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The Factors Affecting The Occurrence of Neonatal Respiratory Distress (RDN) in The Neonatal Intensive Care Unit at RSUD Undata

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Abstract
Introduction: *In 2022, about 15% of infants treated in the NICU of RSUD Undata experienced respiratory distress neonatal (RDN), mostly related to preterm birth and neonatal infection.* ***Objective:*** *To identify factors influencing RDN in the NICU of RSUD Undata.* ***Methods:*** *A quantitative cross-sectional study conducted from August to October 2025 involving 43 mothers selected through purposive sampling. Univariate analysis described variable distribution, while logistic regression identified factors associated with RDN.* ***Results and Discussion:*** *Logistic regression showed a Chi-Square of 42.396 (p = 0.000), indicating that low birth weight (LBW), neonatal infection, gestational diabetes, and maternal age simultaneously affected RDN. Partially, LBW (p = 0.016), neonatal infection (p = 0.028), and gestational diabetes (p = 0.041) significantly influenced RDN, while maternal age (p = 0.417) did not.* ***Conclusion:*** *LBW, neonatal infection, and gestational diabetes significantly contributed to RDN, with LBW as the most dominant factor.*

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Introduction

Neonatal Respiratory Distress (NRD) is one of the leading causes of neonatal morbidity and mortality, particularly among preterm and low birth weight (LBW) infants. This condition occurs due to the immaturity of the neonatal respiratory system and may be caused by several factors, including hyaline membrane disease (HMD), impaired respiratory transition, and respiratory tract infections (Aditya & Putra, 2022). Globally, NRD remains a serious health problem, especially in developing countries, with approximately 10–15% of preterm infants requiring intensive care in the Neonatal Intensive Care Unit (NICU) due to respiratory disorders (WHO, 2020).

In Indonesia, the neonatal mortality rate remains relatively high, at 15 per 1,000 live births according to the 2022 Indonesia Demographic and Health Survey, which has not yet met the Sustainable Development Goals (SDGs) target of fewer than 12 deaths per 1,000 live births by 2030. This situation is more concerning in Central Sulawesi Province, where the neonatal mortality rate reaches 28 per 1,000 live births, significantly exceeding the national average. Neonatal Respiratory Distress is reported as one of the leading causes of neonatal mortality in this region, particularly among preterm and LBW infants (Central Sulawesi Provincial Health Office, 2021).

As a referral hospital in Central Sulawesi, RSUD Undata faces similar challenges. Data from the NICU of RSUD Undata in 2022 showed that approximately 15% of infants admitted to the NICU experienced NRD, with most cases associated with preterm birth and neonatal infection. Other contributing factors, such as maternal gestational diabetes, also increase the incidence of NRD through delayed fetal lung maturation (Kim et al., 2020). Previous studies have identified prematurity, low birth weight, and male sex as the dominant risk factors for NRD in NICU settings (Aditya & Putra, 2022).

NRD is often exacerbated by neonatal infections such as sepsis and pneumonia, particularly in preterm and LBW infants whose immune systems are not fully developed (Choi, 2020; Chawanpaiboon et al., 2019). This condition frequently requires intensive respiratory support, including Continuous Positive Airway Pressure (CPAP) or mechanical ventilation. However, limitations in healthcare resources and challenges in infection management within NICUs may hinder optimal treatment (Saugstad, 2021).

A preliminary study conducted at UPT RSUD Undata found that during 2023–2024 there were 101 neonatal deaths, with approximately 40% of cases associated with NRD as the primary contributing factor, followed by low birth weight (30%), preterm birth (20%), and neonatal infections (10%). These findings indicate that NRD remains a major contributor to neonatal mortality at RSUD Undata. Therefore, early identification of risk factors and strengthening evidence-based neonatal care are essential to reduce neonatal mortality and support the achievement of the SDGs target (Manuaba, 2023).

Method

This study is a quantitative research with a cross-sectional design, conducted at Undata General Hospital, Central Sulawesi Province, from August to October 2025. The study population consisted of mothers whose babies were treated in the Neonatal Intensive Care Unit (NICU) of Undata Hospital. The sample size was determined using an estimation formula for an unknown population, resulting in 43 respondents. The sampling technique used in this study was purposive sampling.

Univariate analysis was performed to describe the frequency distribution of each variable, including the independent variables (low birth weight/LBW, neonatal infection, gestational diabetes, and maternal age) and the dependent variable (respiratory distress

neonatal/RDN). To examine the influence of the independent variables on the dependent variable, logistic regression analysis was used, as the dependent variable (RDN) is categorical with two categories (yes or no).

