worldwide are anaemic.

According to research conducted by Bilano, V L et al (2014) anemia, hypertension, and obesity are the highest risk factors for preeclampsia and eclampsia. Other diseases that can increase the risk of are diabetes mellitus, vascular and connective tissue disease, nephropathy, antiphospholipid antibody syndrome, older maternal age (≥30 years), high BMI, history of chronic hypertension, gestational diabetes, cardiac or renal disease, pyelonephritis or urinary tract infection were significantly associated with higher preeclampsia/eclampsia risks. A current study by Sattar et al, has shown a significant relationship between anemia and hypertensive disorder in pregnancy. Other risk factors for chronic hypertension that can occur include advanced maternal age, obesity, type 2 diabetes mellitus, renal disease, and gestational diabetes mellitus in the index pregnancy.

The high prevalence of preeclampsia, eclampsia and anemia that occurred in pregnant women suggest this research to find out the correlation between anemia with preeclampsia and eclampsia in Dr. Soetomo Hospital Surabaya.

2. Method

The type of research is analytic observational with cross-sectional design. This study will analyze medical records of pregnant women with caesarean section delivery at Dr. Soetomo General Hospital, Surabaya. The variables of this research are classified as anemia as independent variable and preeclampsia/eclampsia as dependent variable. However, from the total samples obtained, about 8 patient samples were eliminated because of the incomplete medical records nor met the exclusion criteria. Thus, only 141 remaining samples meet the inclusion criteria of this research to be further analyzed using Chi-square in statistical tests. Inclusion criteria are pregnant woman aged 16-35 years old. Exclusion criteria are history of preeclampsia/eclampsia and gemelli.

3. Result

Table 1. Patients' Profile Based on Age

Age Category	Frequency (n)	Percentage (%)	Minimum	Maximum	Mean
< 21	6	4.30%	18	35	28
21-25	26	18.40%			
> 25	109	77%			
Total	141	100%			

Table 1 describes the number of samples according to age. Categorized as under 21 with percentage of 4.30%, 21-25 with percentage of 18.40% and above 25 with percentage of 77%. Minimum number 18, maximum number 35 and mean of 28.

Table 2. Patients' Profile Based on Hemoglobin Level

Hb	Frequency (n)	Percentage (%)	Minimum	Maximum	Mean
< 11 g/dL	57	40.40%			
≥ 11 g/dL	84	59.60%	5 g/dL	15 g/dL	11.06
Total	141	100%			

Table 2 describes the number of samples according to hemoglobin level. Categorized as under 11 g/dL is 57 with percentage of 40.40% and more than equal to 11 g/dL shows 87 with percentage of 59.6%. The maximum number is 5 g/dL with minimum number 15 g/dL and mean of 11.06.

Table 3. Patients' Profile Based on Gravida

Gravida	Frequency (n)	Percentage (%)
Primigravida	47	33.33%
Multigravida	94	66.70%
Total	141	100%

Table 3 describes the number of samples with primigravida is 47 (33.33%) and multigravida of 94 (66.70%).

Table 3. Patients' Profile Based on BMI

BMI Category	Frequency (n)	Percentage (%)	Minimum	Maximum	Mean
< 18.5	1	0.70%			
18.5 - 24.9	21	14.90%			
25.0 - 29.9	57	40.4%	18	35	28.7
≥ 30	62	44.0%			
Total	141	100%`			

Table 3 presents BMI which categorized with underweight < 18.5 (0.70%), normal 18 – 24.9 (14.90%), overweight 25 – 29.9 (44%), and obese ≥ 30 (37%).

Table 4. Cross Tabulation Variable of Anemia and Preeclampsia/Eclampsia

Variable	Anemia (+)		Anemia (-)	
	Frequency (n)	Percentage (%)	Frequency (n)	Percentage (%)
Non-eclampsia	50	69.40%	33	47.80%
Preeclampsia	5	6.90%	10	14.50%
Severe Preeclampsia	16	22.20%	23	33.30%
Eclampsia	1	1.40%	3	4.30%
Total	72	100.00%	69	100.00%

Table 4 presents cross tabulation variable of anemia and preeclampsia/eclampsia shows patients with anemia in accordance to non-preeclampsia is 50 (69.40%), preeclampsia 5 (6.90%), severe preeclampsia 16 (22.20%), and eclampsia 1 (1.40%). Sample of patients without anemia shows 30 (47.80%) non-preeclampsia 10 (14.50%), preeclampsia, 23 (33.30%), severe preeclampsia and 3 (4.30%) eclampsia.

Table 5. Analysis Results of Correlation Between Anemia and Preeclampsia/Eclampsia

Variable	Anemia (+)		Anemia (-)		P
	Frequency (n)	Percentage (%)	Frequency (n)	Percentage (%)	
PE/E (+)	22	30.60%%	36	52.20%	
PE/E (-)	50	69.40%	33	47.80%	0.062
Total	72	100%	69	100%	

In table 5 presents the percentage of anemia patients with preeclampsia/eclampsia shows a number of 22 (30.60%) and non-preeclampsia/eclampsia 50 (69.40%). Non-anemia patients show higher percentage of preeclampsia/eclampsia with 36 (52.20%) and number of non-preeclampsia/eclampsia 33 (47.80%). Table 5 shows there is no correlation between anemia and preeclampsia/eclampsia because the value is p=0,062 (p>0,05).

