



Relationship between maternal factors and the incidence of low birth weight in Central Sulawesi Province: Analysis of 2022 Indonesian Nutritional Status Survey Data

Rosma Annisa^{✉1}, Yoli Farradika²

rosmannisa29@gmail.com¹

Public Health Study Program, Faculty of Health Sciences, Universitas Muhammadiyah Prof. dr. Hamka, DKI Jakarta, Indonesia^{1,2}

Abstract

Low Birth Weight (LBW) remains an unresolved public health problem in Indonesia, and in 2022 Central Sulawesi Province was recorded as the region with the highest national proportion of LBW. Low birth weight is frequently associated with several maternal determinants, including parity, anaemia during pregnancy, adherence to iron supplement (blood-boosting tablet) consumption, and the frequency of Antenatal Care (ANC) visits. This study aimed to analyse the association between these maternal factors and the occurrence of LBW in Central Sulawesi Province in 2022. An observational analytic design with a quantitative approach was employed using secondary data from the 2022 *Survey Status Gizi Indonesia* (SSGI), processed in June 2025. The population comprised all live-born infants with documented birth weights, and subjects were recruited through total sampling. After records with incomplete information were excluded, 686 infants were analysed. Data were analysed univariately, bivariately using the Chi-Square test, and multivariately using Cox regression at a significance level of $p < 0.05$. The proportion of LBW in the study area was 5.4%. All p-values exceeded 0.05, namely parity ($p = 0.965$), maternal anaemia ($p = 0.455$), iron tablet consumption ($p = 0.793$), and ANC visits ($p = 0.902$), indicating that these four factors were not significantly associated with LBW. These findings suggest that the determinants of LBW in Central Sulawesi are likely influenced by factors beyond the available variables, underscoring the need for more complete data and further in-depth research.

Keywords: Anaemia, Antenatal Care, *Survey Status Gizi Indonesia* (SSGI), Low Birth Weight, Parity

History Article : Submit : 11 June 2026 Accepted : 29 August, Publish : 31 August 2026

Doi : <https://doi.org/10.64146/gqdrs014>

How to cite this article:

Farradika, Y., & Annisa, R. (2026). Relationship between maternal factors and the incidence of low birth weight in Central Sulawesi Province: Analysis of 2022 Indonesian Nutritional Status Survey Data. *Health Smart : Jurnal Kesehatan Masyarakat*, 2(2), 170-182. <https://doi.org/10.64146/gqdrs014>

Copyright © 2026



✉ Corresponding author:

Email Address: rosmannisa29@gmail.com (**Rosma Annisa**)

e-ISSN: 3111-2131

INTRODUCTION

The degree of health of a baby at the beginning of life is an important marker of the quality of a nation's human resources. The series of events from pregnancy, birth, to the postpartum period also determine the condition of the baby when it is born. Among the various problems encountered in maternal and neonatal services, birth weight that is below the normal threshold occupies a prominent position. World Health [Organization \(2023\)](#) has emphasized that this problem does not stop at the large chance of complications during the neonatal period, but is also related to long-term growth and development obstacles.

Babies born weighing less than 2.500 grams are in a vulnerable position because their organs and functions are not yet fully mature. [Dhivar et al. \(2024\)](#) states that this group is the main contributor to morbidity and mortality in neonates and infants, and even contributes to the majority of neonatal deaths in developing countries. The condition of low birth weight (LBW) is also often accompanied by stunted growth and a weakened immune system. Dhivar et al. Adding that the subsequent impacts can include growth disorders, cognitive and neurodevelopmental delays, as well as increased vulnerability to chronic diseases in adulthood.

Globally, LBW is still a relevant public health issue because of its contribution to neonatal morbidity and mortality. [WHO \(2023\)](#) noted that in 2020 there were 19,8 million babies or 14,7% of all world births who were born with low weight, or around one in every seven births. Responding to this condition, [FAO et al. \(2024\)](#) explained that the World Health Assembly (WHA) set a target of reducing the world prevalence of LBW to 10,5% by 2030.

