The Relationship Between Chronic Energy Deficiency and The Incidence of Preeclampsia and Preterm Birth in The Working Area of The Balisoan Community Health Center

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Abstract, Background: Chronic Energy Deficiency (CED) in pregnant women is a condition of long-term energy reserve depletion characterized by an Upper Arm Circumference (MUAC) < 23.5 cm. This condition increases the risk of pregnancy complications such as preeclampsia and preterm birth. Objective: This study aimed to analyze the relationship between CED and the incidence of preeclampsia and preterm birth in the working area of the Balisoan Community Health Center. Methods: This analytical quantitative study employed a cross-sectional design. The sample consisted of 60 respondents selected using total sampling technique from secondary data of medical records and maternal cohort registers. Data analysis used the bivariate Chi-Square test. Results: The results showed that the majority of respondents (61.7%) were of healthy reproductive age, but most (70%) were unemployed. The test of the relationship between CED and preeclampsia showed a p-value = 0.000, where all cases of preeclampsia occurred in the CED group. The test of the relationship between CED and preterm birth showed a p-value = 0.005 with an OR value = 6.481. Conclusion: There is a highly significant relationship between CED and the incidence of preeclampsia and a significant relationship between CED and the incidence of preterm birth. Mothers with CED have a 6.4 times greater risk of delivering preterm babies compared to mothers without CED.

Keywords: Chronic Energy Deficiency (CED), Maternal Cohort Registers, Preeclampsia, Preterm Birth, Upper Arm Circumference

1. INTRODUCTION

Pregnancy is an important physiological process in a woman's life, involving significant physical changes and health needs. One common problem in pregnancy is Chronic Energy Deficiency (CED), a condition of long-term depletion of the body's energy reserves, characterized by an Upper Arm Circumference (MUAC) of less than 23.5 cm. CED in pregnant women risks causing various complications, such as low birth weight (LBW), preterm birth, and maternal and infant mortality (Kronis et al., 2024).

According to World Health Organization (WHO, 2023) data, approximately 287,000 Maternal Mortality Rates (MMR) are recorded annually worldwide. According to data from the Indonesian Ministry of Health (Kemenkes RI), the MMR in 2022 was recorded at 4,005 cases, equivalent to approximately 305 per 100,000 live births. This figure remains far above the national target set at 183 per 100,000 live births by 2024 (Kemenkes RI, 2024). Based on data, the leading causes of maternal death in Indonesia include hemorrhage, hypertension, infection, and delivery complications (Kemenkes RI, 2022).

Based on MMR data in Banjarnegara Regency, a significant change has occurred. In 2022, the MMR was recorded at 7.5 per 1000 live births (LB), increased to 10.5 per 1000 LB in 2023, and then decreased to 9.3 per 1000 LB in 2024 (Banjarnegara District Health Office, 2024).

One factor contributing to the high MMR is the condition of CED in pregnant women. Based on data from the Indonesian Ministry of Health (2022), out of a total of 2,443,494 pregnant women whose MUAC was measured, 206,074 (8.41%) experienced CED. This figure shows a decrease from the previous year and is already below the national target threshold of a maximum of 13% (Kemenkes RI, 2022). Based on data, the problem of CED in pregnant women in Indonesia remains a major challenge.

Based on data from the Indonesian Ministry of Health in 2022, the prevalence was 8.41%. This figure reflects that nearly 9% of pregnant women in Indonesia experience CED, affecting their health.

Low education levels, low socioeconomic status, inadequate nutritional intake, and hazardous and unsanitary environmental conditions are variables contributing to CED in pregnant women. This occurs particularly in rural and border communities where healthcare and nutrition education are difficult to access. This also occurs among pregnant women in metropolitan areas who are financially disadvantaged.

The impact of CED on pregnant women is quite severe as it can endanger fetal health. Children born underweight or preterm are at higher risk of disorders such as respiratory problems, infections, and even death. Furthermore, babies born with these conditions are more likely to experience growth and development problems, including brain development issues. Additionally, CED in pregnant women can also increase the risk of anemia. Anemia in pregnant women can negatively impact maternal and fetal health by increasing the risk of preterm birth, low birth weight, and maternal and infant mortality (Alyssa Atikah Putri & Shella Salsabila, 2023).

2. METHODS

This study was an analytical quantitative study with a cross-sectional design. The research was conducted in the working area of the Balisoan Community Health Center. The study population consisted of all pregnant women recorded in the Health Center's medical records. The sample was selected using total sampling technique with a total of 60 respondents. The data used were secondary data from maternal cohort registers and medical records. The independent variable was Chronic Energy Deficiency (CED) (MUAC < 23.5

cm), while the dependent variables were the incidence of Preeclampsia and Preterm Birth (< 37 weeks). Data analysis included univariate (frequency distribution) and bivariate analyses. The relationship test used the Chi-Square test as an alternative test at a significance level of $\alpha = 0.05$.

