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The Correlation Between Chronic Energy Deficiency And Anaemia In Pregnant Women With Low Birth Weight

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Abstract

Low birth weight (LBW) has been identified as a significant factor that can compromise intrauterine growth. In Indonesia, LBW cases are still quite high, with influential maternal factors, including chronic energy deficiency (CED) and anaemia. It is well-established that the food intake consumed during pregnancy affects the incidence of CED and anaemia. Aim: To determine the correlation of chronic energy deficiency and anaemia with LBW in East Semarang. Methods: This study used an analytical observational study with case control. There were 100 samples divided into 50 LBW (case) and 50 non-LBW (control) in the East Semarang Health Center working area. Samples were obtained from Karangdoro Health Center Medical Records from January 2021 to December 2022. The sampling technique employed consecutive sampling. The research data was tested using Chi-square test.. Results: The results of the analysis test indicated a correlation between chronic energy deficiency and LBW with a p-value of 0,000 and anaemia with LBW with a p-value of 0,001. The odd ratio result on CED is 12,966, while the odd ratio on anaemia is 4,030.. Conclusion: This study can be concluded that CED and anaemia have an influence on LBW.

Keywords LBW, CED, Anaemia

INTRODUCTION

Birth weight is one of the most important variables affecting the physical and brain development of the child, as well as a sign of good *intrauterine* growth for the future survival.[1] According to the World Heart Organization (WHO), Low Birth Weight (LBW) is a birth weight of less than 2500 grams regardless of gestational age.[2] LBW conditions can be caused by several factors, such as maternal, fetal, and pregnancy history factors.[3]

Maternal factors of LBW include anemia, food intake consumed during pregnancy and consumption of pregnancy supplements, maternal age during pregnancy, maternal employment, weight during pregnancy, gestational distance, number of maternal parities, as well as education level.

[1] Moradi, G., Zokaeii, M., Goodarzi, E., Khazaei, Z. 'Maternal risk factors for low birth weight infants: A nested case-control study of rural areas in Kurdistan (western of Iran)', *Journal of Preventive Medicine and Hygiene*. 2021;62(2), pp. E399-E406.

[2] Anil, K.C., Basel, P.L., Singh, S. 'Low birth weight and its associated risk factors: Health facility-based case-control study', *PLoS ONE. 2020;*15(6 June), pp. 1-10. https://doi.org/10.1371/journal.pone.0234907.

[3] Annisa, N., Wulan, D., Rengganis, S., Rahmayani, F. Risk Factors For Low Birth Weight Babies. 2023;13, pp. 136-140.

Based on data in Semarang City, the incidence of LBW in 2021 had reached 499 out of 22.030 births.[4] In Central Java, the percentage of mothers who gave birth to live-born babies with LBW in 2022 was 10,70% and higher than in 2021 at 9,72%[6]. Despite efforts to prevent anemia in pregnant women through maternal and child health programs and iron tablet supplementation, the incidence of LBW is still high. If left untreated, it can cause babies to be born with LBW, but also increase the risk of maternal mortality during labor, postpartum hemorrhage, difficult labor due to weakness and other health problems.[5]

Chronic energy deficiency in pregnant women is associated with low intake of macro and micronutrients, which causes disruption of the process of transferring nutrients from the mother to the fetus and results in nutritional deficiencies in the fetus.[6]

Besides CED, maternal factors that affect fetal growth are anemia caused by low hemoglobin (Hb) levels. This can alter placental angiogenesis and cause fetal hypoxia resulting in decreased blood perfusion in the uterus, increased vascular resistance, and restriction of trophoblast surface growth, which is responsible for delivering maternal arterial blood to the placenta.

Based on the description above, research is required to determine the relationship between chronic energy deficiency and anemia in pregnant women with LBW in the East Semarang Community Health Center working area.