[Kemenkes \(2023\)](#) and [WHO \(2023\)](#) reported that more than 96% cases were concentrated in developing countries, while Indonesia recorded a prevalence of 6,0% in 2022. Referring to data [SSGI \(2022\)](#), the Central Sulawesi Provincial Health Service ([Dinkes Sulteng, 2023](#)) shows that Central Sulawesi occupies the highest position with a figure of 8,5%, far exceeding the national target of 3,8%.

The increase in the proportion of LBW births does not stand alone, but is influenced by a number of maternal determinants, including parity, anemia in pregnancy, consumption of blood supplement tablets, and regularity of antenatal care (ANC) visits. [Kemenkes RI \(2021\)](#) explains that a high number of births generally has clinical consequences for the mother and baby, including complications during pregnancy and childbirth.

Previous literature indicates that risks to mother and baby tend to increase in the first birth as well as in the third birth and beyond. [Nur et al. \(2022\)](#) explains that repeated pregnancies cause the capacity of the uterine tissue to decrease so that blood perfusion to the placenta is no longer optimal.

Reduced blood flow carrying nutrients to the fetus leads to inhibition of intrauterine growth, so that the chance of a baby being born with LBW increases with increasing parity.

Anemia experienced by women during pregnancy is another determinant related to the incidence of LBW. Deficiency of iron, folic acid and vitamin B12 is the most common cause of this condition. Kemenkes RI (2023) states that this situation opens up opportunities for various complications, ranging from miscarriage, bleeding and premature delivery, to the birth of a low birth weight baby.

Verma et al. (2026) strengthens this picture by showing that iron deficiency anemia still has a high prevalence in pregnant women and adolescent girls, with low iron intake, socio-economic status, and limited access to health services as the main determinants.

Giving blood supplement tablets during pregnancy is necessary so that blood formation in the mother's body remains adequate. The findings of Natalia et al. (2024) indicate that mothers who are not disciplined in consuming blood supplement tablets have a greater chance of giving birth to LBW babies than those who complete more than 90 tablets. Supplementation is a way to fulfill needs when iron sources from the daily menu are no longer able to cover the body's needs.

Kemenkes RI (2023) explains that one blood supplement tablet (TTD) contains 60 mg of elemental iron along with 400 mcg of folic acid and is intended for all pregnant women without requiring the presence or absence of anemia, with a program recommendation of at least 90 tablets throughout pregnancy at a dose of one tablet per day on a regular basis. Azkia et al. (2026) added that the development of functional food sources of iron based on local ingredients, such as a sponge formula made from mung bean flour, has the opportunity to complement supplementation in efforts to prevent anemia.

The use of antenatal services also has implications for the health status of mothers and children. Arief et al. (2025) found a significant association between the completeness of antenatal examinations and the incidence of LBW, namely that mothers who did not undergo a complete examination were far more likely to give birth to LBW babies than mothers with a complete examination. Kemenkes RI (2022) formulates ANC services as a series of activities from conception to delivery which are provided to all pregnant women with a minimum standard of four examinations, namely once in the first trimester, once in the second trimester, and twice in the third trimester. Arief et al. (2025) also emphasized that the regularity of visits is closely related to the knowledge and information obtained by the mother, which is useful for monitoring fetal development, maintaining maternal health, finding complications early, and preparing for the birthing process.

The baby's weight at birth ultimately becomes a marker of survival chances as well as the trajectory of future growth and development. In Central Sulawesi, the contribution of LBW and prematurity to the infant mortality rate in 2022 was recorded at 21,88% (Dinkes Sulteng, 2023). Studies on the determinants of LBW in this province still mostly rely on data from health facilities with limited coverage, while analysis based on representative provincial-scale surveys is still rarely carried out.

Utilization of SSGI (2022) data provides an opportunity to examine maternal determinants on a broader and more representative basis. Based on these conditions, this study aims to analyze the relationship between maternal factors, which include parity, maternal anemia, blood supplement tablet consumption, and antenatal care visits, with the incidence of low birth weight in babies in Central Sulawesi Province in 2022.

