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FACTORS ASSOCIATED WITH LOWER BIRTH WEIGHT AMONG INFANTS IN SOUTH BORNEO (KALIMANTAN SELATAN) PROVINCE, INDONESIA

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Abstract

Background: According to the thrifty phenotype hypothesis, individuals who have a birth weight (BW) less than 3000 grams are at risk of suffering from metabolic syndrome and type 2 DM in adulthood. The prevalence of DM and metabolic syndrome in Indonesia and South Kalimantan is increasing. In 2023, the Indonesian Health Survey (SKI) data showed that the percentage of BW less than 3000 grams in Indonesia reached 35.3% and in South Kalimantan 41.7%. This indicates an increase in the percentage of BW less than 3000 grams in South Kalimantan when compared to the Basic Health Research (Riskesdas) 2018 data, the percentage of BW less than 3000 grams in South Kalimantan was 37.5%. **Method:** This is a quantitative study using a cross-sectional research design and using secondary data from the SKI 2023. Data were analyzed univariately and bivariately with complex samples and chi square tests. **Results:** This study found a strong association between BW and CED (*p-value = 0.001*) where mothers with a history of CED had a 5 times higher risk. **Conclusion:** The conclusion is that the factors associated with BW in South Kalimantan is the history of CED so that this factor becomes important for one of the prevention of NCDs in South Kalimantan.

Keywords: Birth weight; South Kalimantan; CED; thrifty phenotype

Introduction

According to the thrifty phenotype hypothesis, babies with birth weight (BW) of under 3000 grams are at high risk of having metabolic syndrome and type 2 diabetes as they reach adulthood.[1] Low birth weight (LBW) is conventionally defined as a birth weight below 2500 grams. The thrifty phenotype hypothesis, however, is not limited to this cutoff and also includes infants with birth weight below 3000 grams, who may also face increased long-term metabolic risks. LBW infants, who represent a subset of those born with birth weight under 3000 grams, have been extensively studied and are known to experience substantially higher risks of neonatal mortality, estimated to be 2–10 times greater than infants with normal birth weight, they are also at a higher risk of stunted growth and development such as stunted motor development, behavioral problems, and cognitive deficit; low intelligence quotient (IQ); alongside non-communicable diseases such as obesity, diabetes, and cardiovascular diseases in the future.[2,3] During the first 6 months, the growth of LBW babies seem to be faster compared to babies with normal birth weight. LBW babies however have to keep catching up with their stunted growth until their first year. Diseases such as bronchopulmonary dysplasia, neonatal jaundice, necrotizing enterocolitis, and neonatal sepsis could stunt their development if not taken care of.[4]

Data from the 2023 Indonesian Health Survey (SKI 2023) shows that the national percentage of LBW babies of under 3000 grams is 35,3%, while in South Kalimantan it's shown at 41,7%, an increase from 37,5% according to the 2018 General Health Survey (Riskesdas 2018) in Southern Kalimantan and 35,6% nationally which sees a slight decrease in percentage. This may be due to the COVID-19 pandemic limiting people's access to health services,

including maternity care. Concerns about infection especially COVID-19, service restrictions, and limited health facility capacity have prevented optimal pregnancy monitoring. In addition, low socioeconomic groups face greater barriers to obtaining services.[5] This situation has the potential to increase the risk of LBW. LBW contributes to stunting, which corresponds to fetal nutritional status which also affects development until adulthood. In 2023, the prevalence of stunting in Indonesia reached 12,9%, and specifically severe stunting reached 5,4%. Stunting itself as an undernutrition issue could increase the risk of children suffering from infections, such as tuberculosis, pneumonia, and diarrhea. According to the thrifty phenotype hypothesis, LBW increases the risk of type 2 diabetes and metabolic syndromes. In 2023, the national prevalence of diabetes reached 1,7% with 50,2% of it being type 2 diabetes; obesity reached 36,8%, hypertension at 29,2%, low high density lipids (HDL) at 87%, and high triglycerides at 41,7%. In South Kalimantan, the prevalence of the above are 1,4% for diabetes with 52,6% being type 2 diabetes; 32.9% for central obesity, and 34,1% for hypertension. [6–8]

