

# Maternal Risk Factors Associated with Low Birth Weight Infants at The Regional Significant Relationship Technical Implementation Unit Ibnu Sina Lalundu Health Center Donggala Regency Januari-Desember 2024

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## ABSTRACT

The quality of life of future generations is greatly affected by instances of low birth weight, as children's growth and development will encounter obstacles that result in reduced intelligence. Maternal risk factors such as maternal age, parity, nutritional status, and history of illness during pregnancy are suspected to play a significant role in the incidence of low birth weight. This study aims to identify maternal risk factors associated with the occurrence of low birth weight. This study used a case-control design with a total sample of 48 respondents, consisting of 16 cases (infants with low birth weight) and 32 controls (infants with normal birth weight). This study uses secondary data in the form of medical records of mothers giving birth from January to December 2024 at the Regional Technical Implementation Unit (UPTD) of Puskesmas (Community Health Center) Ibnu Sina Lalundu. The research results indicate that maternal risk factors significantly associated with the occurrence of low birth weight are maternal age <20 years or >35 years ( $p=0.010$ ;  $OR=3.2$ ), undernutrition status based on MUAC measurement ( $p=0.001$ ;  $OR=4.1$ ), and a history of anemia during pregnancy ( $p=0.003$ ;  $OR=3.6$ ). The risk factor of parity did not show a significant relationship ( $p>0.05$ ).

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## 1. INTRODUCTION

Birth weight is an important indicator of a newborn's health status and a major determinant of a child's survival, growth, and subsequent development. The World Health Organization (WHO) defines low birth weight (LBW) as a baby born weighing less than 2,500 grams, regardless of gestational age. Low birth weight remains a public health problem in many countries, particularly developing ones, as it significantly contributes to neonatal and infant morbidity and mortality. According to the WHO, the global infant mortality rate (IMR) will reach 25.9 deaths per 1,000 live births in 2023. Of this number, low birth weight (LBW) is the leading cause of infant mortality, accounting for 35.15% of all infant deaths. This is because babies born with low birth weight tend to have a greater risk of morbidity and mortality than babies born with normal birth weight. (WHO, 2023).

Low birth weight (LBW) cases in Indonesia remain quite high, with infant mortality largely attributable to LBW. Low birth weight babies are at risk of disease, vital organ failure, and even death. In 2023, Indonesia ranked fifth in the world for prematurity rates, with a LBW prevalence of 7.1%. This

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situation indicates that efforts to prevent low birth weight (LBW) still face challenges, particularly in rural areas with limited health resources (Kementerian Kesehatan RI., 2023).

Low birth weight (LBW) has both short-term and long-term impacts on infant health. In the short term, LBW increases the risk of asphyxia, hypothermia, hypoglycemia, and neonatal infection. In the long term, LBW babies are at risk of impaired growth and cognitive development, as well as an increased risk of degenerative diseases such as diabetes mellitus and hypertension in adulthood. Neonatal mortality and morbidity, stunted growth and cognitive development, and various chronic diseases later in life are closely linked to LBW. The quality of life of future generations is greatly affected by LBW, as the child's growth and development are hampered, resulting in decreased intelligence (Sari, A. P., Romlah, & Anita, T., 2021; Sari, N., Rasyid, A., & Yusuf, M., 2022; Yuliana, R., & Lestari, D., 2021).

According to the Indonesian Ministry of Health (2023), the incidence of low birth weight (LBW) in Indonesia remains quite high, at around 6.2% of all live births. This condition is influenced by various maternal factors, such as maternal age, parity, pregnancy spacing, nutritional status, pregnancy-related illnesses (such as anemia or preeclampsia), and behavior during pregnancy, including adherence to antenatal care (ANC) checkups. Mothers who are too young (<20 years) or too old (>35 years) have a higher risk of giving birth to low birth weight babies due to suboptimal or declining biological conditions. Similarly, poor maternal nutritional status before and during pregnancy will affect fetal growth in the womb.