METHODOLOGY

Type of research

This research is an observational analytical research with a quantitative approach. Analysis was carried out on secondary data from the 2022 Indonesian Nutrition Status Survey (SSGI), and the study area focused on Central Sulawesi Province as one of the provinces included in the survey. All research stages, starting from preparing proposals, obtaining permits and ethics, processing, to writing reports, will take place from October 2024 to July 2025, with the main data processing carried out in June 2025.

Time and place of research

The research population was all live-born babies in Central Sulawesi Province whose birth weight was documented in the 2022 SSGI data.

Population and sample

Subjects were captured using a total sampling technique so that at the initial stage 7.767 babies were collected. The data source comes from the Individual questionnaire instrument and the 2022 SSGI Household questionnaire. The dependent variable in this study is the incidence of LBW, while the independent variables include parity, maternal anemia, consumption of blood supplement tablets (TTD), and antenatal care (ANC) visits.

Data collection techniques and instrument development

Variable operational limits are determined as follows. The incidence of LBW is categorized as LBW if the birth weight is less than 2.500 grams and not LBW if the birth weight is 2.500 grams or more. Parity is grouped into high parity (more than 3 times) and low parity (3 times or less). Maternal anemia is determined based on hemoglobin levels, namely anemia if it is less than 11 gr/dL and not anemia if it is 11 gr/dL or more. TTD consumption is categorized as irregular if it is less than 90 tablets and regular if it is 90 tablets or more during pregnancy. ANC visits were grouped into non-routine if less than 4 times and routine if 4 times or more during pregnancy.

Research ethical approval was issued by the Health Research Ethics Committee of the Muhammadiyah University of Purwokerto with Number KEPK/UMP/127/VI/2025. Before the analysis was carried out, a data cleaning process was carried out by removing records that had incomplete information on the variables studied, so that the amount of data suitable for analysis was reduced from 7.767 to 686 babies.

Data analysis techniques

Data processing was carried out in three stages, namely univariate, bivariate and multivariate. Univariate analysis presents the frequency and percentage distribution of each research variable. Bivariate analysis tests the relationship between each independent variable and the dependent variable using the Chi-Square test. Multivariate analysis utilized Cox regression to identify the factors that most determine the incidence of LBW. The magnitude of the risk was estimated using the Risk Ratio (RR) with a confidence interval of 95%, and statistical significance was set at a value of $p < 0,05$.

RESULTS

Of the 7.767 babies in Central Sulawesi recorded in the 2022 SSGI, records with incomplete information were removed first from the analysis process. This screening left 686 babies who met the requirements and were then analyzed.

Univariate Analysis

Univariate analysis was aimed at capturing the frequency and percentage of each research variable, including LBW, parity, maternal anemia, blood supplement tablet consumption, and antenatal care visits. Details of the distribution are presented in Table 1.

Table 1. Frequency Distribution of Baby Characteristics Based on Maternal Factors in Central Sulawesi Province According to SSGI Data for 2022

Variable	N	%
LBW		
Yes (< 2500 gr)	37	5,4
No ($\geq$ 2500 gr)	649	94,6
Parity		
High (> 3 times)	85	12,4
Low ($\leq$ 3 times)	601	87,6
Maternal Anemia		
Anemia (< 11 gr/dL)	248	36,2
No anemia ($\geq$ 11 gr/dL)	438	63,8
TTD consumption		
Irregular (< 90 tablets)	497	72,4
Regular ($\geq$ 90 tablets)	189	27,6
ANC visit		
Not Routine (< 4 times)	152	22,2
Routine ($\geq$ 4 times)	534	77,8

Source: Processed Secondary Data, SSGI 2022

Table 1 shows that 5,4% of babies in Central Sulawesi were born LBW. Most of the babies, namely 87,6%, came from mothers with low parity, while 63,8% were born to mothers who had no history of anemia. The majority of babies (72,4%) were born to mothers who consumed blood supplement tablets irregularly throughout pregnancy, and 77,8% came from mothers who had regular pregnancy checks through ANC visits, compared to 22,2% of mothers who had irregular visits.

Bivariate Analysis

The relationship between maternal factors and the incidence of LBW in babies in Central Sulawesi is presented in Table 2.