3. RESULTS

Table 1 Respondent Characteristics

Variable	F	%
Age		
< 20 years	12	20.0
20-35 years	37	61.7
> 35 years	11	18.3
Total	**60**	**100.0**
Education		
Elementary/Junior High	22	36.7
Senior High	31	51.7
Higher Education	7	11.7
Total	**60**	**100.0**
Occupation		
Unemployed	42	70.0
Employed	18	30.0
Total	**60**	**100.0**
Parity		
Primipara	24	40.0
Multipara	25	41.7
Grand Multipara	11	18.3
Total	**60**	**100.0**

Based on the table above, it can be concluded that the majority of respondents were of healthy reproductive age (20-35 years) at 61.7%, with a secondary education level (Senior High) at 51.7%. The majority of respondents were Housewives or unemployed (70.0%) and had a multiparous delivery history (41.7%).

Table 2 Relationship Between CED Incidence and Pre-eclampsia Incidence in the Working Area of Balisoan Community Health Center.

Variable CED	Pre-eclampsia (Yes)	Pre-eclampsia (No)	Total	p-value
CED (Yes)	13 (40,6%)	19 (59,4%)	32 (100%)	**0,000**
CED (No)	0 (0,0%)	28 (100%)	28 (100%)	
Total	**13**	**47**	**60**	

The Chi-Square test results showed a p-value = 0.000 (p < 0.05), indicating a highly significant relationship between CED and the incidence of pre-eclampsia. Clinically, all cases of pre-eclampsia were found in the group of mothers experiencing CED.

Table 3 Relationship Between CED Incidence and Preterm Birth Incidence in the Working Area of Balisoan Community Health Center.

Variabel CED	Preterm Birth (Yes)	Preterm Birth (No)	Total	p-value	OR (95% CI)
CED (Yes)	14 (43,8%)	18 (56,2%)	32 (100%)	**0,005**	**6,481**
CED (No)	3 (10,7%)	25 (89,3%)	28 (100%)		(1,620 – 25,927)
Total	**17**	**43**	**60**		

The Chi-Square test results showed a p-value = 0.005 (p < 0.05), indicating a significant relationship between CED and preterm birth. The OR value = 6.481 shows that mothers with CED have a 6.4 times greater risk of delivering preterm babies compared to mothers without CED.

DISCUSSION

Chronic energy deficiency is a state of chronic malnutrition, a pathological condition due to nutritional deficiency, and a MUAC threshold for Women of Reproductive Age (WRA) and Pregnant Women (PW) of < 23.5 cm is estimated to lead to LBW babies (Supariasa, 2020). Chronic Energy Deficiency (CED) is a condition where a person's nutritional status is poor due to inadequate intake of energy sources containing macro- nutrients, which are needed by the body in large amounts, and micro-nutrients needed in small amounts.

Chronic Energy Deficiency (CED) commonly occurs in women of reproductive age, i.e., women aged between 15 and 45 years. Chronic energy deficiency can be measured by knowing a person's upper arm circumference and body mass index. Mothers with an upper arm circumference of less than 23.5 cm can be classified as having chronic malnutrition (Fitriana et al., 2024).

The problems experienced by pregnant women still require attention despite various nutritional improvement programs being implemented. The form of nutritional improvement programs for pregnant women with CED includes Supplementary Feeding for Recovery (PMT-P) in the form of program biscuits, non-program biscuits, powdered milk, liquid milk, raw food ingredients, and cooked food ingredients. The implementation of PMT-P distribution is not specifically supervised regarding the rules for the amount that must be consumed by the mother, so often the food is not consumed by the mother and is given to other family members.4 Long-term low energy consumption is the cause of CED and risks experiencing hemorrhage, anemia, stagnant weight, preterm birth, pre-eclampsia, and susceptibility to infectious diseases. Additionally, it will impact the duration of labor and the condition of LBW in babies (Dewi & Putra, 2020).

The mechanism of nutritional status on the incidence of preeclampsia can be explained through two different extreme conditions that both increase the risk. In undernutrition conditions, there is impaired placentation due to limitations of essential nutrients required for optimal placental development, as well as endothelial dysfunction caused by deficiencies in micro and macro nutrients that play a role in maintaining vascular integrity. Meanwhile, in overnutrition or obesity conditions, the mechanism is far more complex, including insulin resistance and metabolic syndrome that disrupt the body's metabolic homeostasis, chronic inflammation due to increased pro-inflammatory cytokines from excess adipose tissue, oxidative stress that damages vascular endothelial cells, dyslipidemia with increased blood lipid levels triggering atherosclerosis, impaired placentation due to inadequate uteroplacental perfusion, and hyperleptinemia or increased leptin hormone contributing to endothelial dysfunction and increased blood pressure. Both suboptimal nutritional status conditions will ultimately disrupt the normal physiological adaptation of pregnancy and increase the susceptibility of pregnant women to preeclampsia (Della et al., 2025).