Factors that correspond to LBW include sociodemographics such as residence, maternal age, education level, and occupation. Mothers living in rural areas are at higher risk of having LBW babies due to a lower accessibility to maternal care compared to mothers living in urban areas. A good education level increases the mother's knowledge of maternal care and nutrition. Mothers who are of early maternal age (<18 years) and of advanced maternal age (≥35); and mothers with exhausting or high risk jobs (chemical or pollutant exposure) are also at higher risk of birthing LBW babies even if their jobs support their wages for a better nutrition and antenatal care.[9–14] Other than sociodemographic factors, maternal health and other issues during pregnancy such as anemia (low consumption of iron-folic acid tablets),

chronic energy deficiency (CED), hypertension, lack of antenatal care, smoking, and parity also affect the growth of the infant, increasing the risk of LBW if not managed.[15–20]

Geographically, South Kalimantan Province is located in the southeastern part of Kalimantan Island and borders Central Kalimantan Province to the west, East Kalimantan Province to the north, the Makassar Strait to the east, and the Java Sea to the south. It covers an area of approximately 38,744.23 km², or about 6.98% of Kalimantan Island. Topographically, the region consists of alluvial plains, swampy plains, hills, and mountains, with two main characteristics which are lowlands and highlands. The lowland areas generally consist of peatlands and swamps, which are mostly found in the western and eastern coastal areas, while the highlands are located in the central part and are dominated by the Meratus Mountains, which stretch to East Kalimantan.[21,22]

In addition to its geographical and topographical conditions, the socio-cultural aspects of the people of South Kalimantan are also an important characteristic. This province has the highest proportion of respondents who use traditional medicine. Based on interviews, the high use of traditional medicine is influenced by a strong belief in local medical practices that are widely known and have been passed down from generation to generation, especially among communities living in remote areas.[5]

Method

This observational study employed a cross-sectional design using secondary data from SKI 2023 with the dependent variable being birth weight in South Kalimantan, and the independent variables being sociodemographic factors (residence, maternal age, education

level, and occupation status), maternal health (chronic energy deficiency, obesity, anemia, hypertension, antenatal care frequency, and consumption of iron-folic acid tablets), supplementary feeding, and parity. The data was further analyzed for this research from April-June 2025.

Each variable from each factor is then categorized in accordance with previous theories, studies, and adjustments to the SKI 2023 questionnaires. The dependent variable in this study is birth weight which is categorized into < 3000 grams and ≥ 3000 grams according to the thrifty phenotype hypothesis. It should be noted that in this study, we did not categorize LBW with conventional cut-off (< 2.500 grams), instead we categorized infant's birth weight to; infant with birth weight < 3.000 grams which is considered to be shortened as "Lower Birth Weight" terms and infant with normal birth weight (> 3.000 grams).

Independent variables in this study are differentiated into two main factors, which are sociodemographic, and maternal health. Sociodemographic factors include residence, categorized into rural and urban; maternal age, categorized into at risk (ages < 20 or > 35), and not at risk (ages 20-35) which is based on a which stated ages below 20 years old, the female reproductive organs are not yet fully mature and the mother's psychological condition is also not yet stable. Meanwhile, at the age of over 35, the mother's reproductive organs are also no longer functioning optimally[10]; maternal education level, categorized into finished high school and above, and finished middle school and below; and occupation status, categorized into employed, and unemployed.

There are also two other independent variables, being supplementary feeding, categorized into received supplementary feeding, and didn't receive supplementary feeding; and parity, categorized into primipara, multipara, and grandemultipara.

For the maternal health factor, the variables include chronic energy deficiency, categorized into CED, and non-CED; hypertension history, categorized into hypertensive, and non-hypertensive; obesity, categorized into obese and non-obese; anemia, categorized into anemic and non-anemic; antenatal care frequency, categorized into adequate, and inadequate; and consumption of iron-folic acid tablets, categorized into ≥90 tablets and <90 tablets. It should be noted that the data for maternal health in this study were taken from the Maternal and Infant Health Booklet (Buku KIA) data that was compiled in SKI 2023. This explains the lack of specific numeral cut-off points (e.g. Hb <11 g/dL that indicates anemia) associated with the maternal health conditions that are analyzed in this study.

The population of this study are the last children of every household in the province of South Kalimantan based on SKI 2023 data. The samples used in this study are the last children with a documented birth weight alongside the mothers of every household in the province that are respondents of SKI 2023 that match the inclusion criteria, which includes: documented birth weight, last child, and born between January 1st 2018 to the time of the SKI 2023 interview. Meanwhile, the exclusion criteria include children born premature, and twins. The sample size (n) of this study is 1108.