Table 2. Relationship between maternal factors and LBW incidence in Central Sulawesi Province based on SSGI data for 2022

Variable	LBW				Total		RR (95% CI)	P
	Yes		No					
	N	%	N	%	N	%		
Parity								
Tall	4	4,7	81	95,3	85	100	0,857 (0,311-2,359)	0,965
Low	33	5,5	568	94,5	601	100		
Maternal Anemia								
Anemia	16	6,5	232	93,5	248	100	1,346 (0,716-2,530)	0,455
Not Anemic	21	4,8	417	95,2	438	100		
TTD consumption								
Irregular	28	5,6	469	94,4	497	100	1,183 (0,569-2,460)	0,793
Regular	9	4,8	180	95,2	189	100		
ANC visit								

Not Routine	9	5,9	143	94,1	152	100	1,129 (0,545-2,341)	0,902
Routine	28	5,2	506	94,8	534	100		

Source: Processed Secondary Data, SSGI 2022

Referring to Table 2, the proportion of LBW is actually greater in babies from low parity mothers (5,5%) compared to high parity mothers (4,7%). The group of LBW babies was also more common in mothers who experienced anemia during pregnancy (6,5%) compared to mothers without anemia (4,8%). A similar pattern is seen in the TTD consumption variable, namely 5,6% in the group of mothers who are not regular compared to 4,8% in the group who are regular. The same trend was seen in ANC visits, namely that LBW babies were more likely to come from mothers with irregular visits (5,9%) than mothers with regular visits (5,2%).

The Chi-Square test produced a p value above 0,05 for all variables, namely parity ($p = 0,965$), maternal anemia ($p = 0,455$), TTD consumption ($p = 0,793$), and ANC visits ($p = 0,902$), so that the four variables were declared not significantly related to the incidence of LBW in babies in Central Sulawesi.

Multivariate Analysis

Statistically, there is not a single independent variable that meets the selection criteria for multivariate modeling, namely the value $p < 0,25$ at the bivariate stage. However, the four variables have a strong substantive basis for the incidence of LBW based on a theoretical review, so they are still involved in multivariate modeling as an exploratory analysis.

Table 3. Results of Multivariate Analysis of LBW Incidence in Central Sulawesi Province in 2022

Variable	B	RR	95% CI	<i>P-value</i>
Parity	-0,303	0,739	0,261 – 2,092	0,569
Maternal Anemia	0,356	1,427	0,744 – 2,737	0,285
TTD consumption	0,307	1,360	0,636 – 2,907	0,428
ANC visit	0,085	1,089	0,509 – 2,329	0,826

Source: Processed Secondary Data, SSGI 2022

As presented in Table 3, parity, maternal anemia, blood supplement tablet consumption, and ANC visits did not have a significant influence on the incidence of LBW (value $p > 0,05$).

DISCUSSION

Relationship between parity and the incidence of LBW

The analysis in this study did not find a significant relationship between parity and the incidence of LBW ($p = 0,965$; $p > 0,05$). It is interesting to note that the group of mothers with low

parity actually showed a greater proportion of LBW babies (5,5%) than the group of mothers with high parity (4,7%).

These findings are in line with [Artini et al. \(2023\)](#) which also did not obtain a significant association between parity and the incidence of LBW ($p = 0,081$). A similar strengthening came from [Apriani et al. \(2024\)](#) with a p value of $0,236 (> 0,05)$, which means that parity is not related to the incidence of LBW. Different results were reported by [Aisah et al. \(2025\)](#) which found a relationship between the two variables ($p = 0,000$).

[Artini et al. \(2023\)](#) explained that mothers who have experienced repeated births are generally better trained in caring for pregnancies and are more sensitive to recognizing danger signs, so they tend to be more disciplined in having pregnancy checks and better manage their nutritional intake compared to mothers who have given birth for the first time. Accumulated experience from previous pregnancies has the potential to function as a protective factor against the incidence of LBW. This pattern is in line with research findings, namely that the proportion of LBW is slightly higher in low parity mothers, although this difference is not statistically significant.

