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Birth Weight and Gestational Age Significantly Associated with Infant Mortality at Bahteramas Regional General Hospital, Southeast Sulawesi, in 2025

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Abstract

Infant mortality remains an important indicator of public health and reflects the quality of maternal and neonatal health services. Low birth weight (LBW) and gestational age that is not in accordance with the pregnancy period are two major biological factors that contribute to an increased risk of infant mortality. At Bahteramas Regional General Hospital, as a provincial referral hospital, infant mortality cases still occur every year, requiring a more specific analysis of the determinants. This study aims to determine the relationship between birth weight and gestational age and infant mortality at Bahteramas Regional General Hospital. The research method used an observational study with a *cross-sectional* approach based on medical record data. The sample used total sampling, covering all infants who died at the Bahteramas Regional General Hospital in Southeast Sulawesi Province from 2024 to November 2025, totaling 153 infant deaths. Data analysis was performed using the chi-square test and logistic regression. The results showed that birth weight had a significant relationship with infant mortality, with LBW infants having a higher probability of death than infants with normal birth weight. Gestational age also had a significant effect, with premature infants having a higher risk of death than full-term infants. The conclusion of this study is that birth weight and gestational age are important determinants of infant mortality at Bahteramas Regional General Hospital. Strengthening early detection of pregnancy risks, monitoring antenatal care, and optimizing neonatal services are essential to reduce infant mortality rates.

Keywords: Birth Weight; Gestational Age; Infant Mortality; Hospital; Southeast Sulawesi

1. Introduction

The Infant Mortality Rate (IMR) is one of the main indicators in assessing the level of public health, as it describes the probability of a child dying before reaching one year of age. IMR also reflects social, economic, environmental conditions, and the quality of community access to health services, sanitation, and nutrition (1). The Sustainable Development Goals (SDGs) target a reduction in IMR to less than 12 per 1,000 live births by 2030 (2). Despite a 44% global decline since 2000, the risk of death in the first month of life remains high, mainly due to a lack of skilled care and inadequate monitoring of pregnancy, detection of complications, and delivery and postpartum services (3).

Globally, Indonesia ranks 80th out of 227 countries in infant mortality rates, with 18.9 deaths per 1,000 live births in 2024 (4). In 2023, the national infant mortality rate was recorded at 16.85 per 1,000 live births, meaning Indonesia still needs to reduce the infant mortality rate by 4.85 points to achieve the SDGs target (5). This challenge is further complicated by the increase in under-five mortality, which reached 34,226 cases in 2023, with 80.4% of these occurring in the neonatal period (6).

In Southeast Sulawesi Province, the IMR showed a significant increase, from 148 cases in 2019 to 456 cases in 2020. After that, the mortality rate remained high at around 400 cases per year until 2023 (7). Various factors such as the 4 Too's (too

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young, too old, too close birth spacing, too many children) and the Three Too Late's (too late to make a decision, too late to reach referral facilities, too late to get help) also contribute to the high maternal and infant mortality rates (8).

Based on data searches conducted by researchers to date, there has been no research on the determinants of infant mortality in Southeast Sulawesi. The determinants of infant mortality based on research by Sari et al. (2025) show that the main cause of death is low birth weight (LBW), which accounts for 46% of deaths. Most deaths (52%) occur in infants aged 0-6 days, with males dominating. As for maternal factors, most infant deaths occurred in mothers aged 20-35 years, accounting for 74% of deaths (9). Research by Sajrah et al (2024) found that gestational age (pregnancy age) and birth weight were also significantly associated with infant mortality (10).

Meanwhile, research by Dias et al (2023) in Espirito Santo, Brazil, analyzed data from 5,089 infant mortality cases and found that premature birth, postnatal mortality, and birth weight between 3,000 and 4,000 grams had higher indications of preventable infant mortality (11). Therefore, this study recommends strengthening maternal and child health services to detect high-risk pregnancies during the prenatal period and integrating perinatal networks in a comprehensive manner.

Various causes of infant mortality can serve as a basis for evaluating efforts to reduce the infant mortality rate (IMR) through the recording and reporting of mortality data. The recording and reporting of mortality data in hospitals is carried out by utilizing mortality statistics in health care facilities sourced from medical records. The evaluation of the Infant Mortality Rate (IMR) sourced from medical records can be used as a basis for health care facilities in determining policies to address various causes of infant mortality in order to reduce the infant mortality rate in the coming year (12).