SKI 2023 was conducted by Badan Kebijakan Pembangunan Nasional (BKPK) in collaboration with Badan Pusat Statisik (BPS) in terms of method and sample framework. Data collecting and processing were conducted by collectors and interviewers with a minimum of

a health diploma (D3) background. Data collection methods employed interviews, measurements, and check-ups. SKI 2023 Data was obtained through submitting an application to the head of data and information technology of The Health Ministry of Indonesia through https://layanandata.kemkes.go.id/.

Data analysis includes editing, recoding, cleaning, and processing using IBM SPSS Statistics ver. 22. The results are presented in univariate and bivariate analyses using complex samples due to a weighted product process in accordance with the analysis guidelines of SKI 2023. Bivariate analysis uses chi-square to ascertain the association between dependent and independent variables.

Ethical clearance for this study was obtained from the Ethics Committee of Universitas Indonesia (approval number: Ket-480/UN2.F10.D11/PPM.00.02/2025). In addition, formal authorization to access the data was granted by Badan Kebijakan Pembangunan Kesehatan (BKPK) as the data owner. All procedures performed in this study complied with institutional ethical standards. Data were handled confidentially and used solely for academic research purposes.

Results

Results of this study are presented in univariate and bivariate analyses in accordance to the SKI 2023 analytical guidelines which uses complex samples due to a weighted product with an n of 1108 samples. The results of the study are as follows:

Table 1. Participants' Characteristics

Variable	n	%
Birth Weight		
< 3000 gram	410	37
≥ 3000 gram	698	63
Total	**1108**	**100**
Residence		
Urban	510	46
Rural	598	54
Total	**1108**	**100**
Maternal Age		
Not at risk	907	81,8
At risk	201	18,2
Total	**1108**	**100**
Maternal Education Level		
Finished High School and Above	528	47,7
Finished Middle School and Below	580	52,3
Total	**1108**	**100**
Occupation Status		
Unemployed	668	60,3
Employed	440	39,7
Total	**1108**	**100**
Chronic Energy Deficiency History		
Non-CED	1035	98,2
CED	19	1,8
Total	**1054**	**100**
Obesity History		
Non-obese	1042	98,8
Obese	12	1,2
Total	**1054**	**100**
Anemia History		
Non-Anemic	1022	96,9
Anemic	32	3,1
Total	**1054**	**100**
Hypertension History		
Non-hypertensive	1022	97
Hypertensive	32	3
Total	**1054**	**100**
ANC Frequency		
Adequate	587	47
Inadequate	521	53
Total	**1108**	**100**

Iron-Folic Acid Tablet Consumption		
≥ 90 tablets	635	57,4
< 90 tablets	473	42,6
Total	**1108**	**100**
Supplementary Feeding		
Received Supplementary Feeding	264	23,8
Didn't receive Supplementary Feeding	844	76,2
Total	**1108**	**100**
Parity		
Primipara	267	24,1
Multipara	811	73,4
Grandemultipara	27	2,4
Total	**1105**	**100**

Table 2. Bivariate Analysis between Independent Variables with LBW <3000 grams*

Variabel Independen	< 3000 gram		≥ 3000 gram		Total		OR	*P-value*
	N	%	N	%	N	%		
Residence								
Rural	228	38,1	371	61,9	598	100	1,104 (0,8 - 1,4)	0,522
Urban	182	16	327	64,2	510	100		
Maternal Age								
At risk	74	36,7	127	63,3	201	100	0,984 (0,6 - 1,4)	0,939
Not at risk	336	37,1	571	62,9	907	100		
Maternal Education Level								
Finished High School and Above	234	40,3	346	59,7	580	100	1,347 (0,9 - 1,8)	0,055
Finished Middle School and Below	176	33,4	352	66,6	528	100		
Occupation Status								
Employed	159	36,1	281	63,9	441	100	0,938 (0,6 - 1,2)	0,681
Unemployed	251	37,6	417	62,4	667	100		