Relationship between maternal anemia and LBW incidence

The results showed a greater proportion of LBW in babies from mothers with a history of anemia during pregnancy (6,5%) compared to babies from mothers without such a history (4,8%). However, the Chi-Square test produced a p value of $0,455$ so that statistically maternal anemia was not related to the incidence of LBW ($p > 0,05$).

Similar findings were found in [Ilmiyani et al. \(2021\)](#) which confirmed that there was no relationship between anemia and the incidence of LBW. Similar support was provided by [Maulana et al. \(2022\)](#) with statistical test results of $p = 0,092 (> 0,05)$, which means there is no significant association between anemia in pregnant women and the incidence of LBW.

Different directions reported by [Wahyuni et al. \(2021\)](#). Through a systematic review of a number of studies, this research concluded that there was a link between anemia in pregnancy and an increased risk of LBW. The trend in the figures in this study still shows a higher proportion of LBW in mothers with a history of anemia (6,5%) compared to mothers without a history of anemia (4,8%), even though statistical testing does not prove a relationship ($p > 0,05$).

[Maulana et al. \(2022\)](#) explains that pathophysiologically, anemia in pregnancy is closely related to the incidence of LBW because this condition disrupts the adequate supply of oxygen and nutrients to the fetus. The need for iron increases during pregnancy to support fetal growth as well as increase the mother's blood volume. Anemic conditions, especially in the second and third trimesters,

reduce hemoglobin levels so that the blood's capacity to carry oxygen to the placental tissue is also reduced.

This situation has the potential to cause chronic hypoxia in the fetus which leads to stunted growth (intrauterine growth restriction/IUGR), so that the risk of low birth weight increases. Impaired placental function also accompanies anemia, including decreased uteroplacental blood flow and impaired nutrient transfer. Severe anemia even has the potential to trigger premature labor, which is one of the main causes of LBW.

Relationship between TTD consumption and LBW incidence

Based on research results, the incidence of LBW is more common in babies of mothers who do not regularly consume blood supplement tablets (5,6%) compared to babies of mothers who regularly consume them (4,8%). The Chi-Square test produced a p value of 0,793 which means there is no relationship between blood supplement tablet consumption and the incidence of LBW ($p > 0,05$).

These results are in line with [Rahim et al. \(2022\)](#) which obtained a p value of 0,401 ($> 0,05$) so that compliance with taking blood supplement tablets is considered not related to the incidence of LBW. A different conclusion was put forward by [Aprisia dan Simbolon \(2022\)](#) which found a significant relationship between the consumption of blood supplement tablets and the incidence of LBW in Indonesia ($p = 0,0001$). The percentage of LBW babies in the group of mothers who consume TTD irregularly remains higher (5,6%) than the group of mothers who regularly consume it (4,8%), even though the statistical relationship is not proven ($p > 0,05$).

[Aprisia dan Simbolon \(2022\)](#) explains that as the time of delivery approaches, pregnant women's iron needs increase because the volume of blood required by the mother and fetus also increases. Iron deficiency during pregnancy increases the risk of premature birth and LBW. Pregnancy also requires additional iron to increase the number of red blood cells and form fetal and placental red blood cells.

[Tiyasasih et al. \(2023\)](#) stated that low intake of blood supplement tablets results in disruption of metabolic processes and DNA synthesis which play an important role in the growth and development of fetal cells. Pregnant women who do not regularly consume blood supplement tablets basically face problems with compliance with health recommendations, which can stem from limited knowledge, awareness, and motivation. This disobedient behavior is often motivated by the mother's lack of understanding regarding the role of blood supplement tablets in preventing anemia and maintaining fetal growth.

Other factors that also hinder regular consumption are discomfort due to side effects of tablets such as nausea or constipation, traditional beliefs that apply in the surrounding environment, and weak support from family and health workers. Consumption of blood supplement tablets that are not carried out regularly increases the risk of anemia, disrupts the flow of oxygen and nutrients to the fetus, and ultimately leads to complications during labor and the birth of a low birth weight baby.

Relationship between ANC visits and the incidence of LBW

The results of the study showed that LBW status was more common in babies from mothers who did not regularly make ANC visits (5,9%) compared to babies from mothers who did so regularly (5,2%). The Chi-Square test obtained a p value of 0,902 so that ANC visits were declared not related to the incidence of LBW ($p > 0,05$).

