Journal of Health and Nutrition Research

Volume 3 No 1 (2024): 68-73
E-ISSN: 2829-9760 (Online)
Published by Media Publikasi Cendekia Indonesia
Journal homepage: https://www.journalmpci.com/index.php/jhnr
DOI: https://doi.org/10.56303/jhnresearch.v3i1.201

The Effect of Chronic Energy Deficiency, Anemia, and Compliance with Iron Supplement Consumption in Pregnant Women on Low Birth Weight

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ABSTRACT

This study aims to determine the effect of chronic energy deficiency, anemia, and compliance with the consumption of iron supplement tablets by pregnant women with low birth weight. This research design was a case-control retrospective approach with a sample size of 33 people. The independent variables in this study were chronic energy deficiency, anemia, and compliance with iron supplement consumption during pregnancy; the dependent variable was Low Birth Weight (LBW). Data collection using observation and interviews, statistical tests using the chi-square test. The results of the research were that there was an effect of Chronic Energy Deficiency (CED) (p=0.000) OR=94.5, anemia (p=0.019) OR=9.64, compliance with iron supplement consumption on LBW (p=0.009) OR=12.00. An OR value > 1 proves that pregnant women with CED anemia and compliance with iron supplement consumption have a greater risk of giving birth to LBW children than mothers without CED are anemic and adhere to iron supplement consumption. The incidence of CED, anemia, and compliance with iron supplement consumption in pregnant women influence LBW. Prevention efforts need to be carried out through education and assistance from families in meeting the nutritional needs of pregnant women, as well as compliance in consuming iron supplements as recommended.

ARTICLE INFO

ORIGINAL RESEARCH

Submitted: 19 October 2023
Accepted: 02 April 2024

Keywords:
Chronic Energy Deficiency, Anemia, Compliance, Iron Tablets, Pregnant Women, Low Birth Weight

Access this article online

Quick Response Code

Key Messages:

- Chronic energy deficiency (CED), anemia, and compliance with iron supplement consumption are all risk factors for low birth weight (LBW) in pregnant women
- Prevention efforts should be made to educate pregnant women about the importance of meeting their nutritional needs and complying with iron supplement consumption

Introduction

Birth weight is an important predictor in determining a person's future health status (1). This makes birth weight an important indicator of a toddler's health, both in terms of physical and cognitive development (1). WHO states that the prevalence of Low Birth Weight (LBW) babies worldwide is 15.5% or around 20 million babies born yearly, 96.5% of which occur in developing countries (2). Indonesia is a developing country that has a fairly high prevalence of LBW. Indonesia is ranked ninth highest in the world, with a LBW incidence rate of more than 15.5% of births every year (3). According to the 2021 Health Profile, the LBW percentage in East Kalimantan Province is 4.9%. Based on the Local Area Monitoring of Maternal and Child Health of the North Penajam Paser District Health Service up to the fourth quarter of 2022, the percentage of LBW coverage is 7.3%, anemia is 2.1% and Chronic Energy Deficiency (CED) in pregnant women is 8.4 % and Fe in the third trimester is 89%, while at the community health center level until the fourth quarter of 2022 the percentage of coverage at the Gunung Intan Community Health Center with LBW is 8.3%, anemia 1.6%, CED pregnant women 14.6%, Fe in the third trimester 88.9% and 4 cases of neonatal death (Dinas Kesehatan PPU, 2022).

The mother's health also influences the condition of babies experiencing LBW during pregnancy. Pregnant women who experience CED can cause the placenta to become smaller, reducing the transfer of oxygen and nutrients to the fetus. Other risks in pregnant women with CED include

experiencing anemia during pregnancy, which can also negatively affect the mother and fetus. Disruption of oxygenation and the flow of nutrients from mother to fetus during pregnancy is caused by anemia. Then, giving iron supplements to pregnant women is indirectly related to the hope of preventing LBW (4).

The research aims to determine the effect of CED, anemia, and compliance with iron supplement consumption on LBW in pregnant women at the Gunung Intan Community Health Center, Babulu District, North Penajam Paser Regency.