Result and Discussion
1. Result
Univariate Analysis
Univariate analysis was conducted to describe the distribution of each research variable, both independent and dependent. The results are presented in frequency tables to provide an overview of respondent characteristics and the conditions of infants treated in the Neonatal Intensive Care Unit (NICU) of Undata Hospital. The distribution of each variable is presented in the following table:

1) Low Birth Weight (LBW)
The distribution of Low Birth Weight (LBW) in the NICU of Undata Hospital is presented in the following table:

Table 1
Distribution of Respondents Based on LBW

Duration of Internet Use	f	%
Experience	20	46.5
Normal	23	53.5
Total	**43**	**100**

Source: Primary Data, 2025

Based on Table 1, out of 43 respondents, 20 (46.5%) mothers had infants with LBW, while 23 (53.5%) did not.\.

2) Neonatal Infection
The distribution of neonatal infection in the NICU of Undata Hospital is presented in the following table:

Table 2
Social Media Use

Social Media Use	f	%
Experience	24	55.8
No Experience	19	44.2

Source: Primary Data, 2025

Based on Table 2, 24 respondents (55.8%) had infants who experienced neonatal infection, while 19 (44.2%) did not.

3) Gestational Diabetes
The distribution of gestational diabetes in the NICU of Undata Hospital is shown below:

Table 3
Distribution of Respondents Based on Gestational Diabetes

Cyberbullying	f	%
Experience	24	55.8
Normal	19	44.2
Total	**43**	**100**

Source: Primary Data, 2025

Based on Table 3, 24 respondents (55.8%) experienced gestational diabetes, while 19 (44.2%) did not.

4)   **Maternal Age**

The distribution of maternal age is shown in the following table:

Table 4

Distribution of Respondents Based on Online Gaming

Online Game	f	%
< 20 years	2	4.7
20 - 35 year	27	628
> 35 year	14	32.6
Total	**43**	**100**

Source: Primary Data, 2025

Based on Table 4, most mothers were aged 20–35 years (27 respondents or 62.8%), which is considered the optimal reproductive age. Meanwhile, 14 mothers (32.6%) were older than 35 years, a group biologically at higher risk for pregnancy and childbirth complications. Only 2 mothers (4.7%) were under 20 years of age. These findings indicate that the majority of mothers were within a healthy reproductive age, though a significant proportion still fell into high-risk age groups, especially those older than 35.

5)   **Respiratory Distress Neonatal (RDN)**

The distribution of Respiratory Distress Neonatal (RDN) is presented in the table below:

Table 5

Distribution of Respondents Based on Stress Levels

Online Game	f	%
Experience	22	51,2
No Experience	21	48,8
Total	**43**	**100%**

Source: Primary Data, 2025

Based on Table 5, 22 infants (51.2%) experienced Respiratory Distress Neonatal, while 21 infants (48.8%) did not. This indicates that more than half of the neonates treated in the NICU experienced early respiratory complications, highlighting RDN as a significant clinical concern requiring serious attention in neonatal care.

Multivariate Analysis
Simultaneous Test (F-Test)

The Omnibus Tests of Model Coefficients is used to examine whether all independent variables LBW, neonatal infection, gestational diabetes, and maternal age simultaneously influence the dependent variable, namely the occurrence of respiratory distress neonatal (RDN) in the Neonatal Intensive Care Unit of RSUD Undata. Determination of whether the hypothesis is accepted or rejected is carried out by comparing the calculated chi-square value and its significance level of 5% (0.05).

Table 6
Simultaneous Test (F-Test)

Chi-square	Df	Sig.
42.396	4	0.000
42.396	4	0.000
42.396	4	0.000

Source: Primary Data, 2025

Based on the table above, the chi-square value of the model is 42.396 with a significance value of 0.000. The significance value of 0.000 < 0.05 indicates that LBW, neonatal infection, gestational diabetes, and maternal age simultaneously have a significant influence on the occurrence of respiratory distress neonatal (RDN) in the NICU of RSUD Undata. This means that infants who experience LBW, neonatal infection, gestational diabetes, and have mothers with risky ages collectively contribute to the likelihood of RDN in the Neonatal Intensive Care Unit of RSUD Undata.

Wald Test (t-Test)

The Wald test is used to examine whether each independent variable LBW, neonatal infection, gestational diabetes, and maternal age individually influences the dependent variable, namely the occurrence of respiratory distress neonatal (RDN) in the Neonatal Intensive Care Unit of RSUD Undata in this study.

To determine whether the hypothesis is accepted or rejected, the calculated t-value and the significance level $\alpha = 0.05$ are compared using the following criteria:

1. If the significance value > 0.05, then the hypothesis (H0) is accepted. This indicates that the independent variable does not partially influence the dependent variable.
2. If the significance value ≤ 0.05, then the hypothesis (H0) is rejected. This indicates that the independent variable partially influences the dependent variable.