Pre-eclampsia is a potentially dangerous pregnancy complication characterized by high blood pressure. This condition typically occurs when gestational age reaches 20 weeks. Therefore, pregnant women must be vigilant and maintain their health to prevent complications. Globally, pre-eclampsia also remains a problem, with 10% of pregnant

women worldwide experiencing preeclampsia, and it causes 76,000 maternal deaths and 500,000 infant deaths annually. Based on research by the United States Agency for International Development (USAID) in 2016, as much as 99% of maternal deaths are related to low- and middle-income countries (Agnes Dewi Astuti, 2025).

Preeclampsia is not a single "disease" but affects all aspects of the mother, placenta, and fetus. The etiology of preeclampsia is divided into four major groups: genetic, immunological, nutritional and infectious causes, and the interaction between all of them, supported by environmental factors. Risk factors for preeclampsia include: age, parity, obesity, diabetes, chronic hypertension, history of kidney disease, history of eclampsia, multiple pregnancy, family history of preeclampsia, interpregnancy interval, socioeconomic status, autoimmune diseases (Nurun Ayati Khasanah, Ferilia Adiesti, 2023).

Management of preeclampsia during pregnancy can be done through hospital or home care, rest, antihypertensive treatment, and maternal and fetal monitoring. Preeclampsia can also be managed through a regular diet, good stress management relaxation, early identification and treatment, regular blood pressure monitoring, urine tests, and a healthy lifestyle (Wati & Widiyanti, 2020).

The results of research conducted by Koniyo (2012) in (Anasari & Pantiawati, 2016) stated that mothers with poor nutritional status gave a 4.4 times significant risk of preterm birth compared to good nutritional status. Maternal malnutrition was found to affect placental growth and function, with small placental size and reduced Deoxyribose-Nucleic Acid (DNA) content. This indicates that a small placental size results in low nutrient transfer to the fetus, consequently inhibiting fetal growth leading to preterm birth. As a result of this preterm birth, the child born will experience various health problems due to the immaturity of the fetus at birth, causing many body organs to not function optimally. This results in preterm babies having difficulty adjusting to extrauterine life, thus experiencing many health disorders.

Preterm birth is birth that occurs before 37 completed weeks of gestation. The incidence of preterm birth is a multifactorial process disorder; several risk factors causing preterm birth include: psychosocial factors such as anxiety, stress, occupation, cigarette exposure, sexual activity, and nutritional status. Demographic factors such as age, socioeconomic condition, and race/ethnicity. Maternal factors such as cervical incompetence, premature rupture of membranes, medical illnesses, and prenatal care, as well as infection and genetic factors.

The problems occurring in preterm birth are not only perinatal mortality; babies born prematurely require special care and have a greater risk of abnormalities or health problems both in the short and long term. Common short-term abnormalities include: RDS (Respiratory

Distress Syndrome), intra/periventricular hemorrhage, NEC (Necrotizing Enterocolitis), bronchopulmonary dysplasia, sepsis, and patent ductus arteriosus. Long-term abnormalities often include neurological disorders such as cerebral palsy, retinopathy, mental retardation, and neurobehavioral dysfunction can also occur (Yuniwiyati et al., 2023).

Preterm birth risks increasing perinatal mortality by 65%-75%, generally related to low birth weight babies weighing less than 2,500 grams and gestational age less than 37 weeks. Low birth weight is caused partly by preterm birth. Due to its negative impacts, low birth weight and restricted fetal growth need to be prevented, not only perinatal mortality but also morbidity, future generational potential, mental abnormalities, and economic burden for families and the nation as a whole. The quality of life for preterm babies also differs from that of full-term babies, considering the incomplete formation of organs and systems in the body (Pera Mandasari & Eka Juniarty, 2023).

4. CONCLUSION

Based on the research results regarding the relationship between CED incidence and the incidence of preeclampsia and preterm birth in the working area of the Balisoan Community Health Center, the following conclusions can be drawn:

1. Respondent Characteristics: The majority of respondents were in the healthy reproductive age range (20-35 years) at 61.7%, had Senior High School education (51.7%), were unemployed/Housewives (70.0%), and had a history of multiparous delivery (41.7%).

2. Relationship between CED and Preeclampsia: There is a highly significant relationship between CED and the incidence of preeclampsia (p = 0.000). Clinically, preeclampsia complications were only found in the group of mothers suffering from CED (100% of total preeclampsia cases).

3. Relationship between CED and Preterm Birth: There is a significant relationship between CED and the incidence of preterm birth (p = 0.005). Pregnant women with CED were proven to have a 6.481 times higher risk of experiencing preterm birth compared to pregnant women with normal nutritional status.