The 2023 report from the Central Sulawesi Provincial Health Office shows that the incidence of low birth weight (LBW) in Central Sulawesi Province was 5.53%, or 2,305 cases. Meanwhile, in 2024, the incidence of low birth weight (LBW) decreased to 5.49%, or 2,273 cases. The incidence of LBW in Donggala Regency in 2023 ranked second highest in Central Sulawesi after Parigi Moutong Regency (329 cases or 8.1%), which was 324 cases (8.1%). However, in 2024, Donggala Regency ranked first with the highest number of LBW cases in Central Sulawesi, with 416 cases (8.3%). This number also indicates an increase in LBW cases from the previous year. Meanwhile, the top 5 Community Health Centers in Donggala Regency with the percentage of LBW births are Donggala Community Health Center with 99 babies (16.2%), Lembaga Community Health Center with 61 babies (13.9%), Tambu Community Health Center with 38 babies (9.1%), Dlatope Community Health Center with 35 babies (14.5%), and Tompe Community Health Center with 16 babies (8.1%).

The working area of the Ibnu Sina Lalundu Community Health Center (UPTD) in Donggala Regency is a rural area with limited access to maternal health services. Based on preliminary data obtained from the Community Health Center's medical records, cases of low birth weight babies continue to occur annually, despite various maternal health promotion and intervention efforts. This indicates that risk factors remain uncontrolled, both medically and socioeconomically within the local community.

## 2. METHODS

This study used a case-control design with a total sample of 48 respondents, consisting of 16 cases (infants with low birth weight) and 32 controls (infants with normal birth weight). The data collection technique is secondary data recorded in medical records. The population consists of mothers who gave birth between January and December 2024 at the Regional Technical Implementation Unit (UPTD) of Puskesmas (Community Health Center) Ibnu Sina Lalundu, selected through purposive sampling.

The case-control approach allows researchers to compare risk factor exposure in a group of mothers who gave birth to low-birth-weight babies (cases) with mothers who gave birth to babies with

normal birth weight (controls) during the same period. This model is considered efficient in studying the incidence of relatively rare diseases or conditions, such as low-birth-weight babies, because it can identify risk factors in less time and cost (Setiawan & Sari, 2021; Sastroasmoro & Ismael, 2020). Furthermore, this approach is suitable for studies using secondary data from medical records, where data on events and risk factors have been previously recorded. The analysis was conducted by identifying the odds ratio (OR) as a measure of the association between risk factors and the incidence of LBW.

### 3. RESULTS AND DISCUSSIONS

#### RESULTS

**Table 1. Distribution of Respondents Based on Parity, Nutritional Status, Anemia and LBW Incidence at the UPTD Ibnu Sina Lalundu Health Center, Donggala Regency**

Risk Factor	Case n (%)	Control n (%)	Total N (%)
<b>Mother's age:</b>			
Risk	11 (68,7)	10 (31,3)	21 (43,7)
Not risk	5 (31,3)	22 (68,7)	27 (56,3)
<b>Parity:</b>			
Risk	6 (37,5)	19 (59,4)	25 (52,1)
Not risk	10 (62,5)	13 (40,6)	23 (47,9)
<b>Nutrition Status:</b>			
KEK	12 (75,0)	10 (31,2)	22 (45,8)
Not KEK	4 (25,0)	22 (68,8)	26 (54,2)
<b>Anemia:</b>			
Anemia	13 (81,2)	8 (25,0)	21 (43,7)
Not anemia	3 (18,8)	24 (75,0)	27 (56,3)

Source: Processed Secondary Data 2025

Table 1 shows that in this study, there were more respondents of non-risk age, namely 27 people (56.3%). The proportion of the case group with at-risk age was 68.7%, and those without at-risk age was 31.3%. The proportion of the control group with at-risk age was 31.3%, and those without at-risk age was 68.7%.

The parity risk factor shows that the majority of respondents had at-risk parity, namely 25 people (52.1%). The proportion of the case group with at-risk parity was 37.5%, and those without at-risk parity 62.5%. The proportion of the control group with at-risk parity was 59.4%, and those without at-risk parity 40.6%.

Nutritional status factors show that the majority of respondents had non-CED nutritional status, namely 26 people (54.2%). The proportion of the case group with CED nutritional status was 75% and those with non-CED nutritional status were 25%. The proportion of the control group with CED nutritional status was 31.2%, and those with non-CED nutritional status were 68.8%.

The most common risk factor for anemia was 27 respondents (56.3%) who were not anemic. The proportion of cases with anemia was 81.2%, and those without anemia was 18.8%. The proportion of controls with anemia was 25%, and those without anemia was 75%.

