KESANS: International Journal of Health and Science
2808-7178 / 2808-7380
http://kesans.rifainstitute.com/index.php/kesans/index

Prolonged Labor and Gestational Age, with the Incidence of Neonatorum Asphyxia in Newborns in the Perinatology Unit of Guido Valadares National Hospital

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Article Information
Submitted: **20 February 2026**
Accepted: **28 February 2026**
Publish: **05 March 2026**

Keyword: Prolonged Labor; Gestational Age; Neonatal Asphyxia; Newborn;

Abstract
Introduction: *Neonatal asphyxia—defined as failure to establish adequate breathing at birth—remains a major cause of neonatal morbidity and mortality, especially in developing countries. Prolonged labour and abnormal gestational age can impair placental oxygen transfer and heighten asphyxia risk.* ***Objective:*** *To examine the association between prolonged labour, gestational age, and neonatal asphyxia among newborns treated in the Perinatology Unit of Guido Valadares National Hospital.* ***Method:*** *A cross-sectional correlational study involved 85 mother–infant pairs selected purposively from 110 admissions in 2025. Prolonged labour and gestational age were independent variables; neonatal asphyxia was the outcome. Data were gathered via structured questionnaire and medical records, then analysed with multinomial regression (α = 0.05).* ***Results and Discussion:*** *Prolonged labour showed a significant independent association with asphyxia (p = 0.001), whereas gestational age alone did not (p = 0.389). Simultaneous analysis demonstrated that both variables together were significantly related to asphyxia incidence (p = 0.005).* ***Conclusion:*** *Prolonged labour is the principal contributor to neonatal asphyxia, and its combined effect with gestational age further elevates risk. Rigorous intrapartum monitoring and timely obstetric intervention are essential to improve neonatal outcomes*

How to Cite **José Ximenes da Conceição, Windy Rakhmawat, Henny Suzana Mediani, Ati Surya Mediawati, Cenia Fatima Cabral/Prolonged Labor and Gestational Age, with the Incidence of Neonatorum Asphyxia in Newborns in the Perinatology Unit of Guido Valadares National Hospital, Vol. 5, No. 5, 2026**
DOI https://doi.org/10.54543/kesans.v5i5.587
e-ISSN/p-ISSN **2808-7178 / 2808-7380**
Published by **CV Rifainstitut/KESANS: International Journal of Health and Science**

Introduction

Neonatal mortality remains a significant global health problem. In 2022, approximately 2.3 million babies died in the first 28 days of life, an average of 6,500 deaths per day. Neonatal deaths accounted for 47% of all under-five deaths, an increase from 44% in 2000. Sub-Saharan Africa recorded the highest rate, at 27 per 1,000 live births, while Central and Southern Asia recorded 21 per 1,000 live births. The main causes of neonatal death include prematurity with respiratory complications or trauma, neonatal infections, and congenital anomalies (WHO, 2024).

Reducing neonatal mortality is part of the Sustainable Development Goals (SDGs), which aim to reduce the neonatal mortality rate to ≤25 per 1,000 live births by 2030. Intrapartum complications, including asphyxia, are reported to be the second-highest cause of neonatal mortality (23.9%) after prematurity (Febrina et al., 2020). Globally, neonatal mortality accounts for approximately 37% of infant mortality. Approximately 75% of deaths occur in the first week of life, and 25–45% occur within the first 24 hours. The main causes of neonatal mortality are prematurity (29%), sepsis (25%), pneumonia (23%), and asphyxia and trauma. Asphyxia ranks third as a cause of neonatal death in the early period of life (Intan & Rasmawat, 2023).

