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ASSOCIATION OF THIRD TRIMESTER MATERNAL HEMOGLOBIN WITH MEASUREMENT OF NEWBORN'S ANTRHROPOMETRY

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ABSTRACT

Background: More than 20 million babies are born each year with a body weight of less than 2500 g, and 17% of all births in developing countries. Birth weight plays a role in mortality and morbidity, development and, future health of children. Low birth weight is a significant risk factor for infant death and other physical disorders. Anemia that occurs in maternal can increase the risk of mortality, perinatal morbidity and can affect the state of newborns. Anemia in maternal is related to low gestational age, low birth weight, and increased risk of small infants for gestational age. Research on the relationship of maternal's hemoglobin levels in third trimester to anthropometric measurement of newborns has never been carried out at Rumah Sakit Nasional Diponegoro (RSND). **Objective:** This study aims to determine relationship between maternal's hemoglobin levels in third trimester with anthropometry of newborns. **Method:** This research was a study with cross sectional design. Data is collected from medical records at RSND. Babies born viewed medical records to determine inclusion criteria in the study. Anthropometric data were collected for newborns and the third trimester hemoglobin level was recorded in pregnant women. Assosiation analytic was performed with chi square test. **Results:** There was a significant relationship between maternal's hemoglobin levels in third trimester with measurements of newborn weight, body length, and head circumference. **Conclusion:** Maternal's hemoglobin in third trimester affect the measurement of weight, body length, and head circumference neonates.

Keywords: anemia, hemoglobin, anthropometry, maternal, newborn

INTRODUCTION

Pregnant women susceptible to anemia. Pregnant women who have anemia are a problem all over the world, especially in developing countries. In a publication *World Health Organization* (WHO), pregnant women are said to be anemic when hemoglobin (Hb) levels are less than 11.0 g / dL.[1] In Indonesia the incidence of anemia in pregnant women in 2013 was around 37.1% with the proportion at 36.4% in urban areas and 37.8% in rural areas. A survey conducted in 15 districts in Central Java showed that the prevalence of anemia in

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maternal was 57.7%.[2] Anemia that occurs in maternal can increase the risk of mortality, perinatal morbidity and can affect the state of newborns. Anemia in pregnant women is related to low gestational age, low birth weight, and increased risk of small birth for gestational age.[3] Other studies have also shown a link between infant anthropometry: length of birth, birth weight, and head circumference with anemia in maternal.[4] The results of previous studies have shown that anemia due to decreased Hb in the third trimester can reduce the average value of newborn weight, body length, and chest circumference. Hb value in the third trimester is very influence on the anthropometric value of newborns.[5] As long as we know, there were no research in Indonesia that has analyzed association between hemoglobin levels with anthropometric of newborn comprehensively, including weight, length, head circumference, and chest circumference. Based on the description above, this research written to determine relationship between maternal hemoglobin levels in third trimester with anthropometric measurements of newborns compared with the confounding variables (maternal age and number of parity).

METHODS

The design of this research is cross sectional study base medical records of mothers who gave birth at RSND Semarang. The samples in this study were all pregnant women who gave birth in the Department of Obstetric and Gynecology at RSND Semarang from two thousand and sixteen until two thousand and nineteen, which were randomly collected and fulfilled the inclusion, exclusion and dropout criteria. The sampling technique is consecutive sampling by taking data that meets the inclusion and exclusion criteria sequentially within a certain period of time until the number of samples is needed fulfilled. In this study the number of samples obtained by one hundred samples. Anthropometric data of newborns was collected from medical records at RSND. Then the maternal hemoglobin in third trimester, maternal age, and maternal parity were checked in the medical records of pregnant women. Univariate analysis is performed for the characteristics of respondents and bivariates with chi square test to determine the

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relationship between the independent variable with the dependent variable and the confounding variable with the dependent variable. Significant results will be followed by multivariate analysis to find out which factors most have an association with newborn anthropometry. Ethical Clearence in this study was obtained from Komisi Etik Penelitian Kesehatan (KEPK) Medical Faculty, Diponegoro University, Semarang with number ethical clereance 101/EC/KEPK/FK-UNDIP/IV/2019.