Methods

The research design used in this research was case-control with a retrospective approach, namely research that tried to look backward, meaning that data collection starts from the effects or consequences that have occurred (LBW), then from these effects, we traced back the causes or variables that influence the consequences (5). The research was conducted at Gunung Intan Health Center, Babulu District, North Penajam Paser Regency, from January to February 2023.

The population was all babies born in January-November 2022 at the Gunung Intan Community Health Center, which had 130 births with 11 LBW babies. The sample cases in this study were LBW babies recorded at the Gunung Intan Community Health Center, Babulu District, born in January-November 2022, totaling 11 babies sampled in total. Then, for the control sample, the number of samples taken was 1:2 by recruiting several subjects with an effect (case group), then looking for other subjects with comparable characteristics but who do not have an effect (control group) (6). The number of cases in this study was 11 LBW babies, and the number of control cases was 22 normal-born babies, with a total sample of 33. The sampling technique used purposive sampling according to the inclusion and exclusion criteria.

The independent variables of this study were CED, anemia, and compliance with iron supplement tablet consumption. The dependent variable of this research was the incidence of LBW. Table 1 shows the methods and tools for measuring each research variable.

Table 1 Operational Definition, Measuring Methods, Measuring Instruments, and Measuring Results for each Research Variable

No	Variable	Operational Definition	Measuring Methods	Measuring Instruments	Results
1	CED	A condition of chronic maternal energy deficiency during pregnancy, which is known from upper arm circumference (UAC) <23.5 cm	Viewing maternal and child health (MCH) cohorts and books	Secondary Data	1. CED, if UAC < 23.5 cm 2. No CED, if UAC ≥ 23.5 cm
2	Anemia	In the third trimester, pregnant women's blood tests showed Hb levels < 11 g/dl.	Viewing cohorts and MCH books	Secondary Data	1. Anemia, if the Hb level is <11 g% 2. No anemia, if Hb level ≥ 11 g%
3	Compliance with Iron consumption	The mother's compliance with health workers' instructions regarding the correct consumption of iron supplement according to health workers' recommendations during pregnancy.	Interview and View MCH book data	Questionnaire and Secondary data	1. Disobedience, if the mother consumes iron supplement < 90 tablets 2. Obedience, if the mother consumes iron supplement ≥ 90 tablets
4	LBW	Newborn with birth weight at birth <2500 grams.	Viewing cohorts and MCH books	Secondary Data	1. LBW, if the baby's birth weight is <2500 g 2. Not LBW, if the baby's birth weight is ≥ 2500 g

Research data analysis was carried out univariately and bivariately using SPSS and the Che Square statistical test with a significance level of $p < 0.05$. This research has received approval from the East Kalimantan Ministry of Health Polytechnic Research Ethics Commission with Certificate number DP.04.03/7.1/07882/2023.

Results

Based on 33 respondents, 18 people (54.5%) were between the ages of 20-35 years, most of the parity had more than one pregnancy, 18 people (54.5%), most had middle school and high school education, 10 people each (30.3%) and housewives' work was 28 people (84.8%) (Table 2).

Table 2 Frequency Distribution of Respondent Characteristics at Gunung Intan Community Health Center, Babulu District, North Penajam Paser Regency

Characteristics	n	%
Age (y.o)		
< 20	10	30.3
20-35	18	54.5
> 35	5	15.2
Parity		
First pregnancy	18	54.5
Pregnancy more than 1 time	10	30.3
Pregnancy more than 5 times	5	15.2
Education		
Elementary School	8	24.2
Junior High School	10	30.3
Senior High School	10	30.3
College	5	15.2
Education		
Housewife	28	84.8
Honorary employees	4	12.1
Private employees	1	3.0
Total	33	100

Table 3 The influence of CED, Anemia, and Compliance with Iron Supplement with LBW at Gunung Intan Community Health Center, Babulu District, North Penajam Paser Regency

Variable	LBW						P	*OR* (CI 95%)
	Cases		Control		Total			
	n	%	n	%	n	%		
CED Status								
CED	9	81.8	1	4.5	10	30.3	0.000	94.500 (7.571-1179.529)
Non CED	2	18.2	21	95.5	23	69.7		
Anemia Status								
Anemia	9	81.8	7	31.8	16	48.5	0.019	9.643 (1.633-56.925)
Non anemia	2	18.2	15	68.2	17	51.5		
Iron supplement compliance								
Disobedience	9	81.8	6	27.3	15	45.5	0.009	12.000 (1.990-72.352)
Obedience	2	18.2	16	72.7	18	54.5		