Chronic Energy Deficiency History								
CED	14	74,1	5	25,9	19	100	5,082 (1,7-14,5)	0,001
Non-CED	372	36	662	64	1035	100		
Obesity History								
Obese	4	29,1	9	70,9	13	100	0,704 (0,09-5,1)	0,727
Non-Obese	383	36,8	658	63,2	1042	100		
Anemia History								
Anemic	13	41,2	19	58,8	32	100	1,218 (0,5- 2,6)	0,616
Non-Anemic	374	36,5	648	63,5	1022	100		
Hypertension History								
Hypertensive	10	31,7	22	68,3	32	100	0,795 (0,3- 1,7)	0,560
Non-Hypertensive	377	36,9	645	63,1	1022	100		
ANC Frequency								
Inadequate	208	35,4	380	64,6	587	100	0,862 (0,6- 1,1)	0,344
Adequate	202	38,8	318	61,2	521	100		
Iron-Folic Acid Tablet Consumption								
< 90 tablets	181	38,2	292	61,8	473	100	1,091 (0,8- 1,4)	0,575
≥ 90 tablets	228	36,1	403	63,9	631	100		
Supplementary Feeding								
Didn't Receive Supplementary Feeding	303	35,9	541	64,1	844	100	0,822 (0,5 - 1,1)	0,291
Received Supplementary Feeding	107	40,5	157	59,5	264	100		
Parity								
Primipara	111	41,7	156	58,3	267	100	1,000 (-)	
Multipara	291	35,8	520	64,2	811	100	0,780 (0,5-1,1)	0,071
Grandemultipara	5	17,5	22	82,5	27	100	0,295 (0,09-0,9)	

**Data were analyzed with chi-square analysis*

From table 1, it can be inferred that from the 1108 mothers that were interviewed in South Kalimantan in 2023, 410 (37%) were found to have given birth to babies < 3000 grams or lower birth weight, while 698 (63%) gave birth to babies ≥3000 grams or normal birth

weight. For the sociodemographic factors, the majority of respondents (54%) live in rural residences, are at a not at risk maternal age (81.8%), have finished middle school and below (52.3%), and are unemployed (60.3%).

For the maternal health factors, majority of respondents were non-CED (98.2%), non-obese (98.8%), non-anemic (96.9%), non-hypertensive (97%), had adequate ANC visits (53%), and consumed ≥90 iron-folic acid tablets (57.4%). For the independent factors, majority of respondents didn't receive supplementary feeding (76.2%), and are multipara mothers (73.5%)

From table 2, it can be inferred that the variables of residence, maternal age, education level, occupation status, obesity history, anemia history, hypertension history, ANC frequency, iron-folic acid tablet consumption, supplementary feeding, and parity, aren't found to have strong associations with birth weight <3000 grams. However, a strong association was found between the variable of CED history with birth weight <3000 grams ($p = 0.001$) where mothers with a history of CED were found to be 5 times more likely to birth a baby with birth weight < 3000 grams.

Discussion

South Kalimantan's landscape is dominated by peatland lowlands in coastal areas and mountainous regions in the central part of the province.[21,22]Degradation and conversion of peatlands have weakened their natural water regulation function, contributing to recurrent flooding in several areas.[23] These environmental conditions may create barriers to

transportation and access to maternal healthcare services, particularly in remote and flood-affected communities, which could indirectly contribute to the occurrence of LBW.

In South Kalimantan, distribution of healthcare workers and facilities are unequal, which in turn limits access to healthcare in remote areas. For instance, the ratio for doctors per 1000 population is only 0.67 doctors per 1000 population, which is below the accepted WHO minimum standard of 1 doctor per 1000 population. Personnel are also more concentrated in urban areas compared to rural areas, creating a higher burden in rural healthcare workers in South Kalimantan.[24] In addition to the unequal distribution of healthcare facilities and personnel, health-seeking behavior may also influence service utilization. In some communities, traditional medicine practices passed down through generations are still preferred over formal healthcare services, which may contribute to delays in accessing antenatal care and nutritional monitoring.[5]

The proportion of BW under 3000 grams was found to be higher in rural residences which was 38,1% compared to urban residences which was 16% which means that mothers living in rural areas have a tendency to birth babies < 3000 grams. With a p-value of 0.522, this finding corresponds a study where the results found that residence and LBW aren't strongly associated with a p-value of 0.203.[25] Advancements in technology, especially in mass media has reached rural households, making them imitate the routines of urban societies with their practices and habits. Due to these changes, the impact of urban living into the rural characteristics of the mother and infant could result in mistakes during the gestation period of the mother.[26]

Maternal age was not found to have any strong association with birth weight of < 3000 grams, the p-value was found to be 0.939. The proportion of birth weight of < 3000 grams in at risk mothers was 36,7% compared to not at risk mothers which was 37,1%, meaning that mothers at a not at risk maternal age are more prone to birthing babies < 3000 grams. This finding is not in-line with a study that found a strong association between maternal age and LBW with a p-value of 0.03, alongside a 1.17 times higher risk of birthing LBW babies for at risk mothers.[10] Mothers of an at risk maternal age are more prone to birthing LBW babies due to their reproductive organs not being fully developed, alongside an unstable psychological condition when they're conceiving below 20 which tends to cause a deficiency in nutritional requirements for the infant's development. Pregnancy above the age of 35 also affects development of the infant.