METHODS

This study is an analytical observational study with case control on pregnant women with LBW 50 respondents and not LBW 50 respondents in the East Semarang Health Center working area. Samples were obtained from the Karangdoro Health Center Medical Records from January 2021 to December 2022 in accordance with the inclusion and exclusion criteria. The inclusion criteria of this study were babies born in the Karangdoro Health Center working area and complete medical records, including weight at birth, maternal Hb levels during pregnancy, and maternal LiLA during pregnancy. Meanwhile, the exclusion criteria used in this study were incomplete respondent data, babies born with gemelli, congenital abnormalities, mothers who had a history of hypertension, preeclampsia, and eclampsia, mothers who experienced infection during pregnancy (TORCH), pregnancy with hydramnios, and mothers who experienced placental abruption and placenta previa.

The method used to take samples is to use consecutive sampling techniques. The sample was taken based on the criteria set by the researchers. The basis for determining the sample size was calculated using the formula for unpaired categorical comparative tests. Data were obtained from Karangdoro Health Center medical records and was analysed using IBM SPSS Statistics. The test chosen to analyze the correlation between variables was the Chi-square test.

RESULTS AND DISCUSSION

Distribution of Respondent Characteristic

[4] Badan Pusat Statistik Provinsi Jawa Tengah. *Number of Infants Born, Infants with Low Birth Weight, and Undernourished by District/City in Central Java Province, 2017-2021*. Terbit 2022; *Badan Pusat Statistik Provinsi Jawa Tengah*.

[5] Andriani, C.Z., Masluroh. The Relationship of Anemia and Chronic Energy Deficiency (CEC) in Pregnant Women with the Incidence of LBW', *SIKLUS: Journal Research Midwifery Polytechnic Tegal*.*2023*;12(1), pp. 40-47. https://doi.org/10.30591/siklus.v12i1.4631.

[6] Hardiati, R.H., Thasliyah, D. 'Chronic energy deficiency as a risk factor for LBW: Literature Review', *Medika: Scientific Journal of Health*. 2022; 2(2), pp. 6-11.

The table in the case group above shows that the highest number of respondents in this study are pregnant women aged < 20 years and > 35 years totaling 33 people (66%) and in the control group, the most respondents are aged 20-35 years totaling 40 people (80%).

The case group of the last education of the highest number of respondents is the last education of junior high school with a total of 21 people (62%), in the control group the 1456os tis junior high school with a total of 29 people (58%). In the case group, the largest number of respondents are housewives with a total of 29 (58%) and in the control group, the largest number of mothers are also housewives with a total of 32 people (64%). The case group of parity the highest number of respondents is the grande multipara group totaling 21 (42%), while the control group of the highest number of parity is multipara totaling 27 people (54%). The case group of gestational age shows the highest number of respondents is aterm, totaling 14 (28%), while the control group is aterm, totaling 36 people (72%).

The IMT case group is the largest number of respondents with the less IMT group are 42 people (84%), while the control group is the most IMT normal IMT as many as 39 people (78%).

Tabel 1. Distribution of Respondent Charateristic

Characteristics	Group			
	Case		Control	
	n	%	n	%
Age (year)				
Age < 20 years > 35 years	33	66%	10	20%
20-35 years old	17	34%	40	80%
Last Education				
Elementary School	10	20%	1	2%
Junior High School	21	42%	20	40%
Senior High School	19	38%	29	58%
Occupation				
Housewife	29	58%	32	64%
Employees	21	42%	18	36%
Parity				
Primiparous	14	28%	21	42%
Multiparous	15	30%	27	54%
Grande multipara	21	42%	2	4%
IMT				
BMI less	42	84%	11	22%
Normal BMI	8	16%	39	78%
Pregnancy Age				
Preterm	14	28%	3	6%
Aterm	36	72%	47	94%
LILA				

CED	41	82 %	13	26 %
No CED	9	18 %	37	74 %
HB Levels				
Anemia	28	56 %	12	24 %
No. Anemia	22	44 %	38	76 %

Correlation Between CED and Anaemia With LBW in Pregnant Women

Based on table 2, the Chi square test shows that the p-value = 0,000 (<0,05) in CED and anemia p-value = 0,001 (<0,05). It can be concluded that there is a significant correlation between CED and anemia with LBW. The odd ratio result obtained OR 12,966 means that pregnant women with CED are more at risk 12 times greater to give birth to LBW than those without CED and the odd ratio result of anemia OR 4,030 means that pregnant women with anemia are more at risk 4 times greater to give birth to LBW than those without anemia.