Bahteramas Regional General Hospital, as the main referral hospital in Southeast Sulawesi, faces fluctuating infant mortality patterns. In 2022, there were 110 infant deaths, in 2023 there were 88 infant deaths, and in 2024 there were 103 infant deaths, with the majority of deaths occurring at 0–6 days of age. The dominant causes were respiratory disorders, pneumonia, hypoxia, and congenital malformations (13). This variation underscores the need for further study of the determinants of infant mortality at this hospital.

Based on this description, this study aims to analyze the determinants of infant mortality at the Bahteramas Regional General Hospital in Southeast Sulawesi, particularly in relation to birth weight, gestational age, and other maternal and neonatal factors. The results of this study are expected to provide a clear picture of the main causes, which can then be used as a basis for hospital management and the local Health Office to develop effective policies and programs to reduce infant mortality and improve the quality of neonatal health services at the Bahteramas Regional General Hospital in Southeast Sulawesi.

2. Material and methods

This study is an observational study. The design used is *cross-sectional* with secondary data derived from patient medical records. The study population consists of all infants who died at the Bahteramas Regional General Hospital in Southeast Sulawesi Province from 2024 to November 2025, totaling 153 infant deaths, using *total sampling*. The tool used in this study was an observation sheet. Data collection techniques were carried out through observation or review of medical records (MR) during the period January 2024 to November 2025 at Bahteramas Regional General Hospital. The observation sheet was one of the data instruments used by researchers as a tool to assist in indirect data collection. The independent variables in this study were birth weight and gestational age, while the dependent variable was infant mortality. Data analysis was performed using chi-square analysis and logistic regression with the help of SPSS.

3. Results

3.1. Respondent Characteristics

3.1.1. Infant Gender

The characteristics of respondents according to infant gender at the Bahteramas Regional General Hospital in Southeast Sulawesi can be seen in the following table:

Table 1 Frequency Distribution of Respondent Characteristics Based on Infant Gender at Bahteramas Regional General Hospital, Southeast Sulawesi, 2025

No.	Gender	f	%
1.	Male	83	54.2
2.	Women	70	45.8
Total		153	100

Source: Secondary Data 2025

Table 1 shows that of the 153 respondents, the highest gender was male, numbering 83 babies (54.2%), and the lowest was female, numbering 70 babies (45.8%).

3.1.2. Economic Status

The characteristics of respondents according to economic status at the Bahteramas Regional General Hospital in Southeast Sulawesi can be seen in the following table:

Table 2 Frequency Distribution of Respondent Characteristics Based on Economic Status at Bahteramas Regional General Hospital, Southeast Sulawesi, 2025

No.	Economic Status	f	%
1.	Low	86	56.2
2.	Moderate	55	36
3.	High	12	7.8
Total		153	100

Source: Secondary Data 2025

Table 2 shows that of the 153 respondents, those with the highest economic status were respondents with low economic status, numbering 86 people (56.2%). Meanwhile, those with medium economic status numbered 55 people (36%), and the lowest were those with high economic status, numbering 12 people (7.8%).

3.2. Univariate Analysis

3.2.1. Infant Mortality

The frequency distribution of respondents according to infant mortality at the Bahteramas Regional General Hospital in Southeast Sulawesi can be seen in the following table:

Table 3 Frequency Distribution of Respondents Based on Infant Mortality at Bahteramas Regional General Hospital, Southeast Sulawesi, 2025

No.	Infant Mortality	f	%
1.	Neonatal Mortality (0-28 days)	121	79.1
2.	Non-Neonatal Deaths	32	20.9
Total		153	100

Source: Secondary Data 2025

Table 3 shows that of the 153 respondents, the highest number of infant deaths occurred in the neonatal period (0-28 days), totaling 121 infants (79.1%), while the lowest number occurred outside the neonatal period, totaling 32 infants (20.9%).

3.2.2. Birth Weight

The frequency distribution of respondents according to birth weight at the Bahteramas Regional General Hospital in Southeast Sulawesi can be seen in the following table:

Table 4 Frequency Distribution of Respondents Based on Birth Weight at Bahteramas Regional General Hospital, Southeast Sulawesi, 2025

No.	Birth Weight	f	%
1.	Low Birth Weight (LBW)	95	62.1
2.	Normal Birth Weight (NBW)	56	36.6
3.	High Birth Weight (HBW)	2	1.3
Total		153	100

Source: Secondary Data 2025

Table 4 shows that of the 153 respondents, the highest birth weight was low birth weight (LBW), with 95 babies (62.1%). Normal birth weight (NBW) was 56 babies (36.6%). The lowest was high birth weight, with 2 babies (1.3%).