Mother's education level was not found to have a strong association with LBW, where the o-value was found to be 0.055. The proportion of birth weight < 3000 grams was found to be higher in mothers who finished below middle school level at 40,3% compared to mothers who finished above high school level with 33,4%. The mother's lack of knowledge affects their personal and family health, including their reproductive health, the health of the newborn, and overall understanding of healthcare. The higher their education level, the better their knowledge is about nutritional requirements and other health considerations during pregnancy.[27]

Mother's occupation status was not found to have any strong association with birth weight, the p-value was found to be 0.681. The proportion of babies born < 3000 grams was found to be higher in unemployed mothers which was 37,6% compared to employed mothers

which was 36,1%. This is in-line with a previous study that states that there was no strong association found between mother's occupation status and LBW where the p-value was found to be 1.000. Although employment status is often used as an indicator of workload, it does not necessarily reflect the level of physical exertion. Some employed mothers work primarily in sedentary occupations, such as office-based jobs, which may involve limited physical activity. In contrast, unemployed mothers may still engage in physically demanding domestic tasks, including laundry, carrying heavy items, and other forms of manual labor. Prolonged working hours, high physical demands, and insufficient rest, whether in formal employment or domestic settings, can lead to physical exhaustion and stress in pregnant women. These conditions may negatively affect maternal health and interfere with fetal growth and development. As a result, both employed mothers in physically demanding jobs and unemployed mothers who perform strenuous household tasks may face an increased risk of delivering infants with low birth weight. [28,29]

CED history was found to have a strong association with LBW, where the p-value was found to be at 0.001. Mothers with a history of CED were found to be 5 times more likely to birth a baby < 3000 grams (95% CI = 1,769-14,598). Previous studies found that mothers with a history of CED were 2.1 times more likely to birth a LBW baby (p = 0.001; OR = 2.115).[30] However, it should be noted that the proportion of CED history in mothers is skewed towards mother with no CED history where the proportion is 98.2 % compared to mothers with a history of CED where it's 1.8%. This skewed proportion could happen due to the categorization conducted during data recoding. This limitation should be considered when looking at the relationship between the two variables. It should also be noted that the metabolism of

nutrients in pregnant women is a lot higher compared to non-pregnant women, this results in additional requirements in nutrients, which include an additional 300 kcal, and 12 grams of protein, totaling at 2500 kcal and 75-100 grams of protein. If pregnant women consume less than 1500 kcals per day, they are more at risk of birthing a LBW baby.[31]

Obesity history was not found to have any strong association with LBW, where the p-value was found to be 0.727. The proportion of LBW in mothers with a history of obesity was found to be 29.1% compared to non-obese mothers with 36.1%. This oddity in proportions could be caused by a low prevalence of obesity in the study population which means lower odds of finding an LBW case in an already small population of mothers with a history of obesity. Another cause could be that obesity is more closely linked to a high birth weight or macrosomia, due to a higher insulin resistance in obese mothers, even when they're not diabetic, causing the infant to have a higher blood glucose and insulin. Other than that, lipase in placenta metabolizes triglycerides in the mother's blood, which could cause excess free fatty acids to be transferred into the growing infant, causing an overgrowth in the infant's growth.[32]

Anemia history was not found to have any strong association with birth weight, where the p-value was found to be 0.560. The proportion of babies born < 3000 grams in anemic mothers was found to be 41,2%, compared to non-anemic mothers which was 36,5%. This finding is not in-line with a previous study that found a strong association between anemia history and incidence of LBW where they found that anemic mothers were 7,4 times more likely to birth a LBW baby.[33]Anemia affects LBW incidence by way of a disruption in the

transfer of hemoglobin to the infant through the placenta, which causes a disruption in the infant's weight gain.[34]