Data from 2023 showed that neonatal deaths were mostly caused by asphyxia (20–60%), infection (25–30%), low birth weight (25–30%), and birth trauma (5–10%). The prevalence of asphyxia increased from 17 per 100,000 births in 2018 to 23 per 100,000 births in 2020 (Ridlo & Khoeroh, 2024). The incidence of neonatal asphyxia in developed countries is approximately 2 per 1,000 live births, while in developing countries it can be up to 10 times higher. In premature infants, the prevalence of asphyxia reaches 73 per 1,000 births, with approximately 50% experiencing severe degrees (Lestari et al., 2023). In Indonesia, the 2020 Health Profile recorded 5,549 neonatal deaths due to asphyxia, an increase from 5,464 cases in 2019 (Sirait et al., 2023). Seventy-one (71.97%) of neonatal deaths occurred between 0 and 28 days of age. Causes of death included low birth weight (35.25%), asphyxia (27.4%), congenital abnormalities (11.4%), infection (3.4%), neonatal tetanus (0.03%), and other causes (22.5%) (Herayono et al., 2022). In referral hospitals, asphyxia-related deaths were reported to reach 41.94%, and intrapartum asphyxia accounted for 21% of neonatal deaths (Mutiara et al., 2020).

Various studies have shown that neonatal asphyxia is influenced by maternal and neonatal factors. Fidayanti's (2023) study reported that 64.3% of infants experienced asphyxia, with associated factors including maternal age 20–35 years (32.1%), eclampsia (12.5%), gestational age (3.6%), and birth weight (10.7%) (Ekasari et al., 2024). Other associated factors include maternal age, parity, anemia, ruptured membranes, prolonged labor, and prematurity (Fitriana et al., 2020). Gestational age, birth weight, and hypertension in pregnancy have also been shown to be significantly associated with the incidence of neonatal asphyxia (Pratama & Handayani, 2022).

Maternal risk factors include gestational hypertension (24%), pregnancy infection (10%), and prolonged or difficult labor (2.8–4.9%). Neonatal risk factors include malpresentation (51%), gestational age (25%), and low birth weight (45%) (Sakunti, 2022). Regional data shows variations in asphyxia cases. In Sukoharjo Regency, 131 cases were recorded in 2019, 115 cases in 2020, and 38 cases in 2021 (Rahayu, 2023). At At-Taqwa Islamic Hospital in Gumawang, 34 cases were recorded in 2018, 44 cases in 2019, and 33 cases (January–October 2020), most of which were related to abnormal deliveries (Utami & Aniroh, 2019).

In Timor-Leste, the WHO (2022) reported a neonatal mortality rate of 21.73 per 1,000 live births. In 2020, neonatal deaths due to asphyxia reached 29.9%, while in the under-five age group, the rate was 14.3% (WHO, 2021). WHO data (2023) shows a mortality rate due to neonatal asphyxia of 14.3 per 100,000 population. At the Guido Valadares National Hospital (HNGV), 413 cases of neonatal asphyxia were recorded in 2023. In 2024, there were 114 cases, with 114 deaths due to asphyxia. From January to April 2025, 110 cases of neonatal asphyxia were recorded (HNGV, 2025). Reported risk factors include high parity, hypertension, preeclampsia/eclampsia, anemia, diabetes, premature rupture of membranes, malpresentation, low birth weight, and infection (Monteiro et al., 2022; Indriani, 2019). When assessing the impact of prolonged labour and gestational age on neonatal asphyxia, it is therefore essential to control for major confounders—birth weight, fetal presentation, mode of delivery, and maternal hypertensive disorders—since each independently influences perinatal outcomes.

Based on the high incidence and mortality rate due to neonatal asphyxia and the presence of various maternal and neonatal risk factors, research is needed to determine the relationship between prolonged labor and gestational age with the incidence of neonatal asphyxia in newborns in the Perinatology Unit of the Guido Valadares National Hospital (HNGV) in 2025.

Method

This study used a quantitative correlational method with a cross-sectional approach conducted at the Perinatology Unit of Guido Valadares National Hospital. The study sample consisted of 85 mothers selected by purposive sampling from a total population of 110. The independent variables included prolonged labor and gestational age, while the dependent variable was the incidence of neonatal asphyxia. Data were collected using a questionnaire and analyzed using multinomial regression at a significance level of $\alpha = 0.05$.

Result and Discussion

1. Result

This study involved 86 mothers who gave birth to babies with neonatal asphyxia at the Perinatology Unit of the Guido Valadares National Hospital during the period January to April 2025.