Table 3 shows that of the 11 babies born LBW, the majority were born to mothers who experienced CED, namely 9 people (81.8%) and 2 babies (18.2%) were born to mothers who did not experience CED, while of the 22 babies who born not LBW, the majority, namely 21 babies (95.5%) were born to mothers who were not CED and 1 baby (4.5%) was born to a mother who was CED. Odds Ratio (OR) analysis shows a value of 94.5, meaning that mothers who experience CED during pregnancy have a 94.5 times greater risk of giving birth to LBW babies than mothers who do not have CED during pregnancy. Then, the anemia status variable shows an OR value of 9.643, meaning that mothers who experience anemia during pregnancy have a 9.643 times greater risk of giving birth to LBW babies than mothers who are not anemic during pregnancy. Furthermore, the variable for adherence to drinking iron supplements shows an OR value of 12,000, which means that mothers who do not comply with

drinking iron supplements during pregnancy have a 12,000 times greater risk of giving birth to LBW babies compared to mothers who adhere to consuming iron supplements during pregnancy.

Discussion

The Effect of Chronic Energy Deficiency on Low Birth Weight

The research results show an effect of CED on LBW with a p-value of 0.000, where mothers who experience CED during pregnancy have a 94,500 times greater risk of giving birth to LBW children compared to pregnant women who do not experience CED during pregnancy. This research is in line with research conducted by (7) where the research results show a relationship between the incidence of CED and the incidence of LBW in the Rajadesa Community Health Center Work Area in 2019. Research Hayati et al. (2020) (8) showed CED as a risk factor for LBW babies (P=0.004), while the OR value showed that CED when pregnant women were 7 times more at risk of giving birth to LBW babies than mothers who did not experience CED.

Pregnant women who suffer from CED can cause the placenta to become smaller, reducing the transfer of oxygen and nutrients to the fetus. The impact is that the mother will give birth to a small or LBW baby. To prevent the risk of CED in pregnant women, it is suggested that all women of childbearing age before pregnancy have good nutrition (UAC 23.5 cm) (9). The placenta needs more adequate levels of protein during pregnancy to carry food to the fetus and to form maternal and fetal enzyme hormones. Lack of energy and protein in pregnant women can affect the fatty acid profile, so the transfer of nutrients from the mother to the fetus is disrupted. Brain size will also decrease in this mechanism due to changes in protein structure, growth factor concentration, and neurotransmitter production (10).

According to researchers' assumptions, LBW occurs in some pregnant women who experience CED during pregnancy due to their young age < 20 years. Based on the characteristics of respondents, 30.3% of pregnancies in mothers aged < 20 years are young, causing mothers to be unable to meet the daily nutritional needs necessary for fetal development so that the need for nutrition for the fetus will decrease. According to Rukmana (2019), pregnancy < 20 years will cause competition between the young mother and fetus to obtain nutrients because they are both in the period of growth and development, and this competition causes the mother to experience CED (10). Parity can also affect CED in pregnant women. The results of the data obtained showed that 15.5% of mothers who had given birth more than 5 times accompanied by CED included giving birth to LBW children. According to Manuaba (2018) parity will affect the mother's physical condition and nutritional status, as many mothers need much nutrition to recover their body condition after giving birth. (11)

Effect of Anemia on LBW Events

The study's results showed an influence of anemia on LBW with a p-value of 0.019. mothers who experience anemia during pregnancy have a 9.643 times greater risk of giving birth to LBW children than pregnant women who do not experience anemia during pregnancy. This research is not in line with research conducted by (12), where the results of the research show that there is no influence between anemia and the incidence of LBW in the Sapala Community Health Center Work Area in 2023 with a chi-square p-value test result of 0.177. Different from Research Hayati et al. (2020) (8), the results of the chi-square test showed that anemia in mothers during pregnancy was a risk factor for the incidence of LBW (p=0.001), while the OR value proved that mothers who experienced anemia were 9 times more likely to give birth to babies with LBW compared to mothers who were not anemic during pregnancy.