RESULTS

Characteristic of the Participant

The basic characteristics of subject can be seen in the following table:

Table 1. Maternal and neonate characteristics

Characteristics	n(n%)	Mean±SD
Maternal data		
Maternal age		28.30 ± 5.88
- ≥20 and <35 years old	85(85%)	
- <20 and ≥35 years old	15(15%)	
Hemoglobin levels (gr/dl)		11.31 ± 1.29
- Normal (≥11)	59 (59%)	
- Mild anemia (9-11)	41(41%)	
- Moderate anemia(6-9)	0(0%)	
- Severe anemia (<6)	0(0%)	
Parity		1.34 ± 0.69
- Primipara	44(44%)	
- Multipara	56(56%)	
MCV (fl)		85.06 ± 7.51
- Normokromik (82-92)	75(75%)	
- Mikrositik (<82)	25(25%)	
- Makrositik (>92)	0(0%)	
MCH (pg)		28.62 ± 2.92
- Normokromik (27-31)	82(82%)	
- Hipokromik (<27)	16(16%)	
- Hiperkromik (>31)	2(2%)	
MCHC (gr/dl)		33.48 ± 1.25
- Normal (30-35)	88(88%)	
- Low (<30)	9(9%)	
- High (>35)	3(3%)	

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Neonate Data		
Weight (g)		3132.1 ± 306.11
- Normal (≥2500)	92(92%)	
- Low (<2500)	8(8%)	
Height (cm)		48.5 ± 1.41
- Normal (≥48)	76(76%)	
- Low(<48)	24(24%)	
Head circumference (cm)		33.72 ± 1.14
- Normal (≥33)	87(87%)	
- Low (<33)	13(13%)	
Chest circumference (cm)		32.85 ± 1.48
- Normal (≥30)	97(97%)	
- Low (<30)	3(3%)	

The result of this study show from all total samples, there are 61 males and 39 females samples. This study also obtained from 41 sample of maternal anemia, the most type of anemia was found normochromic normocytic anemia (68.3%) and hypochromic microcytic (21.9%).

Analisis Bivariate

Table 2. Association between hemoglobin levels, maternal age, and parity with neonate's weight

	Low	Normal	P	PR	95%CI	
	n(n%)	n(n%)			Lower	Upper
Hb levels			0.001	1.24	1.069	1.445
- Mild anemia	8 (8%)	33 (33%)				
- Normal	0 (0%)	59 (59%)				
Maternal age			0.602	1.1	1.031	1.182
- <20 and ≥35	0 (0%)	15 (15%)				
- ≥20 and <35	8 (8%)	77 (77%)				
Parity			0.728	1.27	0.337	4.805
- Primipara	4 (4%)	40 (40%)				
- Multipara	4 (4%)	52 (52%)				

Table 3. Association between hemoglobin levels, maternal age, and parity with neonate's lenght

	Low	Normal	p	PR	95%CI	
	n(n%)	n(n%)			Lower	Upper
Hb levels			0.0001*	2.23	1.582	3.170
- Mild Anemia	23 (23%)	18 (18%)				
- Normal	1 (1%)	58 (58%)				

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Maternal age			0.512	1.16	0.925	1.479
-	<20 and ≥35	2 (2%)	13 (13%)			
-	≥20 and <35	22 (22%)	63 (63%)			
Parity			0.657	1.27	0.635	2.553
-	Primipara	12 (12%)	32 (32%)			
-	Multipara	12 (12%)	44 (44%)			

Table 4. Association between hemoglobin levels, maternal age and parity with head circumference of neonate

		Low	Normal	p	PR	95%CI	
		n(n%)	n(n%)			Lower	Upper
Hb levels				0.0002*	1.46	1.189	1.804
-	Mild Anemia	13 (13%)	28 (28%)				
-	Normal	0 (0%)	59 (59%)				
Maternal age				0.685	1.08	0.926	1.276
-	<20 and ≥35 tahun	1 (1%)	14 (14%)				
-	≥20 and <35 tahun	12 (12%)	73 (73%)				
Parity				1.00	1.09	0.395	3.015
-	Primipara	6 (6%)	38 (38%)				
-	Multipara	7 (7%)	49 (49%)				

Tabel 5. Association between hemoglobin levels, maternal age and parity with chest circumference of neonate

		Low	Normal	p	PR	95%CI	
		n(n%)	n(n%)			Lower	Upper
Hb levels				0.066	1.07	0.99	1.176
-	Mild Anemia	3 (3%)	38 (38%)				
-	Normal	0 (0%)	59 (59%)				
Maternal age				1.000	1.03	0.995	1.080
-	<20 and ≥35 tahun	0 (0%)	15 (15%)				
-	≥20 and <35 tahun	3 (3%)	82 (82%)				
Parity				0.581	2.54	0.238	27.169
-	Primipara	2 (2%)	42 (42%)				
-	Multipara	1 (1%)	55 (55%)				

In this study also shown the relationship between types of anemia based on erythrocyte index with anthropometry of newborns. The type of anemia in maternal that was found in this study only normochromic normocytic anemia and hypochromic microcytic anemia. The analysis showed a non significant assotiation test.