Table 1
Respondents' characteristics (sociodemographics) (n=85)

Distribution	*f*	*%*
Age		
< 20	7	8
20-35	59	69
>35	19	22
Last Level of Education		
Illiteracy	2	2
Elementary School	10	12
Middle School	15	18
High School	44	52
University	14	16
Profession		
Housewife	73	86
Farmers	4	5
Civil Servants	8	9
Duration of pregnancy		
<37 Weeks	14	16
37-41 Weeks	34	40
>41 Weeks	37	44
n	**85**	**100**

Source: Research Results at HoREX Baucau, 2025.

Based on Table 1, the majority of the 85 respondents were aged 20–35 years (69%). The majority had a high school education (52%) and were housewives (86%). Based on gestational duration, the category >41 weeks accounted for the largest proportion (44%), followed by 37–41 weeks (40%) and <37 weeks (16%). In general, the respondents' characteristics were dominated by optimal reproductive age, secondary education, and post-term pregnancy.

Table 2

Frequency distribution of respondents based on duration of labor, gestational age, and asphyxia neonatorum in the Perinatology Unit, HNGV, 2025 (n=85).

Duration of labor	*f*	*%*
Short Labor	38	45
Prolonged Labor	47	55
Gestational Age		
Preterm	14	16
Aterm	34	40
Post-term	37	44
Asphyxia Neonatorum		
Severe	12	14
Moderate	34	40
Mild	39	46
n	**85**	**100**

Source: Research Results at HoREX Baucau, 2025.

Based on Table 2, of the total 85 respondents in the HNGV Perinatology Unit in 2025, the majority of deliveries were prolonged, 47 (55%), compared to short deliveries, 38 (45%). Based on gestational age, the majority of babies were born in the postterm category, 37 (44%), followed by term, 34 (40%), and preterm, 14 (14%). Meanwhile, the degree of neonatal asphyxia was dominated by mild 39 (46%) and moderate 34 (40%),

while severe asphyxia was recorded in 12 (14%). These findings indicate that the proportion of prolonged deliveries and postterm gestational age is quite dominant in the study population, with most cases of asphyxia being mild to moderate, although severe cases still have significant clinical implications.

Table 3

Relationship between Duration of Labor and Neonatal Asphyxia in Newborns in Perinatology Unit, HNGV, 2025 (n = 85)

Duration of labor		Asphyxia Neonatorum				*Coefficient*	*Exp (B)*
		severe	Moderate	Mild	Total		
Short Labor	*n*	1	11	26	38	*0.00*	*4,500*
	%	2.6	29	68.4	100		
Prolonged Labor	*n*	11	23	13	47		
	%	23.4	49	27.6	100		
Total	*n*	12	34	39	85		
	%	14	40	46	100		

Source: Research Results at HoREX Baucau, 2025.

Based on the results of Table 3, it shows that the duration of labor has a clear relationship with the severity of neonatal asphyxia. In short labor, the majority of babies experienced mild asphyxia (68.4%), while in prolonged labor, moderate (49%) and severe (23.4%) asphyxia were more common. Overall, the distribution of cases consisted of 46% mild, 40% moderate, and 14% severe. The Exp (B) value of 4.500 indicates that the risk of asphyxia in prolonged labor is approximately 4.5 times higher than in short labor. Meanwhile, the coefficient of 0.00 confirms a significant relationship between the duration of labor and the severity of asphyxia. These findings emphasize that prolonged labor is an important risk factor that increases the likelihood of moderate to severe asphyxia, so that rapid and appropriate obstetric intervention is essential to reduce neonatal morbidity and mortality.

Table 4

Relationship between Gestational Age and Neonatal Asphyxia in Newborns in the Perinatology Unit, HNGV, 2025 (n = 85)

Gestational Age		Asphyxia Neonatorum				*Coefficient*	*Exp (B)*
		severe	Moderate	Mild	Total		
Preterm	*n*	0	6	8	14	*0.207*	*0.682*
	%	0	42.8	57.1	100		
Aterm	*n*	4	15	15	34		
	%	11.8	44.1	44.1	100		
Posterm	*n*	8	13	16	34		
	%	21.6	35.1	43.2	100		
Total	*n*	12	34	39	85		
	%	14	40	46	100		

Source: Research Results at HoREX Baucau, 2025.