3.2.3. Gestational Age

The frequency distribution of respondents according to gestational age at Bahteramas Regional General Hospital, Southeast Sulawesi, can be seen in the following table:

Table 5 Frequency Distribution of Respondents Based on Gestational Age at Bahteramas Regional General Hospital, Southeast Sulawesi, 2025

No.	Gestational Age	f	%
1.	Preterm	89	58.2
2.	Full term	60	39.2
3	Postterm	4	2.6
Jumlah		153	100

Source: Secondary Data 2025

Table 5 shows that of the 153 respondents, the highest gestational age was in the preterm gestational age group, with 89 babies (58.2%). Meanwhile, the term gestational age group had 60 babies (39.2%). The lowest was in the postterm gestational age group, with 4 babies (2.6%).

3.3. Bivariate Analysis

3.3.1. Relationship Between Birth Weight and Infant Mortality

The relationship between birth weight and infant mortality at Bahteramas Regional General Hospital in Southeast Sulawesi can be seen in the following table:

Table 6 shows that of the 153 respondents, the most dominant factor was low birth weight (LBW), with 95 respondents (62.1%) experiencing neonatal death and 10 respondents (6.5%) not experiencing neonatal death. Meanwhile, among those with Normal Birth Weight (NBW), there were 56 respondents (36.6%), with 34 respondents (22.2%) experiencing neonatal death and 22 respondents (14.4%) not experiencing neonatal death. The lowest factor was high birth weight (BBLL), with 2 respondents (1.3%) experiencing neonatal death.

Furthermore, the results of the statistical test using the *Chi-square* analysis showed a p-value of 0.000 < α 0.05, so Ha was accepted and H0 was rejected, which means that birth weight is related to infant mortality.

Table 6 Distribution of the Relationship Between Birth Weight and Infant Mortality at Bahteramas Regional General Hospital, Southeast Sulawesi, 2025

	Infant Mortality				**Total**		
Birth Weight	Neonatal Mortality (0-28 days)		Non-Neonatal Deaths		f	%	*P-value*
	f	%	f	%			

Low Birth Weight (LBW)	85	55.6	10	6.5	95	62.1	
Normal Birth Weight (NBW)	34	22.2	22	14.4	56	36.6	0.000
High Birth Weight (HBW)	2	1.3	0	0,0	2	1.3	
Total	121	79.1	32	20.9	153	100	

Source: Secondary Data 2025

3.3.2. Relationship Between Gestational Age and Infant Mortality

The relationship between gestational age and infant mortality at Bahteramas Regional General Hospital in Southeast Sulawesi can be seen in the following table:

Table 7 Distribution of the Relationship between Gestational Age and Infant Mortality at the Bahteramas Regional General Hospital in Southeast Sulawesi in 2025

	Infant Mortality				**Total**		
Gestational Age	Neonatal Mortality (0-28 days)		Non-Neonatal Deaths		f	%	*P- value*
	f	%	f	%			
Preterm	78	51.0	11	7.2	89	58.2	
Full term	40	26.1	20	13.1	60	39.2	0.008
Postterm	3	1.9	1	0.7	4	2.6	
Total	121	79.0	32	21.0	153	100	

Source: Secondary Data 2025

Table 7 shows that of the 153 respondents, the most dominant factor was preterm gestational age, with 89 respondents (58.2%) experiencing neonatal death and 11 respondents (7.2%) not experiencing neonatal death. Meanwhile, among full-term pregnancies (Aterm), there were 60 respondents (39.2%), with 40 respondents (26.1%) experiencing neonatal death and 20 respondents (13.1%) not experiencing neonatal death. The lowest factor was post-term gestational age, with 4 respondents (2.6%), distributed as 3 respondents (2.0%) experiencing neonatal death and 1 respondent (0.7%) not experiencing neonatal death.

Furthermore, the results of the statistical test using the *Chi-square* analysis showed a p-value of 0.008 < α 0.05, so Ha was accepted and H0 was rejected, which means that gestational age is related to infant mortality.