Table 7
Partial Test (t-Test)

Variable	Wald	Df	Sig.	Exp (B)
BBLR	5.799	1	0.016	28.405
Neonatal Infection	4.844	1	0.028	32.488
Gestational Diabetes	2.433	1	0.041	5.482
Maternal Age	.659	1	0.417	.367

Source: Primary Data, 2025

Based on Table 7, the hypothesis testing results using logistic regression analysis are as follows:

First hypothesis (H1): There is an effect of LBW on the occurrence of respiratory distress neonatal (RDN) in the NICU of RSUD Undata. The significance value obtained is 0.016 (<0.05). Thus, H1 is accepted, indicating that LBW significantly influences the occurrence of RDN. This means that LBW has a significant effect on the incidence of respiratory distress neonatal in the NICU of RSUD Undata.

Second hypothesis (H2): There is an effect of neonatal infection on the occurrence of respiratory distress neonatal (RDN) in the NICU of RSUD Undata. The hypothesis test results show a significance value of 0.028 (<0.05). Therefore, H2 is accepted, meaning neonatal infection significantly influences the occurrence of RDN.

Third hypothesis (H3): There is an effect of gestational diabetes on the occurrence of respiratory distress neonatal (RDN) in the NICU of RSUD Undata. The significance

value is 0.041 (<0.05). Thus, H3 is accepted, indicating that gestational diabetes significantly influences the occurrence of RDN.

Fourth hypothesis (H4): There is an effect of maternal age on the occurrence of respiratory distress neonatal (RDN) in the NICU of RSUD Undata. The significance value is 0.417 (>0.05). Therefore, H4 is rejected, indicating that maternal age does not influence the occurrence of RDN in this study.

2. Discussion

The Effect of Low Birth Weight (LBW) on the Occurrence of Respiratory Distress Neonatal (RDN) in the Neonatal Intensive Care Unit of RSUD Undata

The results of this study demonstrate that Low Birth Weight (LBW) has a statistically significant effect on the occurrence of Respiratory Distress Neonatal (RDN) in the NICU of RSUD Undata (p-value = 0.016; Exp(B) = 28.405). This finding indicates that LBW infants treated at RSUD Undata have a 28-fold higher risk of developing RDN compared to infants with normal birth weight.

From a local clinical perspective, most LBW infants admitted to the NICU of RSUD Undata were preterm neonates referred from district hospitals across Central Sulawesi. These infants commonly presented within the first hours of life with tachypnea, chest retractions, nasal flaring, and decreased oxygen saturation. Clinical records from the NICU indicate that LBW infants frequently required early respiratory support, including oxygen therapy, CPAP, and in severe cases, mechanical ventilation. This reflects the limited physiological reserve of LBW infants, particularly in relation to pulmonary function.

The condition of the NICU at RSUD Undata also influences clinical outcomes. As a provincial referral hospital, RSUD Undata manages a high volume of neonatal referrals with varying severity, often arriving in unstable conditions. Limited availability of advanced respiratory support devices and a high nurse-to-patient ratio may further complicate optimal respiratory management, especially for LBW infants who require continuous monitoring and intensive care.

These local findings align with Feldman (2006), who explains that LBW infants experience immature organ development, particularly in the respiratory system. Insufficient surfactant production leads to alveolar collapse and impaired gas exchange, resulting in respiratory distress. Cunningham et al. (2018) similarly highlight pulmonary immaturity as a primary cause of RDS in LBW infants, while WHO (2020) identifies LBW as a major contributor to neonatal morbidity and mortality, especially respiratory-related outcomes. Ballard and Ballard (1995) further emphasize surfactant deficiency as the central etiological factor in respiratory distress among preterm and LBW neonates.

Consistent with this study, previous research by Sinha et al. (2017), Amin et al. (2021), Khanal et al. (2022), and Shrestha and Singh (2020) confirms that LBW significantly increases the risk of RDN due to respiratory system immaturity. However, the markedly high odds ratio observed in RSUD Undata suggests that local factors, such as delayed referral, limited antenatal steroid coverage, and resource constraints in peripheral facilities, may further amplify the risk of RDN among LBW infants in this setting.

The Effect of Neonatal Infection on the Occurrence of Respiratory Distress Neonatal (RDN) in the Neonatal Intensive Care Unit of RSUD Undata

This study found that neonatal infection significantly influences the occurrence of RDN (p-value = 0.028; Exp(B) = 32.488), indicating that neonates with infections have approximately 32 times higher risk of developing respiratory distress than non-infected infants.

In the clinical setting of RSUD Undata, neonatal infections were frequently identified among infants referred from outside facilities, particularly those born prematurely or with LBW. Many infants arrived at the NICU with signs of systemic infection, including temperature instability, respiratory distress, elevated leukocyte counts, and positive sepsis markers. These infants often required immediate respiratory support upon admission, suggesting that infection played a direct role in precipitating respiratory compromise.