Pregnant women who suffer from anemia cause a lack of blood supply to the placenta, affecting the placenta's function for the fetus (13). During pregnancy, mothers experience physiological changes that cause an imbalance in blood plasma and red blood cells, which can be seen as a decrease in hemoglobin levels. This will affect oxygen to the uterus and disrupt intranutrient conditions, especially fetal growth, which will be disrupted, resulting in an impact on fetuses born with LBW. A pregnant woman who has an Hb level <11 g% or anemia will result in a lack of blood supply in the body so that the distribution of maternal nutrition to the fetus is disrupted, which will result in disruption of the growth and development of the fetus and giving birth to LBW (14). There was a relationship between pregnancy and anemia with the incidence of LBW infants in Supiori Hospital (15). Maternal anemia was considered a risk factor for low birth weight (16) and maternal anemia, especially during the first trimester of pregnancy, can be considered as a risk factor for pregnancy outcomes (17).

Effect of Compliance with Iron Supplement Drinking and LBW

The results of the research show that there is an influence between adherence to drinking iron supplements and LBW with a p-value of 0.009, where mothers who do not comply with drinking iron supplements during pregnancy have a 12,000 times greater risk of giving birth to LBW children

compared to pregnant women who adhere to drinking iron supplements during pregnancy. Non-compliance behavior can be influenced by not understanding something, which can also be influenced by a sense of maintaining relationships with health workers who encourage this behavior. In line with research conducted by Khanal et al. (2018) (18), which states that iron supplement tablets are an integral part of Antenatal Care (ANC) in Nepal, iron supplement is significantly related to the baby's birth weight. Mothers who did not consume iron supplements during pregnancy were more likely to have LBW babies (OR 1.839; 95% CI 1.282-2.363). However, this research is not in line with research conducted by Eman Rahim, Darmayanti Waluyo (2022) (19), which was carried out in the work area of the West City Gorontalo Health Center, where the results of the research showed that there was no influence between compliance with iron supplement consumption and LBW with a p-value of 0.401. Certain micronutrients are also vital for improving pregnancy outcomes, including folic acid to prevent neural tube defects and iodine to prevent cretinism (20). Educational materials on iron supplementation should also emphasise taking iron supplements properly and understanding the effect of anaemia on the mother and foetus (21).

To improve maternal health and reduce LBW in this population, comprehensive prenatal care is crucial. This includes routine nutritional screening to identify CED and deficiencies, personalized dietary counseling promoting balanced nutrition and adequate energy intake throughout pregnancy, consistent iron supplementation with education on its importance, and addressing factors that contribute to non-compliance with iron supplementation through improved communication and support.

Conclusion

Pregnant women at Gunung Intan Community Health Center, Kab. North Penajam Paser mostly does not have a CED of 69.7%, anemia is 48.5%, and compliance with drinking iron supplements is 54.5%. The variables CED, Anemia, and Compliance with iron supplement consumption significantly correlate with the incidence of LBW at the Gunung Intan Community Health Center, Kab. North Sharpener Paser.

Funding: This research received no external funding

Acknowledgments: We would like to thank the Principal, staff Gunung Intan Community Health Center, North Penajam Paser Regency, Indonesia who have helped carry out this research.

Conflicts of Interest: The authors declare no conflict of interest.