Tabel 2. Correlation Between CED and Anaemia With LBW in Pregnant Women

Variables	**Newborn Weight**				**P-Value**	**OR**
	LBW		**Normal birth weight**			
	F	%	F	%		
LILA						
CED	41	82 %	13	26 %		
No CED	9	18 %	37	74 %	0,000	12,966
Total	50	100%	50	100%		
HB levels						
Anemia	28	56 %	12	24 %		
No Anemia	22	44 %	38	76 %	0,001	4,030
Total	50	100 %	50	100		

DISCUSSION

The results showed that there is a significant correlation between CED and the incidence of LBW with a p value of 0,000, which stated that there is a correlation between CED in pregnant women with LBW.

The results of research conducted by Wijayanti (2018) mentioned that there is a correlation between CED in pregnant women with LBW because the condition of mothers with CED is easier to feel tired and weak so that it can affect fetal movement. Pregnant women with CED have a risk of 12,9 times (OR 12,966) greater chance of giving birth to LBW.[7]

This is in accordance with research conducted by Zakiah *et al.* (2023), which states that

[7] Badan Pusat Statistik Provinsi Jawa Tengah. *Number of Infants Born, Infants with Low Birth Weight, and Undernourished by District/City in Central Java Province, 2017-2021*. Terbit 2022; *Badan Pusat Statistik Provinsi Jawa Tengah*.

pregnant women with CED are 12 times more likely to give birth to babies with LBW, because the nutritional status of the mother during pregnancy greatly affects the growth of the fetus in the womb.[8]

The results showed that the correlation between anemia and the incidence of LBW with a p value of 0,001. It means that there is a significant correlation between anemia in pregnant women and LBW is accepted. The results of research conducted by Mardiaturrahmah & Anjarwati (2020), stated that there was a correlation between anemia in pregnant women and the incidence of LBW at Pengasih II Public Health Center, Kulon Progo Regency.[9]

Pregnant women are said to be anemic if the Hb level is < 11 g/dl. Anemia in pregnancy can occur due to an increase in blood plasma volume, which causes hemoglobin levels to decrease in the blood. Low Hb levels in less red blood cells can cause low oxygen supply to the uterus so that the formation of the placenta is inhibited and cause the supply of nutrients to the fetus to decrease. In this study, pregnant women with anemia had a 4 times (OR 4.030) greater chance of giving birth to LBW. In accordance with research conducted by Widiyanto and Lismawati (2019), it was found that pregnant women with anemia had a 6 times greater risk of giving birth to babies with LBW.[10]

The age factor in pregnant women with CED and anemia on the incidence of LBW shows that the age group < 20 years with the highest incidence of 36%. Pregnant women at a young age have an endometrial condition that has not developed completely and are still in the biological growth stage where they are not mature enough physically and emotionally.[11]

The results of research conducted by Wahyuni *et al.* (2021) states that the age of mothers who are too young has a condition of the uterus and pelvis that has not grown perfectly, while mothers who are too old to become pregnant experience a decrease in the function of the reproductive organs so that mothers can experience difficulties during labor and are at risk of giving birth to LBW babies.[12]

Factors of the occurrence of CED and anemia in pregnant women with LBW showed that the last education was junior high school with a percentage of 42,0%. The results of research conducted by Halu (2019) stated that there is a strong correlation between maternal education and the incidence of LBW. Education takes a role in determining the attitude of the mother during pregnancy and has an impact on the health of the fetus.[13]