Based on the results of Table 4, it shows that of the 85 respondents, the preterm group was dominated by mild (57.1%) and moderate (42.8%) asphyxia cases, with no severe cases found. In the term group, the distribution was relatively balanced between moderate (44.1%) and mild (44.1%) asphyxia, with severe cases accounting for 11.8%. Meanwhile, in the postterm group, the proportion of severe asphyxia was higher (21.6%) compared to term, accompanied by moderate (35.1%) and mild (43.2%) asphyxia. Overall, the distribution of cases consisted of 46% mild, 40% moderate, and 14% severe.

The value of **Exp (B) = 0.682** with a coefficient of 0.207 indicates that postterm gestational age does not significantly increase the risk of asphyxia compared to the reference group but still shows a higher tendency towards severe cases. This finding confirms that gestational age plays a role in the variation in the severity of neonatal asphyxia, with postterm as a group that requires more intensive clinical attention.

Table 5

The results of multivariate analysis using binary logistic regression showed that duration of labor and gestational age were associated with the incidence of asphyxia neonatorum.

Chi-Square	Df	Sig	Nagelkerke R square	Interpretation
26.553	3	0.000	0.310	In a simultaneous relationship

Source: Research Results at HoREX Baucau, 2025.

Based on the results of table 5, it shows that the binary logistic regression analysis produced a chi-square value of 26.553 with df = 3 and a p-value of 0.000, which means there is a significant simultaneous relationship between the duration of labor and gestational age with the incidence of neonatal asphyxia. The Nagelkerke R^2 value = 0.310 indicates that the independent variables in the model are able to explain approximately 31% of the variation in the incidence of asphyxia. This confirms that the factors of duration of labor and gestational age contribute significantly to the risk of asphyxia, so both need to be considered comprehensively in efforts to prevent and manage cases of neonatal asphyxia.

2. Discussion

Based on Table 3, the duration of labor shows a significant relationship with the severity of neonatal asphyxia (p=0.00), with an Exp(B) value of 4.500 indicating that prolonged labor increases the risk of asphyxia approximately 4.5 times compared to short labor. Distributionally, in short labor, the majority of babies experience mild asphyxia (68.4%), while in prolonged labor, the proportion of moderate (49%) and severe (23.4%) asphyxia is more dominant. Pathophysiologically, prolonged labor causes repeated uterine contractions for a long time so that uteroplacental perfusion decreases, resulting in progressive fetal hypoxia. If not immediately intervened, this condition progresses to metabolic acidosis and respiratory depression at birth. The World Health Organization report confirms that intrapartum complications, including prolonged labor, are the main determinants of birth asphyxia and contribute significantly to neonatal mortality in developing countries.

These findings are consistent with research by Wall et al. (2009), which showed that intrapartum complications were significantly associated with low Apgar scores and an increased risk of neonatal asphyxia. Kolobo et al. (2019) also reported that prolonged labor more than tripled the risk of asphyxia compared to vaginal delivery. Furthermore, a study by Guaracha-Basáñez et al. (2022) found that prolonged labor was an independent determinant of moderate to severe asphyxia. Similar results were reported by Safiullah et al. (2025), who showed a significant correlation between prolonged labor duration and the need for neonatal resuscitation and the incidence of severe asphyxia. This comparison strengthens the validity of the research findings that labor duration is an important risk factor influencing the severity of asphyxia. Therefore, monitoring labor progress using a

partograph and prompt and appropriate obstetric intervention are crucial strategies in reducing neonatal morbidity and mortality.