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DISCUSSION

The results obtained hemoglobin levels in third trimester pregnant women have a significant relationship to birth weight, body length, and head circumference. But not significant to chest circumference. The results of this study indicate that mothers with normal third trimester hemoglobin levels have a normal infant weight of 1.24 times, normal body length of 2.23 times, and normal head circumference of 1.46 times compared to mothers with mild anemia. These results are consistent with previous research which states that third trimester hemoglobin levels have a significant relationship to birth weight, length, and head circumference. Anemia in third trimester pregnant women is often due to lack of iron supplementation. This iron deficiency results in decreased production of hemoglobin. Lack of hemoglobin causes a lack of oxygen supply which is circulated to the mother and fetal tissues. Lack of hemoglobin levels will also interfere with the composition of the blood resulting in disruption of the transfer of nutrients from mother to baby. This will risk the disruption of fetal growth. [6.7]

Another study conducted bMadaanG, et al, showed that the bust is affected by hemoglobin level of less than 7 g / dl or classified as severe anemia and no significant effect on women with mild anemia.[5] The absence of data from patients who have a history of moderate and severe anemia has an effect on the results of statistical tests which show there is no significant relationship between hemoglobin of third trimester pregnant women on the measurement of the breast circumference of newborns. The relationship of the age of pregnant women to anthropometry of newborns in this study showed no significant results on the measurement of birth weight, body length, head circumference and chest circumference. This means that pregnant women who are <20 years old or ≥35 years do not have significant anthropometric differences in newborns compared to mothers when they are pregnant ≥ 20 or <35 years. The results of this study support previous research which states there is no significant relationship between maternal age with newborn anthropometry.[8,9] Many factors affect the anthropometry of newborns. Previous research has shown that the factor that most influences the anthropometry of a newborn baby is the

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mother's weight during pregnancy. Maternal weight during pregnancy presents the fulfillment of nutritional needs in pregnant women. With nutrients that are lacking during pregnancy will be seen increasing the weight of mothers who are lacking. This causes inadequate needs for the baby in the womb so that SGA or small babies can occur.[10] This is also because pregnant women aged <20 and ≥ 35 years can cause certain maternal conditions such as increased blood pressure, uterine readiness, or degenerative disorders. And this can happen at any age in pregnant women [11] The results of the study also showed that the relationship of the number of parity was not significant to newborn weight, body length, head circumference, and chest circumference. The results of this study are in accorandce with previous studies which stated there was no significant relationship between parity of mothers with small-born babies.[9,12,13] The difference this study with the theory is likely due to many factors that influence the incidence of small babies. There are still other factors that cause the incidence of small babies, including lack of maternal nutrition, pregnancy spacing, congenital abnormalities, and others. In addition, tissue fibrosis that is replaced at every birth can not be ascertained at each mother, so that it can result in insignificant parity relation to anthropometry of newborns.

In this study also correlated between respondents who have anemia hyperchromic microcytic and normochromic normocytic anemia with newborn anthropometry. The results obtained were no significant relationship between pregnant women with hypochromic microcytic anemia and patients with normocromic normocytic anemia with newborn anthropometry. The results of this study difference from previous studies which stated that there was a significant relationship between iron deficiency anemia in small born babies.[14] This discrepancy is likely due to differences in sample. Where in previous studies used samples of maternal who have iron deficiency and not have iron deficiency either suffering from anemia or not. Whereas in this study compared with fellow anemia sufferers with different types of anemia based on erythrocyte index.

The limitation of this study is sample obtained is lack of heterogenous, there are several categories that only have a small number of samples. In addition, there are several factors that influence anthropometry

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of neonate that were not included in this study. In conclusion, hemoglobin levels of maternal in third trimester affect measurement of weight, length, and head circumference of newborn.

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