This finding is in line with [Desi dan Izah \(2024\)](#) which concluded that there was no significant relationship between ANC frequency and the incidence of LBW ($p > 0,05$). [Agustina et al. \(2025\)](#) also stated the same thing, namely that the ANC visit was not related to the LBW incident ($p > 0,05$). [Lein et al. \(2025\)](#) shows different results, namely there is a relationship between ANC visits and the incidence of LBW ($p < 0,05$). The majority of LBW babies in this study still came from mothers who did not regularly make ANC visits (5,9%) compared to mothers who had regular pregnancy checks (5,2%), even though this relationship was not statistically significant.

[Lein et al. \(2025\)](#) states that a quality ANC visit is a sign that the mother received counseling and explanation regarding her pregnancy, as well as efforts to shape behavior so that needs during pregnancy are met and risky events can be avoided. The more often the mother visits according to the recommended standards, the greater the chance of early detection of maternal and fetal health problems, such as anemia, infection, hypertension, or intrauterine growth disorders that have the potential to cause LBW.

ANC visits also function as an entry point for nutritional interventions, starting from giving blood supplement tablets to education on healthy eating patterns which greatly determine fetal growth. N. W. Astuti and D. A. [Astuti \(2025\)](#) added that pregnant women with irregular or less than standard examinations are faced with a greater risk of giving birth to low birth weight babies due to late detection and intervention of risk factors that can actually still be prevented.

[Ihsan et al. \(2026\)](#) shows that providing structured educational modules can improve maternal knowledge and behavior in the first 1.000 days of life, so that the benefits of ANC visits are not solely determined by their frequency, but also by the educational content the mother receives at each visit.

Overall, the absence of a significant relationship for all maternal factors in this study needs to be interpreted with caution. The reduction in sample size from 7.767 to 686 due to incomplete data

reduces the statistical power to detect relationships that may actually exist, especially as the relatively small proportion of LBW (5,4%) results in a limited number of cases in each analysis cell.

The use of secondary data limits the depth of measurement of each variable, for example TTD consumption which is only reflected in the number of tablets without taking into account daily compliance and method of consumption. The combination of these limitations increases the possibility of a type II error, so that the absence of a significant relationship does not necessarily negate the biological role of maternal factors in the incidence of LBW which has been proven in many studies with more adequate designs and measurements.

CONCLUSION

This research found that the proportion of LBW babies in Central Sulawesi according to SSGI data in 2022 reached 5,4%. The maternal factors included in the study, namely parity, maternal anemia, TTD consumption, and ANC visits, were not proven to be related or have a significant effect on the incidence of LBW. These findings need to be interpreted taking into account the limitations of secondary data and the reduction in sample size, so that the absence of a significant relationship cannot be interpreted as meaning that the factor is not clinically important.

REFERENCES

- Agustina, F. R., Sudiarti, T., Fitri, S. A., & Rusydi, R. (2025). Hubungan Kunjungan Antenatal Care (ANC) dengan Kejadian Bayi Berat Lahir Rendah di Kecamatan Babakan Madang, Kabupaten Bogor. *Journal of Educational Innovation and Public Health*, 3(1), 81–90. <https://doi.org/10.55606/innovation.v3i1.3460>
- Aisah, S., Handayani, H., Gunawan, I., & Muttaqin, Z. (2025). Faktor-Faktor Yang Berhubungan Dengan Kejadian Berat Bayi Lahir Rendah (BBLR) Di Ruang Perinatologi RSUD dr. Soekardjo Kota Tasikmalaya Tahun 2024. *SENAL: Student Health Journal*. <https://journal.umtas.ac.id/SENAL/article/view/5092>
<https://doi.org/10.37058/jkki.v17i1.3606>
- Apriani, E., Subandi, A., & Mubarak, A. K. (2024). Hubungan Usia Ibu Hamil, Paritas dan Usia Kehamilan dengan Kejadian BBLR di RSUD Cilacap. <https://www.researchgate.net/publication/394665543> <https://doi.org/10.36760/tens.v2i1.384>
- Aprisia, B., & Simbolon, D. (2022). Konsumsi Tablet Tambah Darah Kaitannya dengan Berat Lahir Bayi di Indonesia. *Journal of Nutrition College*, 11(4), 294–302. <https://doi.org/10.14710/jnc.v11i4.33750>
- Arief, V. M., Abdullah, F., & Salami, S. (2025). Hubungan Pemeriksaan Antenatal Care dengan Kejadian Berat Badan Lahir Rendah di RSUD Meuraxa, Banda Aceh. *Jurnal Medika Malahayati*, 9(2). <https://doi.org/10.33024/jmm.v9i2.19144>