4. Discussion

4.1 Characteristic of pregnant woman

The data on characteristics of pregnant women were analyzed in the form of age, hemoglobin to determine anemia, BMI to determine obesity, also primigravida and multigravida. In the profile of age characteristics, age less than 21 is 4.30%. Between 21-25 with a percentage of 18.40% and higher than 25 with percentage of 77%. Maximum age taken by the sample was found at the age of 35 while the minimum was at the age of 18.

According to characteristic patients based on hemoglobin, it was found the number of patients with hemoglobin level lower than 11 g/dL is 57 (40.40%) and more than equal to 11 g/dL shows number of 87 (59.6%).

Based on the number of gravida divided into primigravida and multigravida. There were 47 pregnant women (33.33%) with primigravida pregnancies and 94 pregnant women (66.70%) with multigravida pregnancies. In BMI characteristic, it was found that the highest frequency is overweight (44%), second highest is obese (37%), normal BMI (14.90%) and underweight (0.70%)

The total number of samples obtained were 141 pregnant women. The sample was analyzed for blood hemoglobin levels to diagnose anemia. The total number of anemia patients was found to be 40.40%. Anemia without preeclampsia/eclampsia was 50 (69.40%) and with preeclampsia/eclampsia showed a number of 22 (30.60%).

Based on the characteristics of the degree of preeclampsia, it is divided into preeclampsia, severe preeclampsia, and eclampsia. In non-anemic patients, the percentage of preeclampsia was 14.50%, severe preeclampsia 32.30% and 4.30% eclampsia. Meanwhile, patients with anemia indicate percentages of 5% preeclampsia, 16% severe preeclampsia, and 1% eclampsia. The results stated that non-anemic patients had a higher percentage of developing preeclampsia, severe preeclampsia, and eclampsia compared to patients with a diagnosis of anemia.

4.2 Analysis on Correlation Between Anemia and Preeclampsia/Eclampsia

The analysis in this study was conducted to see the correlation between anemia with preeclampsia/eclampsia in pregnant women at Dr. Soetomo hospital. In the results of the chi-square statistical test, the value ($p = 0.062$). Thus, it can be concluded that this study did not find a significant relationship between anemia and the incidence of preeclampsia/eclampsia in dr. Soetomo hospital.

During pregnancy, relatively anemia occurs because the blood of pregnant women undergoes hemodilution with an increase in volume of 30% to 40%. Anemia in pregnancy as Hb < 11 g% in the first trimester and < 10.5 g% in the second trimester, because during the second trimester there is a maximal physiological hemodilution process. Increased hemodilution of blood begins to appear in the second trimester of pregnancy. However, the increase in blood cells is not balanced with the increase in blood volume, resulting in hemodilution accompanied by physiological anemia. In pregnancy, oxygen demand is higher, which triggers an increase in erythropoietin production. As a result, the volume of plasma increases and red blood cells (erythrocytes) increase. However, the increase in plasma volume occurs in a greater proportion when compared to the increase in erythrocytes, resulting in a decrease in hemoglobin concentration (Hb) due to hemodilution. (Manuaba.I.B.G, 2010).

In this study, the total patient sample was in the third trimester. So if physiologically, the hemoglobin level obtained in the third trimester was not as low as in the second trimester due to the hemodilution process.

In a cohort study conducted by Malihe Nasiri (2015), showed that low hemoglobin levels or anemia were not associated with preeclampsia. Preeclampsia occurs in pregnant women who have high hemoglobin levels. In pregnant women who have high and oxidized hemoglobin levels, there will be the formation of deposits on the endothelium, this can also be found in the placenta of pregnant women who have preeclampsia.

This research is contrary to the research conducted by Maulina Intan (2013) the results obtained from 44 patients with a diagnosis of preeclampsia and eclampsia, there were 34 people (77%) who had anemia. In the study of Ali et al (2011) women with severe anemia had a 3.6 times higher risk of preeclampsia than women without anemia. Rohilla's (2010) study observed that 17 (17.7%) of 97 women with severe anemia had gestational hypertension or preeclampsia and 2 (2.1%) had eclampsia. Vulnerability of women with anemia for preeclampsia due to deficiency of micronutrients and antioxidants. (Ali, AA et al, 2011). Micronutrients include calcium, phosphorus, sodium, potassium, iron, zinc, copper, magnesium, vitamin B complex, vitamin C, vitamin A, vitamin D, vitamin E, vitamin K (Barasi. M.E, 2007). Deficiency of calcium and protein substances in the diet of pregnant women can lead to the risk of preeclampsia (Saifuddin, 2011).

Another possibility that occurs is that the distribution of anemia data with preeclampsia/eclampsia is less than in non-anemic patients with preeclampsia/eclampsia. It is possible that there are other risk factors other than anemia that influence the incidence of preeclampsia/eclampsia.