3.4. Multivariate Analysis

Multivariate analysis was performed using *multiple* logistic regression statistical testing. The prediction model included candidate model selection and multivariate analysis model creation.

Table 9 multivariate analysis shows that normal birth weight has *a p-value of* 0.031 < 0.05, indicating that normal birth weight is significantly associated with infant mortality. Statistically, normal birth weight shows an OR (15.713), where babies with normal birth weight are 15.713 times less likely to experience neonatal mortality compared to babies with low birth weight (LBW). Meanwhile, full-term gestational age has *a p-value* of 0.037 < 0.05, indicating that full-term gestational age is significantly associated with infant mortality. Statistically, full-term gestational age shows an OR (0.065), where full-term infants are 0.065 times less likely to experience neonatal mortality compared to preterm infants, who are more prone to neonatal mortality.

Table 8 Multivariate Analysis of Infant Mortality Variables at Bahteramas Regional General Hospital, Southeast Sulawesi, 2025

Variable	**Neonatal Mortality (0-28 days)**	**Non-Neonatal Mortality**	**Sig**	**OR**
Birth Weight: Low Birth Weight (LBW)	85	10	0.099	

Normal Birth Weight (NBW)	34	22	0.031	15.713
High Birth Weight (HBW)	2	0	1.000	882.856.780
Gestational Age: Preterm Gestation	78	11	0.115	
Full-Term Gestation	40	20	0.037	0.065
Postterm Gestation	3	1	0.997	70.663.887

Source: Secondary Data 2025

4. Discussion

4.1. Relationship between Birth Weight and Infant Mortality

The results show that the most dominant factor is low birth weight (LBW), with 95 respondents (62.1%) and a distribution of 85 respondents (55.6%) experiencing neonatal mortality. The statistical test using *Chi-square* analysis showed a p-value of 0.000 < α 0.05, so Ha was accepted and H0 was rejected, indicating that there is a relationship between birth weight and infant mortality. Multivariate analysis results show that normal birth weight has *a p-value* of 0.031 < 0.05, indicating that normal birth weight is significantly associated with infant mortality. Statistically, normal birth weight shows an OR (15.713), where infants with normal birth weight are 15.713 times more likely to not experience neonatal mortality compared to infants with low birth weight (LBW).

This is in line with the study by Sari et al (2025) that the characteristics of infants who died aged 0-11 months at the Kediri District Hospital in the first to third quarters based on weight showed that the highest infant mortality occurred in low birth weight (LBW) infants, with 23 cases (46%), and the highest age of infants who died was in the 0–6 day range, with 26 cases (52%) (9). . This is in line with the study by Ramadhan et al (2023), which found that the *chi-square* test between the variables of low birth weight and neonatal mortality showed a statistically significant relationship (P value < 0.001). This study found a *prevalence odds ratio* of 12.46 (95% CI=8.00–19.40) for LBW in relation to neonatal mortality (14). Research by Diaz et al (2023) also shows that birth weights between 3,000 and 4,000 grams indicate a higher probability of preventable infant mortality. Furthermore, medical care is more likely to prevent infant mortality only for the ICE method (11).

Low birth weight babies (LBW) are babies who weigh less than 2,500 grams at birth, regardless of gestational age or pregnancy duration. Since 1961, the WHO has replaced the term premature baby with low birth weight baby (LBW). This is because not all babies born weighing less than 2,500 grams are born prematurely. The birth weight of a baby refers to the weight measured one hour after birth. Many people still assume that LBW only occurs in premature or under-term babies. However, LBW can occur not only in premature babies, but also in full-term babies who experience growth retardation during pregnancy (15).

One of the most significant dangers for LBW babies is airway obstruction. This can lead to asphyxia, hypoxia, and ultimately death. In addition, LBW babies have difficulty adapting if asphyxia occurs during the birth process, resulting in perinatal asphyxia at birth. LBW babies are at risk of apnea and surfactant deficiency, preventing them from obtaining sufficient oxygen, which they previously obtained from the placenta. In such conditions, immediate airway management is required after birth. This action can prevent asphyxia, thereby reducing the mortality rate of LBW babies (15).
According to the researchers' assumptions, low birth weight (LBW) is generally influenced by poor maternal nutrition during pregnancy, and this condition puts babies at a higher risk of death and illness compared to babies with normal birth weight. LBW babies have a lower chance of survival because they are more susceptible to diseases such as asphyxia, infection, hypothermia, and organ failure. This vulnerability makes it difficult for babies to adapt after birth and increases the likelihood of severe complications that can lead to neonatal death. To prevent death in LBW babies, it is necessary to optimize neonatal care by ensuring adequate nutrition for mothers during pregnancy, early detection of risks, immediate management after birth such as maintaining warmth, clearing the airway, and providing breastfeeding and Kangaroo Mother Care (KMC) methods, all of which aim to reduce complications and increase the chances of survival for LBW babies.