Based on Table 4, gestational age showed variation in the distribution of neonatal asphyxia severity, but no statistically significant association was found ($p > 0.05$; coefficient = 0.207; Exp(B) = 0.682). The preterm group was dominated by mild and moderate asphyxia without severe cases, while the term group was relatively balanced between mild and moderate. The postterm group showed a higher proportion of severe asphyxia (21.6%), although analytically it was not significant as an independent risk factor. Biologically, extreme gestational age—both preterm and postterm—is associated with immaturity of lung function, impaired respiratory regulation, and, in postterm, placental insufficiency due to placental aging, which can reduce fetal perfusion and oxygenation. These conditions increase susceptibility to intrapartum hypoxia, leading to neonatal asphyxia.

These findings align with a study by Kune et al. (2021), who reported that gestational ages of less than 37 weeks and more than 42 weeks were associated with an increased risk of neonatal asphyxia after controlling for other obstetric factors. A study by Tunta et al. (2024) showed that prematurity is a significant determinant of asphyxia due to the immaturity of the respiratory and neurological systems. Furthermore, a study by Meshesha et al. (2020) found that postterm birth increases the likelihood of severe asphyxia due to impaired placental function. A recent analysis by Getaneh et al. (2021) confirmed that extreme gestational age increases the risk of adverse neonatal outcomes, including the need for resuscitation. Thus, although the results of this study did not demonstrate statistical significance, the clinical distribution pattern remains consistent with recent literature emphasizing the importance of close monitoring in preterm and postterm pregnancies to prevent neonatal asphyxia.

The results of the binary logistic regression analysis showed that the predictor model was simultaneously significant in explaining the relationship between labor duration and gestational age with the incidence of neonatal asphyxia ($p < 0.001$). With a chi-square value of 26.553 at df = 3, this indicates that the aggregate of independent variables (labor duration and gestational age) is statistically strongly correlated with the phenomenon of neonatal asphyxia. The Nagelkerke R^2 value of 0.310 also confirms that approximately 31% of the variation in neonatal asphyxia incidence can be explained by the model, although other variables outside the model still play a significant role. This finding aligns with multivariate regression psychometric studies on neonatal asphyxia, which confirm that obstetric factors such as labor duration (e.g., prolonged labor) and prematurity are important determinants of asphyxia in newborns.

In an updated meta-analysis encompassing observational studies through 2024, preterm birth (gestational age <37 weeks) was consistently reported as a risk factor for neonatal asphyxia, with a significant odds ratio (OR) of >2.18 compared with full-term infants, demonstrating the biological and clinical relevance of gestational age as a major predictor of neonatal asphyxia (Wang et al., 2025).

Physiologically, prolonged labor can trigger fetal hypoxia through increased intrapartum pressure, impaired placental blood flow, or accumulated oxidative stress in fetal tissues. A systematic meta-analytic review from the Colombian context and other clinical settings found that a prolonged second stage of labor was significantly associated with perinatal asphyxia (ORs as high as >15 in some studies), although the magnitude of the effect varied across populations and clinical definitions. This finding, in line with

Agudelo-Pérez et al.'s (2025) study, suggests that labor duration should be considered not merely as a descriptive statistic but as a clinical indicator of risk, requiring intensive real-time monitoring during labor.

Furthermore, another study by Wang et al. (2025) also showed that prematurity or insufficient gestational age (<37 weeks) increases the infant's vulnerability to postnatal respiratory distress due to immature respiratory organs, low energy reserves, and suboptimal adaptation capacity to external environmental transitions. Thus, both variables—gestational age and labor duration—are important risk factors that work complementarily through biomechanical and physiological mechanisms to increase the probability of neonatal asphyxia. Therefore, early and appropriate clinical intervention, including integrated obstetric risk assessment and proactive labor management, is crucial to reduce the incidence of asphyxia (Msisiri et al., 2024).

Prolonged labor is a significant independent risk factor for neonatal asphyxia, while gestational age does not show a partial association but contributes simultaneously. Preventive efforts should focus on optimizing intrapartum management and timely obstetric intervention to reduce the risk of neonatal asphyxia.

Conclusion

Prolonged labor is a significant independent risk factor for the incidence of neonatal asphyxia, whereas gestational age does not show a partial relationship but contributes simultaneously. Preventive efforts should be focused on optimizing intrapartum management and timely obstetric interventions to lower the risk of neonatal asphyxia.

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