**Table 2. Bivariable Analysis Between Risk Factors and Low Birth Weight (LBW) at the Ibnu Sina Lalundu Community Health Center (UPTD) in Donggala Regency**

Variabel	BBLR		OR	CI	P
	Kasus	Kontrol			
<b>Mother's age:</b>					
Risk	11	10	3,2	1,34-7,12	0,010
Not risk	5	22			
<b>Parity:</b>					
Risk	6	19	1,2	0,42-3,26	0,153
Not risk	10	13			
<b>Nutrition Status:</b>					
KEK	12	10	4,1	2,11-7,15	0,001
Not KEK	4	22			
<b>Anemia:</b>					
Anemia	13	8	3,6	1,87-5,02	0,003
Not anemia	3	24			

Source: Processed Secondary Data 2025

The results of the bivariate analysis of the maternal age variable with LBW have a p value of 0.010 and OR = 3.2. This means that the risk of LBW will increase by 3.2 times in pregnant women with risk ages (<20 and >34 years) compared to pregnant women with non-risk ages (20-34 years) at the UPTD Ibnu Sina. The p value of 0.010 indicates that the age of pregnant women at risk is a significant risk factor (statistically significant) for the incidence of LBW at the UPTD Ibnu Sina Lalundu.

The results of the bivariate analysis of maternal parity variables with LBW have a p value = 0.153 and OR = 1.2. This means that there is no difference in the risk of LBW in pregnant women with parity at risk and pregnant women with parity not at risk of LBW at UPTD Ibnu Sina. The p value = 0.153 indicates that parity is not a significant risk factor (statistically meaningful) for the incidence of LBW at UPTD Ibnu Sina Lalundu.

The results of the bivariable analysis of the nutritional status variable of mothers with LBW have a p value = 0.001 and OR = 4.1. This means that the risk of LBW will increase by 4.1 times in pregnant women with KEK nutritional status compared to pregnant women with non-KE nutritional status at UPTD Ibnu Sina. The p value = 0.001 indicates that the nutritional status of pregnant women with KEK is a significant risk factor (statistically significant) for the incidence of LBW at UPTD Ibnu Sina Lalundu.

The results of the bivariate analysis of the anemia variable with LBW have a p value = 0.003 and OR = 3.6. This means that the risk of LBW will increase by 3.6 times in pregnant women with anemia compared to pregnant women who are not anemic at the UPTD Ibnu Sina. The p value = 0.003 indicates that pregnant women with anemia are a significant risk factor (statistically significant) for the incidence of LBW at the UPTD Ibnu Sina Lalundu.

**Table 3. Multivariable Analysis Between Risk Factors and Low Birth Weight (LBW) at the Ibnu Sina Lalundu Community Health Center (UPTD) in Donggala Regency**

<b>Model 1</b>				
	<b>Variable</b>	<b>OR</b>	<b>CI 95%</b>	<b>Sig</b>
	Mothers Age	0,30	0,01-1,39	0,078
	Nutrition Status	8,13	2,21-20,09	0,005
	Anemia	2,86	1,13-6,14	0,015
	<i>-2 Log Likelihood :</i>	203,191		
	<i>Negelkerke R Square</i>	0,187		
	<i>Overall Percentage</i>	66,1		
<b>Model 2</b>				
	<b>Variable</b>	<b>OR</b>	<b>CI 95%</b>	<b>Sig</b>
	Nutrition Status	8,03	2,71-20,23	0,003
	Anemia	2,73	1,90-6,21	0,010
	<i>-2 Log Likelihood :</i>	204,212		
	<i>Negelkerke R Square</i>	0,178		
	<i>Overall Percentage</i>	79,7		

The results of the multivariable analysis in Table 3 show that, from model one to model two, the nutrition status variable consistently has a high OR value in each model. Based on model two, it can be concluded that the nutrition status variable contributes 79.7% to the incidence of low birth weight (LBW) at the Ibnu Sina UPTD Lalundu.

## DISCUSSIONS

The results of the study showed that there was a significant relationship between maternal age and the incidence of low birth weight (LBW) babies at the UPTD Ibnu Sina Lalundu Health Center, Donggala Regency. Mothers who gave birth at the age of <20 years or >35 years had a higher risk of giving birth to babies with low birth weight compared to mothers aged 20–35 years. These findings are consistent with previous studies that report maternal age as a significant determinant of LBW incidence. Research by Dewi, A. P., Pratiwi, N. D., & Susanti, R. (2022) in Sleman Regency showed that mothers aged <20 and >35 years had a 3.1 times greater risk of giving birth to LBW babies compared to those aged 20–35 years. Similar results were also reported by Fitriani, L., Rahma, N., & Wahyuni, S. (2021) in East Java, who found that maternal age was significantly associated with infant birth weight ( $p=0.001$ ).