4. Clinical Impact: The CED condition disrupts placental development and vascular integrity, ultimately triggering blood pressure disorders (preeclampsia) and increasing fetal susceptibility leading to untimely birth.

REFERENCES

Agnes Dewi Astuti. (2025). Jurnal Pengabdian Kepada Masyarakat Bidang Ilmu Keperawatan Optimal. *Jurnal Pengabdian Kepada Masyarakat Bidang Ilmu Keperawatan Optimal*, 1(2), 29-35. https://doi.org/10.46838/ic.v1i2.466

Alyssa Atikah Putri, & Shella Salsabila. (2023). Dampak Penyakit KEK Pada Ibu Hamil. *Student Scientific Creativity Journal*, 1(3), 246-253. https://doi.org/10.55606/sscj-amik.v1i3.1525

Anasari, T., & Pantiawati, I. (2016). FAKTOR-FAKTOR YANG MEMPENGARUHI PERSALINAN PRETERM DI RSUD Prof. Dr. MARGONO SOEKARJO PURWOKERTO. *Jurnal Kebidanan*, 8(01), 94-109. https://doi.org/10.35872/jurkeb.v8i01.203

Della, H., Fadhilah, S., & Merida, Y. (2025). Hubungan Status Gizi Ibu Hamil dengan Kejadian Preeklamsia di Puskesmas Sungai Durian Sintang preeklamsia mencapai 4 , 2 %. Dari data terakhir peningkatan status gizi dengan preeklamsia. *3(November)*. https://doi.org/10.57214/jasira.v3i4.264

Dewi, M., & Putra, M. G. S. (2020). Faktor Risiko Kurang Energi Kronis (KEK) pada Ibu Hamil di Cikembar Kabupaten Sukabumi. *ARTERI : Jurnal Ilmu Kesehatan*, 1(4), 319-332. https://doi.org/10.37148/arteri.v1i4.113

Fitriana, S., Mulia, U. S., Kotabaru, P., Friscila, I., Mulia, U. S., & Selatan, K. (2024). Studi Karakteristik KEK pada Ibu Hamil. *2*, 10-18.

Hamzah, R., & Rina, M. (2022). Analysis of the Relationship Between Maternal Stress and the Occurrence of Pre-eclampsia in Pregnant Women. *Jurnal Kebidanan Sehat*, 6(3), 112-120. https://doi.org/10.34860/jks.v6i3.210

Hariani, R., & Hidayati, N. (2025). Maternal Nutrition and Its Impact on the Risk of Pre-eclampsia in Pregnant Women in Urban Areas. *Jurnal Penelitian Kesehatan*, 15(1), 73-81. https://doi.org/10.51833/jpk.v15i1.667

Kronis, K. E., Atas, L. L., & Health, W. (2024). Latar Belakang. 2024.

Maulida, S., & Wulandari, A. (2023). The Effect of Education on Maternal Health on the Prevention of Preterm Labor. *Jurnal Ilmu Kesehatan (Health Science Journal)*, 4(2), 88-96. https://doi.org/10.24964/jik.v4i2.145

Nurun Ayati Khasanah, Ferilia Adiesti, C. A. (2023). INDEKS MASSA TUBUH (IMT) IBU HAMIL DENGAN KEJADIAN PREEKLAMSIA. *17(1)*, 52-59. https://doi.org/10.55316/hm.v17i1.1102

Pera Mandasari, & Eka Juniarty. (2023). Faktor-Faktor Yang Berhubungan Dengan Kejadian Persalinan Lama. *Cendekia Medika: Jurnal Stikes Al-Ma'arif Baturaja*, 8(2), 219-224. https://doi.org/10.52235/cendekiamedika.v8i2.234

Surya, P. P., & Ramadhani, L. (2024). The Influence of Maternal Age and Nutritional Status on Preterm Birth Incidence in Hospitals. *Jurnal Kesehatan Masyarakat Indonesia*, 8(2), 45-55. https://doi.org/10.31009/jkmi.v8i2.270

Wati, L., & Widiyanti, R. (2020). Faktor Risiko Kejadian Pre Eklampsi Di Kota Cirebon Tahun 2019. *Dinamika Kesehatan: Jurnal Kebidanan Dan Keperawatan*, 11(1), 147-158. https://doi.org/10.33859/dksm.v11i1.566

Yuniwiyati, H., Wuryanto, M. A., & Yuliawati, S. (2023). Beberapa Faktor Risiko Kejadian Persalinan Prematur (Studi Persalinan Prematur di RSUD Hj. Anna Lasmanah Kabupaten Banjarnegara). *Jurnal Riset Kesehatan Masyarakat*, 3(1), 8-22. https://doi.org/10.14710/jrkm.2023.18003