Data from the NICU RSUD Undata indicate that infection-related RDN cases are commonly associated with early-onset neonatal sepsis and pneumonia. The high proportion of infection-related respiratory distress reflects challenges in perinatal infection prevention, including suboptimal antenatal care, prolonged labor, premature rupture of membranes, and delayed referral from peripheral health facilities. These local service delivery factors are critical in understanding the strong association between infection and RDN in this hospital.

Theoretically, these findings align with Feldman (2006), who describes neonatal immune immaturity as a key factor predisposing newborns to infection-related organ dysfunction, including respiratory failure. Stoll and Hansen (2016) and Lawn et al. (2014) also emphasize that neonatal infections are leading causes of respiratory distress, particularly in developing countries with limited healthcare resources.

Previous studies by Alene et al. (2021), Wang et al. (2020), Kakkar et al. (2022), and Villamor-Martínez et al. (2021) further support the strong association between infection and respiratory distress. However, the higher magnitude of risk observed in RSUD Undata underscores the local burden of infection, compounded by referral delays and limited early detection in primary care facilities, as also reported by the Central Sulawesi Health Office (2021).

The Effect of Gestational Diabetes on the Occurrence of Respiratory Distress Neonatal (RDN) in the Neonatal Intensive Care Unit of RSUD Undata

The results show that gestational diabetes significantly affects the occurrence of RDN (p-value = 0.041; Exp(B) = 5.482), indicating that neonates born to mothers with gestational diabetes are five times more likely to experience respiratory distress.

At RSUD Undata, several mothers delivering infants with RDN had documented gestational diabetes, often diagnosed late in pregnancy or referred with incomplete antenatal metabolic control records. Neonates born to these mothers frequently presented with unstable glucose levels at birth and developed respiratory distress shortly thereafter, necessitating early oxygen therapy or ventilatory support in the NICU.

This finding is clinically relevant in the local context, as RSUD Undata serves as a referral center for complicated pregnancies across Central Sulawesi. Inadequate glycemic control during pregnancy, limited access to routine antenatal screening, and delayed referrals may contribute to the increased risk of RDN associated with gestational diabetes in this hospital.

These results are consistent with Feldman (2006), who explains that maternal hyperglycemia leads to fetal hyperinsulinemia, which inhibits surfactant synthesis and delays lung maturation. Supporting evidence from Yang et al. (2024), Yildiz Atar (2021), Luo et al. (2023), and Pascoe et al. (2022) confirms that gestational diabetes disrupts pulmonary development and increases neonatal respiratory morbidity. The findings at RSUD Undata reinforce the importance of early detection and optimal management of gestational diabetes to prevent RDN.

The Effect of Maternal Age on the Occurrence of Respiratory Distress Neonatal (RDN) in the Neonatal Intensive Care Unit of RSUD Undata

The analysis indicates that maternal age does not have a significant effect on the occurrence of RDN (p-value = 0.417). In the context of RSUD Undata, cases of RDN were observed across various maternal age groups, suggesting that maternal age alone is not a determining factor for neonatal respiratory distress.

Field data show that most mothers in this study were within the healthy reproductive age range, which may explain the absence of a significant association. Moreover, RDN cases at RSUD Undata were more strongly linked to clinical conditions such as LBW, infection, prematurity, and gestational diabetes, rather than maternal age itself.

These findings align with Feldman (2006) and are supported by studies by Wahyuni and Wiwin (2023), Sunil et al. (2019), and Baraldi et al. (2016), which demonstrate that maternal age is not a direct predictor of RDN unless accompanied by obstetric or metabolic complications.

Conclusion

The recommendations of this study emphasize the importance of strengthened preventive efforts across multiple sectors. The Provincial Health Office of Central Sulawesi is advised to enhance programs aimed at reducing Low Birth Weight (LBW) cases through routine maternal monitoring, nutrition education, and strict neonatal infection control policies, while also increasing awareness of gestational diabetes and the need for regular blood glucose checks during pregnancy. RSUD Undata is encouraged to improve care and monitoring for LBW infants, enforce rigorous infection-prevention protocols, and provide special support for mothers at high-risk ages through comprehensive antenatal care. At the community level, greater awareness is needed regarding the importance of routine prenatal examinations, early detection of LBW risks, and planning pregnancies at optimal maternal ages to minimize health risks for both mothers and infants.

The analysis shows that online gaming contributes the greatest influence on stress, with an effective contribution of 6.91% and a relative contribution of 34.65%. This means that online gaming is the most dominant factor affecting stress in female adolescents. High intensity of gaming may lead to psychological pressure, reduced rest time, and emotional tension, resulting in a greater contribution to stress compared to other variables.

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