Biological factors form a strong basis for this relationship. Mothers under 20 years of age are generally not yet at an optimal physical development stage for pregnancy, which can disrupt the supply of nutrients to the fetus (Zulfa, R. A., Wibowo, Y., & Hartini, T., 2020). This condition can lead to intrauterine growth restriction (IUGR), which can lead to low birth weight (LBW). Conversely, at age 35 years and above, there is an increased risk of pregnancy complications such as hypertension, preeclampsia, gestational diabetes, and placental disorders, which can inhibit fetal growth (Khatun, N., Islam, S., & Rahman, M., 2021). In addition to biological factors, socioeconomic and psychological factors also influence the outcome. Mothers who marry and become pregnant at a young age often have

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low levels of education and health literacy, leading to less attention to nutritional status and antenatal care (Rahman, A., Tuminah, S., & Nugroho, P., 2023). This increases the risk of low birth weight (LBW). Meanwhile, older mothers often experience decreased reproductive function, egg quality, and uterine elasticity, which can impact uteroplacental blood flow (Nahar, S., Rahman, A., & Hossain, M. I., 2020).

The results of the study showed that maternal parity had no significant relationship with the incidence of Low Birth Weight (LBW) in the working area of the Ibnu Sina Lalundu Community Health Center (UPTD) in Donggala Regency ( $p > 0.05$ ). The analysis showed that the proportion of mothers with low, medium, and high parity was relatively equal between the case and control groups. Thus, in this study, parity was not proven to be a risk factor for the incidence of LBW. These results align with several previous studies that also found no significant association between parity and the incidence of low birth weight (LBW). Research by Handayani, E., Nugraheni, E., & Sari, D. (2022) in Bantul Regency showed that parity was not a major determinant of birth weight ( $p=0.238$ ). Similarly, research by Rahmawati & Susilowati (2020) in Central Java found that although the proportion of low birth weight was slightly higher in primiparas, it was not statistically significant.

According to reproductive epidemiology theory, parity is often associated with the physiological condition of the uterus and the mother's readiness for pregnancy. However, this relationship is not always consistent, as the effect of parity can be influenced by other factors such as maternal age, nutritional status, pregnancy spacing, and socioeconomic conditions (Hennekens & Buring, 2019). In multiparous mothers, the body has already adapted to previous pregnancies, but at high parity ( $\geq 4$ ), there is an increased risk of obstetric complications such as anemia and placental disorders, which can lead to low birth weight (LBW) (Nahar, S., Rahman, A., & Hossain, M. I., 2020). However, in this study, the lack of a relationship between parity and LBW was likely due to the relatively homogeneous distribution of parity and the limited sample size. Most respondents were in the moderate parity category (2–3 deliveries), which is physiologically considered optimal for pregnancy (Fitriani, L., Rahma, N., & Wahyuni, S., 2021).

The results of the study showed that maternal nutritional status based on Mid-Upper Arm Circumference (MUAC) measurements had a significant relationship with the incidence of Low Birth Weight (LBW) in the working area of the UPTD Ibnu Sina Lalundu Health Center, Donggala Regency ( $p < 0.05$ ). Pregnant women with a MUAC  $< 23.5$  cm, who were categorized as having Chronic Energy Deficiency (CED), had a higher proportion of giving birth to LBW babies compared to mothers with a MUAC  $\geq 23.5$  cm. These findings indicate that maternal nutritional status before and during pregnancy is a critical factor influencing intrauterine fetal growth and birth weight. Mothers with CED experience energy and protein deficits, which disrupt the supply of nutrients to the fetus through the placenta, thus inhibiting fetal growth and increasing the risk of LBW (World Health Organization, 2022).

The results of this study are consistent with research conducted by Wulandari & Prameswari (2020) in Surabaya, which found that mothers with CED had a 3.4 times greater risk of giving birth to LBW babies compared to mothers with normal nutritional status ( $p=0.004$ ). Research by Fitriani, D., Asriani, A., & Nurul, H. (2021) in Bone Regency also showed that mothers with a MUAC  $< 23.5$  cm had a 2.7 times higher chance of having a LBW birth (OR=2.71; 95% CI=1.45–5.06). Similar results were reported by Khatun, N., Islam, S., & Rahman, M. (2021) in Bangladesh, who found that chronic energy deficiency during pregnancy was strongly correlated with low birth weight, especially in populations with low socioeconomic status.