- Artini, N. K. M., Erawati, N. L. P. S., & Senjaya, A. A. (2023). Hubungan Paritas dan Usia Ibu dengan Kejadian Berat Badan Lahir Rendah di Rumah Sakit Umum Bali Royal Hospital. *Jurnal Ilmiah Kebidanan (The Journal Of Midwifery)*, 11(1), 33–40. <https://doi.org/10.33992/jik.v11i1.2312>
- Astuti, N. W., & Astuti, D. A. (2025). Hubungan Kunjungan Antenatal Care dengan Kejadian Berat Badan Lahir Rendah: Studi di Wilayah Kerja Puskesmas Godean II Sleman, DIY. *Buletin Ilmu Kebidanan dan Keperawatan*, 4(01), 18–24. <https://doi.org/10.56741/bikk.v4i01.693>
- Azkia, Hasani, M. S., & Rahmawati, N. (2026). Sponge Formula Based on Mung Bean Flour as a Functional Food Source of Iron for Preventing Anemia. *Jurnal Gizi dan Teknologi Pangan: Nutrismart*, 2(2), 154–164. <https://doi.org/10.64146/J8ESGG34>
- Desi, N. M., & Izah, N. (2024). Analisis Faktor Risiko Berat Badan Lahir Rendah di Wilayah Puskesmas Margadana. *Jurnal Ilmiah Kesehatan*, 13(2), 167–173. <https://doi.org/10.52657/jik.v13i2.2417>
- Dhivar, N. R., Gandhi, R., Murugan, Y., & Vora, H. (2024). Outcomes and Morbidities in Low-Birth-Weight Neonates: A Retrospective Study From Western India. *Cureus*, 16(6), e61981. <https://doi.org/10.7759/cureus.61981>
- Dinas Kesehatan Provinsi Sulawesi Tengah. (2023). Profil Dinkes Provinsi Sulawesi Tengah. <https://dinkes.sultengprov.go.id/profil-dinkes-provinsi-sulawesi-tengah/>
- FAO, IFAD, UNICEF, WFP, & WHO. (2024). The State of Food Security and Nutrition in the World 2024. Financing to end hunger, food insecurity and malnutrition in all its forms. FAO; IFAD; UNICEF; WFP; WHO. <https://doi.org/10.4060/cd1254en>
- Herdiansyah, Dani, D. R., & Simorang, C. P. (2026). Evaluation of the “Pertemuan Peningkatan Kemampuan Keluarga” (Family Capability Improvement Meeting) Health and Nutrition Module Program for Stunting Prevention. *Jurnal Gizi dan Teknologi Pangan: Nutrismart*, 2(2), 98–111. <https://doi.org/10.64146/PZ0F3G10>
- Ihsan, H., Anggraini, W., & Yanuarti, R. (2026). Influence Educational Module on Stunting Prevention and Level of Knowledge of Maternal Behavior in the First 1000 Days of Life for Recipients of the Family Hope Program. *HealthSmart: Jurnal Kesehatan Masyarakat*, 2(1). <https://doi.org/10.64146/1TZBH515>
- Ilmiyani, S. N., Yusuf, N. N., & Aprianti, N. F. (2021). Hubungan Status Gizi dan Anemia pada Ibu dengan Kejadian BBLR di RSUD Dr. R. Soedjono Selong. *ProHealth Journal*, 18(1), 15–20. <https://doi.org/10.59802/phj.202118187>
- Kementerian Kesehatan RI. (2020). Pedoman Pelayanan Antenatal Terpadu (Edisi ke-3).
- Kementerian Kesehatan RI. (2021). Buku Saku Merencanakan Kehamilan Sehat.
- Kementerian Kesehatan RI. (2023a). Buku Saku Pencegahan Anemia pada Ibu Hamil dan Remaja Putri. <https://ayosehat.kemkes.go.id/>
- Kementerian Kesehatan RI. (2023b). Visualisasi Data, Layanan Permintaan Data. <https://layanandata.kemkes.go.id/katalog-data/ssgi/visualisasi-data/visualisasi-ssgi>
- Kumari, D., & Kamal, B. (2026). Childhood Stunting in High-Burden Indian States: Socio-economic Determinants and POSHAN Abhiyaan Exposure. *Jurnal Gizi dan Teknologi Pangan: Nutrismart*, 2(2), 112–123. <https://doi.org/10.64146/XPYQQC85>