5. Conclusion

The conclusion of this research is there is no correlation between anemia with preeclampsia and eclampsia. Thus, anemia is not a risk factor for the occurrence of preeclampsia and eclampsia in pregnant women at Dr. Soetomo Hospital, Surabaya. The possibility of the incidence of preeclampsia/eclampsia might influenced by other risk factor such as obesity, gravida, and maternal age.

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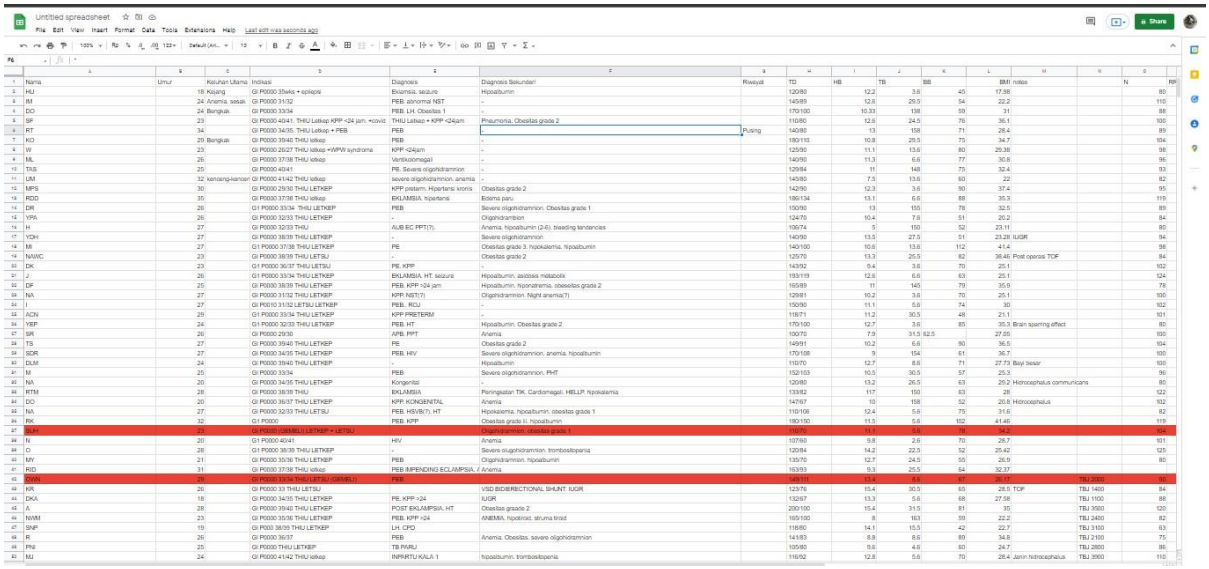
Appendix

A. Raw data



B. Analysis Result

B.1 Obsevational Analytic

Statistics		
Age		
N	Valid	141
	Missing	0

Age					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	1.00	6	4.3	4.3	4.3
	2.00	26	18.4	18.4	22.7
	3.00	109	77.3	77.3	100.0
	Total	141	100.0	100.0	

Statistics		
Hemoglobin		
N	Valid	141
	Missing	0

Hemoglobin					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	10	57	40.4	40.4	40.4
	11-20	84	59.6	59.6	100.0
	Total	141	100.0	100.0	

Statistics		
BMI		
N	Valid	141
	Missing	0

BMI					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	1.00	1	.7	.7	7
	2.00	21	14.9	14.9	15.6
	3.00	51	40.4	40.4	56.0
	4.00	6	44.0	44.0	100.0
	Total	141	100.0	100.0	
Total		141	100.0		

Statistics		
Gravida		
N	Valid	141
	Missing	0

Gravida					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Primigravida	47	33.3	33.3	33.3
	multigravida	94	66.7	66.7	100.0
	Total	141	100.0	100.0	

B.2 Analytical Analysis

Case Processing Summary

	Cases					
	Valid		Missing		Total	
	N	Percent	N	Percent	N	Percent
Anemia * VAR00005	141	100.0%	0	0.0%	141	100.0%

Anemia * VAR00005 Crosstabulation

			VAR00005				
			Non-Preeclampsia	Preeclampsia	Severe Preeclampsia		
Anemia	Non-Anemia	Count	33	10	23		
		% within Anemia	47.8%	14.5%	33.3%		
		% within VAR00005	39.8%	66.7%	59.0%		
		% of Total	23.4%	7.1%	16.3%		
	Anemia	Count	50	5	16		
		% within Anemia	69.4%	6.9%	22.2%		
		% within VAR00005	60.2%	33.3%	41.0%		
		% of Total	35.5%	3.5%	11.3%		
Total		Count	83	15	39		
		% within Anemia	58.9%	10.6%	27.7%		
		% within VAR00005	100.0%	100.0%	100.0%		
		% of Total	58.9%	10.6%	27.7%		

Chi-Square Tests

	Value	df	Asymptotic Significance (2-sided)
Pearson Chi-Square	7.344[a]	3	.062
Likelihood Ratio	7.452	3	.059
Linear-by-Linear Association	5.720	1	.017
N of Valid Cases	141		