4.2. Relationship between Gestational Age and infant mortality

The results of the study show that the most dominant factor is preterm gestational age, with 89 respondents (58.2%) and a distribution of 78 respondents (51.0%) experiencing neonatal mortality. Statistical testing using *Chi-square* analysis showed a p-value of 0.008 < α 0.05, so Ha was accepted and H0 rejected, indicating a relationship between gestational age and infant mortality. Multivariate analysis results show that full-term gestational age has *a p-value of* 0.037 < 0.05,

indicating that full-term gestational age is significantly related to infant mortality. Statistically, full-term gestational age shows an OR (0.065), where full-term babies are 0.065 times less likely to experience neonatal death compared to premature babies, who are more prone to neonatal death.

This is in line with the study by Sajrah et al (2024), which showed that the statistical test results obtained *a p-value* = 0.001 (*p-value* < 0.05), indicating a significant relationship between gestational age and infant mortality in Majene Regency. The OR value is 8.703 (95% CI: 2.783 - 27.214), which means that babies born at a risky gestational age (<37 weeks) are 8.7 times more likely to experience death than babies born at a non-risky gestational age (≥37 weeks) (10). In line with Diaz et al (2023), infant mortality cannot be prevented due to gestational age of less than <37 weeks, which provides a significance of 20% for both ICE and SEADE prevention methods (11). According to the study by Predani et al (2024), preterm gestational age shows a p-value of 0.000 and a PR of 2.52 with a 95% CI: 1.68-3.89. Thus, neonates with a gestational age of less than 37 weeks are at higher risk of death compared to those born at 37 weeks of gestation (16).

Premature babies have a 70 times higher risk of death, especially those born at less than 32 weeks of gestation. This is due to the immaturity of their organ systems. The organs that are not yet mature are the lungs, liver, heart, kidneys, and the gastrointestinal (digestive) system, which causes problems adapting to life outside the womb (15). Premature birth, which occurs at a gestational age of <37 weeks, is one of the predictors of low birth weight. Gestational age plays an important role in determining birth weight. Babies born before term, whether due to gynecological or medical factors, are at higher risk of being born LBW, because growth at < 37 weeks has not reached the optimal stage of growth and development, thus increasing the risk of being born weighing < 2,500 grams (17).

According to researchers' assumptions, preterm gestational age is a major factor that increases the risk of infant mortality, especially during the neonatal period, because babies born before reaching organ maturity face various adaptation problems, particularly in the respiratory and digestive systems and in their ability to maintain vital functions after birth. This condition makes neonates with a gestational age of <37 weeks far more susceptible to complications such as asphyxia, growth disorders, and organ failure compared to full-term babies, thereby significantly increasing the likelihood of death. Immediate postnatal care, including maintaining warmth, assisting with breathing, administering surfactant if necessary, caring for the infant in a neonatal unit with close monitoring, ensuring nutritional needs are met through breastfeeding or feeding tubes, and educating parents to support continued care at home, is crucial in preventing neonatal mortality.

5. Conclusion

The study results indicate that birth weight and gestational age are the primary determinants of infant mortality at Bahteramas Regional General Hospital in Southeast Sulawesi. Infants with LBW have a higher risk of neonatal mortality than infants with normal birth weight, as indicated by a significant association (p=0.000) and lower survival rates. In addition, preterm infants also have a much higher risk of mortality than full-term infants (p=0.008) due to organ immaturity that hinders postnatal adaptation. Multivariately, these two variables were found to be the most influential determinants of infant mortality. These findings emphasize the importance of strengthening pregnancy monitoring, early risk detection, and optimizing neonatal services to prevent infant mortality in health facilities.

Compliance with ethical standards

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Disclosure of Conflict of interest

There is no conflict of interest in this research.

Statement of informed consent

Informed consent was not applicable for this study as it did not involve human participants.

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