- Lein, E. I., Jutomo, L., Nur, M. L., & Picauly, I. (2025). Determinan Kejadian BBLR Pada Kehamilan Remaja di Wilayah Kerja Puskesmas di Pulau Adonara. *Sport Science and Health*, 7(6), 250–261.
- Maulana, M. I., Mauliza, M., Mardiaty, M., Zara, N., & Iqbal, T. Y. (2022). Hubungan Anemia Pada Ibu Hamil Terhadap Kejadian Berat Badan Lahir Rendah di 2 Rumah Sakit Swasta Kota Lhokseumawe Tahun 2020. *AVERROUS: Jurnal Kedokteran dan Kesehatan Malikussaleh*, 8(1), 45–53. <https://doi.org/10.29103/averrous.v8i1.7172>
- Natalia, C. A., Assegg, S. N. Y. R. S., & Nurmainah, N. (2024). Hubungan Kepatuhan Penggunaan Tablet Tambah Darah Pada Ibu Hamil Dengan Kejadian Berat Badan Lahir Rendah. *Pontianak Nutrition Journal (PNJ)*, 7(1), 516–521. <https://doi.org/10.30602/pnj.v7i1.1365>
- Nur, S. A., Sari, I. K., & Morika, H. D. (2022). Hubungan Umur Ibu, Paritas dan Jarak Kehamilan dengan Kejadian Berat Badan Lahir Rendah di RS Bhayangkara Padang. *Jurnal Kesehatan Saintika Meditory*, 5(1), 168–180. <https://doi.org/10.30633/jsm.v5i1.2051>
- Rahim, E., Waluyo, D., & Maesarah, M. (2022). Kepatuhan Ibu Hamil Dalam Konsumsi Tablet Tambah Darah Dengan Kejadian Berat Badan Lahir Rendah. *Jurnal Ilmiah Keperawatan STIKES Hang Tuah Surabaya*, 17(2), 165–170. <https://doi.org/10.30643/jiksht.v17i2.215>
- Tiyasasih, A., Suhartini, T., & Supriyadi, B. (2023). Hubungan Pemberian Zat Besi dalam Kehamilan dengan Kejadian BBLR. *Jurnal Penelitian Perawat Profesional*, 5(1), 209–214. <https://doi.org/10.37287/jppp.v5i1.1408>
- Verma, T., Banerjee, D., & Arjun. (2026). Prevalence and Determinants of Iron Deficiency Anemia Among Pregnant Women and Adolescent Girls. *Jurnal Gizi dan Teknologi Pangan: Nutrismart*, 2(2), 85–97. <https://doi.org/10.64146/GD5AD854>
- Wahyuni, S., Ananti, Y., & Issabella, C. M. (2021). Hubungan Anemia Kehamilan dengan Kejadian Berat Badan Lahir Rendah (BBLR): Systematic Literature Review. *Journal of Health (JoH)*, 8(2), 94–104. <https://doi.org/10.30590/joh.v8n2.p94-104.2021>
- World Health Organization. (2023). *UNICEF/WHO Low Birthweight Estimates: Levels and Trends 2000-2020* (1st ed.).