In the occupation group, housewives as much as 58% is associated with pregnant women with CED and anemia to the incidence of LBW. The severity of the mother's work during pregnancy can lead to prematurity and giving birth to a baby with LBW because the mother cannot rest during pregnancy and this can affect her fetus.[14]

Parity as one of the factors for the occurrence of CED and anemia in pregnant women with LBW showed that parity of more than 5 or grande multipara amounted to 21 people (42%). Normal parity is parity 2-4 (multipara), while risky parity is parity 1 and more than 4. Mothers

[8] Zakiyah Z, Riska Maulidanita. Factors related to nutrition knoledge during pregnancy in the working area of susoh community health center. Jurnal Science Midwifery.2023;Vol.11.No 2. https://doi.org/10.35335/midwifery.v11i2.1289

[9] Mardiaturrahmah, Anjarwati. Kejadian Bayi Berat Lahir Rendah (BBLR) Pada Ibu Hamil dengan Anemia. Jurnal Kebidanan dan Keperawatan Aisyiyah. 2020; Vol.16 No.1. https://doi.org/10.31101/jkk.841

[10] Yuwanti, Mahanani Mulyaningrum, F., TP, N. Correlation Between Mother's Age, Chronic Energy Deficiency and Anemia to Low Birth Weight Babies at Purwodadi II Public Health Center', 2022;*JPBI*, 2(2), pp. 1-8.

[11] Wahyuni, S. A. The Relationship of Pregnancy Anemia with the Incidence of Low Birth Weight (Bblr): A Systematic Literature Review. *Journal of Health (Joh), 2021;8(2), 94-104. Https://Doi.Org/10.30590/Joh.V8n2.P94-104.2021*

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[14] Fajriana A, Annas B. Risk Factors Associated with the Incidence of Low Birth Weight Infants in Semampir District Surabaya. Indonesian N

with parity 1 (primapara) have a stiff pelvis because the mother has never experienced pregnancy before. The results of this study are in accordance with those conducted by Wahyuni *et al.* (2021), which states that risky parity is a risk factor for LBW, which means that pregnant women with risky parity have a 3 (three) times greater chance of giving birth to LBW babies than mothers with non-risky parity.[15]

The factor of the occurrence of CED and anemia in pregnant women with the incidence of LBW is IMT. which shows a lack of IMT with a percentage of 42%. Pregnant women need to consume a variety of foods and more portions and so that their nutritional adequacy is met. Pregnant women with low BMI have a high risk of giving birth to LBW and bleeding during labor.

This is as stated by Supariasa (2014) that the nutritional status of pregnant women greatly affects the growth of the fetus in the womb, if the nutritional status of the mother is poor before and during pregnancy will cause Low Birth Weight Babies (LBW).

Another factor in the occurrence of CED and anemia in pregnant women with LBW is the gestational age that shows at term with a total of 40 cases (42%), while the number of preterm age is 14 cases. Normal gestational age is from 37-42 weeks, while gestational age below 37 weeks is premature. Preterm gestational age will lead to the birth of premature babies with low birth weight (LBW). The results of this study indicate that gestational age is still normal but potentially in preterm cases. Based on research by Fajriana and Buanasita (2018), pregnant women who give birth to premature babies have a 6,2 times greater risk of low birth weight.

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The limitation of this study is that birth spacing, Fe consumption, and economic status were not recorded. This study also only utilized secondary data from medical records so that the researchers could not observe respondents more deeply

CONCLUSION

Based on the research conducted, it shows that there is a correlation between CED and Anemia with LBW in pregnant women in East Semarang as well as CED and Anemia as risk factors for causing babies born with LBW.

The suggestion of this study for future research is to record all related pregnancy spacing, economic status, and record Fe intake during pregnancy so that the most dominant risk factors associated with LBW can be identified.

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