References

1. Kusumawati DD, Yunadi FD. The Correlation Between Low Birth Weight And Early Neonatal Mortality. Jurnal Kesehatan Madani Medika. 2020;11(01):97–101.
2. Wardlaw TM. Low Birthweight: Country, Regional and Global Estimates. UNICEF; 2004. 31 p.
3. Kemenkes RI. Anemia Ibu Hamil dan Bayi Berat Lahir Rendah. 2019;
4. Irohatul & Sumarmi. Hubungan Cakupan Tablet Fe Dengan BBLR di Provinsi Jawa Timur Tahun 2019. Amerta Nutrition. 2019;3(4).
5. Soekidjo Notoatmodjo. Metodologi Penelitian Kesehatan. III. Jakarta: Jakarta: Rineka Cipta; 2018. 236 p.
6. Sastroasmoro dan Ismael. Dasar-dasar Metodologi Penelitian Klinis, Edisi Ketiga. Jakarta: Jagung Seto; 2018.
7. Fatimah S, Yuliani NT. Hubungan Kurang Energi Kronis (Kek) Pada Ibu Hamil Dengan Kejadian Berat Bayi Lahir Rendah (Bblr) Di Wilayah Kerja Puskesmas Rajadesa Tahun 2019. Journal of Midwifery and Public Health. 2019;1(2).
8. Hayati S, Al Fatih H, Cahyati N. Hubungan Kekurangan Energi Kronik (KEK) dengan kejadian anemia pada ibu hamil di Puskesmas Margahayu Raya Kota Bandung. Jurnal Keperawatan BSI. 2020;8(2):205–14.
9. Hardinsyah dan Supariasa. Ilmu Gizi Teori dan Aplikasi. Jakarta: ECG; 2018.
10. Rukmana C. Hubungan Asupan Gizi Dan Status Gizi Ibu Hamil Trimester Iii Dengan Berat Badan Lahir Bayi Di Wilayah Kerja Puskesmas Suruh Kabupaten Semarang. Journal Of Nutrition Collegeollege. 2019;3(1):192–9.
11. Manuaba. Ilmu Kebidanan, Penyakit Kandungan dan KB untuk Pendidikan Bidan. Edisi kedua. Jakarta: EGC; 2018.

12. Zakiah et al. Studi Literatur Faktor-faktor Yang Berhubungan Dengan Kejadian Anemia Pada Ibu Hamil. Journal Mahakam Midwifery. 2023;8(1):24–52.
13. Lelic M, Bogdanovic G, Ramic S, Brkicevic E. Influence of Maternal Anemia During Pregnancy on Placenta and Newborns. Med Arch. 2014 Jun;68(3):184–7.
14. Nur'aini, S. A., Pujiastuti W en, Widatiningsih S. Ibu Hamil Kekurangan Energi Kronis (Kek) Berisiko Melahirkan Bayi Berat Badan Lahir Rendah (Bblr) Di Puskesmas Garung Kabupaten Wonosobo. Jurnal Kebidanan. 2020;
15. Wahyuni S, Putri ARA, Imbir S. The Relationship Of Anemia In Pregnancy With The Event Of LBW Babies (Low Birth Weight) at Supiori Hospital. JURNAL KEBIDANAN KESTRA (JKK). 2022 Apr 25;4(2):108–12.
16. Figueiredo ACMG, Gomes-Filho IS, Silva RB, Pereira PPS, Mata FAFD, Lyrio AO, et al. Maternal Anemia and Low Birth Weight: A Systematic Review and Meta-Analysis. Nutrients. 2018 May 12;10(5):601.
17. Rahmati S, Delpishe A, Azami M, Hafezi Ahmadi MR, Sayehmiri K. Maternal Anemia during pregnancy and infant low birth weight: A systematic review and Meta-analysis. Int J Reprod Biomed. 2017 Mar;15(3):125–34.
18. Khanal et al. Prevalence and Factors Associated with Underutilization of Antenatal Care Services in Nigeria: A Comparative Study of Rural and Urban Residences Based on the 2013 Nigeria Demographic and Health Survey. PLoS One. 2018;13(5):1–21.
19. Eman Rahim, Darmayanti Waluyo M. Kepatuhan Ibu Hamil Dalam Konsumsi Tablet Tambah Darah Dengan Kejadian Berat Badan Lahir Rendah. Jurnal Ilmiah Keperawatan Stikes Hang Tuah Surabaya. 2022;17(kebutuhan ibu hamil dalam konsumsi tablet tambah darah):166.
20. Mousa A, Naqash A, Lim S. Macronutrient and Micronutrient Intake during Pregnancy: An Overview of Recent Evidence. Nutrients. 2019 Feb 20;11(2):443.
21. Triharini M, Nursalam, Sulistyono A, Adriani M, Armini NKA, Nastiti AA. Adherence to iron supplementation amongst pregnant mothers in Surabaya, Indonesia: Perceived benefits, barriers and family support. International Journal of Nursing Sciences. 2018 Jul 7;5(3):243.