Maternal nutritional status in pregnant women reflects a long-term energy deficit that disrupts metabolic function and nutrient transport from the mother to the fetus (Rahayu, A., Sari, N. D., & Puspitasari, T., 2022). Energy and protein deficiencies lead to decreased placental growth hormone synthesis and impaired uterine blood perfusion, ultimately limiting fetal growth and leading to low birth weight (Siregar, M. L., Lubis, R. H., & Gultom, N. 2021; Black et al. 2021). Furthermore, micronutrient deficiencies, particularly iron, zinc, and folate, also contribute to the risk of LBW. Yuliana, R., & Lestari, D. (2021) explain that CED is often accompanied by micronutrient deficiencies that impair fetal oxygen transport and metabolism. These nutritional deficiencies can lead to intrauterine growth restriction (IUGR), a major cause of LBW.

The results of the study showed a significant association between a history of anemia in pregnant women and the incidence of Low Birth Weight (LBW) in the Ibnu Sina Lalundu Community Health Center (UPTD) working area, Donggala Regency ( $p < 0.05$ ). Pregnant women with anemia had a higher proportion of LBW than those without anemia. This indicates that anemia during pregnancy is a significant risk factor for infant birth weight. Anemia in pregnancy, particularly iron deficiency anemia, is a common nutritional problem in developing countries, including Indonesia. According to the World Health Organization (WHO, 2023), anemia is defined as a hemoglobin level  $< 11$  g/dL in the first and third trimesters, or  $< 10.5$  g/dL in the second trimester. Anemia reduces the blood's oxygen-carrying capacity, leading to chronic fetal hypoxia, which can inhibit intrauterine growth and lead to low birth weight (LBW) (Rahman, A., Tuminah, S., & Nugroho, P. (2023).

The results of this study are consistent with research by Fitriani, D., Asriani, A., & Nurul, H. (2021) in Bone Regency, which found that pregnant women with anemia had a 3.2 times higher risk of giving birth to low birth weight babies compared to mothers without anemia ( $p = 0.001$ ). Similar findings were reported by Ahmed, F., Khan, M. R., & Alam, M. (2020) in Bangladesh, which showed that maternal anemia was significantly associated with low birth weight (LBW) with an adjusted odds ratio (AOR) of 2.64 (95% CI: 1.89–3.70). Research by Nurbaiti and Lestari (2022) in Central Sulawesi also reported that the prevalence of low birth weight was higher in anemic mothers (36.4%) than in non-anemic mothers (14.2%).

Physiologically, anemia in pregnancy reduces the supply of oxygen and nutrients to the placental tissue, resulting in impaired fetal growth (Intrauterine Growth Restriction/IUGR) (Black et al., 2021). Hemoglobin deficiency reduces maternal blood oxygen levels and causes chronic fetal hypoxia. This condition can slow cellular metabolism and reduce the synthesis of proteins and enzymes essential for fetal growth (Rahayu, A., Sari, N. D., & Puspitasari, T., 2022). Furthermore, anemia in the first and middle trimesters of pregnancy has a greater impact on birth weight than anemia in the final trimester, as the early stages of pregnancy are a critical period for fetal organ and tissue formation (Tuminah, S., Rahman, A., & Dewi, N., 2023). Therefore, detecting and treating anemia from the first trimester is crucial in preventing low birth weight (LBW).

Based on the results of multivariable analysis, it was found that maternal nutritional status was the most dominant risk factor for the incidence of LBW at UPTD Ibnu Sina Lalundu.

#### 4. CONCLUSION

The results of the study showed that several maternal factors had a significant relationship with the incidence of Low Birth Weight (LBW) in the working area of the UPTD Ibnu Sina Lalundu Health

Center, Donggala Regency, for the period January–December 2024. These factors included maternal age, maternal nutritional status (Chronic Energy Deficiency/KEK), and history of anemia during pregnancy. In contrast, maternal parity in this study did not show a significant association with the incidence of LBW. This indicates that parity does not directly influence birth weight but may interact with other factors such as maternal age and nutritional status. The maternal nutritional status was the most dominant risk factor for the incidence of LBW at UPTD Ibnu Sina Lalundu.

Overall, the results of this study confirm that efforts to prevent LBW at the primary care level need to focus on strengthening reproductive health and nutrition programs for pregnant women, particularly in monitoring gestational age, improving nutritional status, and preventing and controlling anemia.

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