Hypertension history was not found to have any strong association with LBW with a p-value of 0.560. The proportion of LBW in hypertensive mothers was found to be 31,7% compared to non-hypertensive mothers which was 36,9%. This finding is not in-line with a previous study that found a strong association between hypertension and LBW, where the p-value was found to be 0.000. Hypertension in pregnant women was found to be closely linked with LBW incidence due to a suboptimal trophoblast invasion, causing a decrease in utero-placenta blood perfusion due to a decrease in the volume of blood plasma. This results in a restriction in oxygen and nutrients that should be supplied to the infant, causing a growth restriction. A hypoxic placenta also releases compounds referred to as antiangiogenics into the mother's bloodstream, causing endothelial dysfunction, vasoconstriction, and oxidative stress that could lead to pre-eclampsia in pregnant mothers. [16,35,36]

ANC frequency was not found to have any strong association with birth weight, where the p-value was found to be 0.344. The proportion of babies born < 3000 grams was found to be higher in mothers with a adequate ANC visits with 38,8% compared to mothers with inadequate ANC visits with 35,4%. Previous research found that mothers with inadequate ANC visits (at least 4 visits) are 3.6 times more likely to birth LBW babies, the two variables were also found to have a strong association. [37]

Iron-folic acid tablet consumption was not found to have any strong association with birth weight, where the p-value was found to be 0.575. The proportion of babies born <3000 grams was found to be higher in mothers who consume <90 tablets with 38.2%, compared to

mothers who consume ≥90 tablets with 36.1%. A previous study found that iron-folic acid tablet consumption had a strong association with LBW where the p-value was found to be 0.003 (OR = 1.252; 95% CI = 1.081-1.456).[17] One of the main causes of anemia in pregnant women is inadequate consumption of iron-folic acid tablets, which was found to be < 40 mg or less than 90 tablets. Inadequate consumption of iron-folic acid tablets was also found to be linked to an increase in LBW babies.

Supplementary feeding was not found to have a strong association with LBW, where the p-value was found to be 0.291. The proportion of babies born < 3000 grams was found to be higher in mothers who received supplementary feeding with 40,5% compared to mothers who didn't receive supplementary feeding with 35.9%. This finding was not in-line with a previous study that found a strong association between the mothers who received supplementary feeding and LBW (P = 0.015), in which mothers who did not receive supplementary feeding were 1.5 times more likely to give birth to a LBW infant. A previous study found that a lot of mothers didn't consume their supplemental foods in accordance to guidelines. Reasons include the biscuits being too sweet, a hard texture, alongside nausea. Other than that, there are pregnant women who share the supplemental foods to their family members, and have a misunderstanding that supplemental foods are main courses, not supplementary. [38–41]

Parity was not found to have a strong association with birth weight, where the p-value was found to be 0.071. The proportion of babies born < 3000 grams was found to be highest in primipara mothers with 41.7%, and then multipara mothers with 35.8%, and lastly grandemultipara mothers with 17.5%. This is not in-line with a previous study where the findings indicate a strong association between parity and LBW, where the p-value was found

to be 0.025. In this study, primipara were tend to birth babies < 3000 grams due to the mothers being less educated and experienced regarding their pregnancy. This affects their mental and physical preparedness, health check-ups for the infant, and their reproductive organs not being ready during pregnancy, [42,43] hence in previous studies, primipara are included as at-risk parities even though in theory, increases in parity also increases the odds of LBW babies.

Conclusion

This study explores factors associated with lower birth weight among infants (< 3000 grams) in the South Kalimantan Province from sociodemographic, maternal health, and other independent factors. The results confirmed the association with the incidence of lower birth weight, proving that maternal health factors, specifically CED history plays an important role in birth weight. We hope that these findings can drive up the urgency to strengthen and fortify national nutrition programs, especially towards women and pregnant mothers with CED by way of supplementary feeding, standard nutritional quality practices, monitoring compliances either by health workers or Posyandu cadres, and stressing the importance of proper nutrition during pregnancy through health institutions in Indonesia such as the Ministry of Health Republik Indonesia and Public Health Centers. Collaboration between health and education sectors are especially needed to increase community knowledge on CED which in turn mitigates the risk of lower birth weight later on. Further research should be conducted using alternative methods of study to explore the association of other factors that may have associations with the incidence of lower birth weight.

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Conflict of Interest

The author declares no conflict of interest in this publication.

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