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Factors Influencing the Occurrence of Neonatal Asphyxia at Palembang Bari General Hospital

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ABSTRACT

Background: *Asphyxia Neonatorum is one of the highest causes of infant mortality, which is 31.1%. Many factors cause Asphyxia Neonatorum of maternal factors (hypoxia in the mother, maternal age, gravida more than 4, hypertension, and congenital diseases), placental factors (placental abruption, placenta previa), fetal factors (premature, gemelli, LBW, congenital amniotic fluid mixed with meconium, abnormalities of the umbilical cord), and . factors of labor (long labor or parturition with action).* ***Research Objectives****: To find out the factors that influence the occurrence of Asphyxia Neonatorum at Palembang BARI Hospital in 2023. Research Methods: This type of research is a case-control study. The population is all newborns registered in the perinatology room register at Palembang Bari Hospital in 2021 and 2022, namely 1195 newborns, with the number of newborns experiencing Asphyxia Neonatorum as many as 72 cases. A sample of 144 newborns consisted of 72 respondents for the case group and 72 respondents for the control group. Data were analyzed univariate and bivariate using the chi-square test.* ***Results****: The results of statistical analysis showed a p-value <0.05 so there was a relationship between maternal age (p value=0.004), placenta previa (p value=0.025), premature rupture of membranes (p value=0.016), prolonged labor events (p-value = 0.015) with Asphyxia Neonatorum.* ***Conclusion:*** *there is a relationship between factors (maternal age, placenta previa, premature rupture of membranes, prolonged labor) with the incidence of Asphyxia Neonatorum at Palembang Bari Hospital in 2023.* ***Suggestion*** *: It is hoped that this research can add to knowledge and insight so that it becomes one of the efforts in preventing asphyxia neonatorum at Palembang Bari's Hospital*

Keywords: Asphyxia Neonatorum, Premature Rupture of membranes, Prolonged Parturition, Placenta Previa, Maternal Age

INTRODUCTION

Neonatal asphyxia is a condition in which a newborn is unable to breathe spontaneously and regularly, resulting in decreased oxygen (O_2) levels and increased carbon dioxide (CO_2) levels that may have adverse effects on the infant's survival. This disorder can occur during pregnancy, delivery, or immediately after birth. The causes of respiratory failure in newborns are generally classified into maternal factors, placental factors, fetal factors, and labor-related factors (Ilyas et al., 2016).

Neonatal asphyxia can be attributed to several causes. Maternal factors include maternal hypoxia, advanced maternal age, gravida greater than four, hypertension, and vascular diseases that impair oxygen exchange and transport. Placental factors that may contribute to neonatal asphyxia include placental abruption and placenta previa. Fetal factors include prematurity, twin pregnancy, low birth weight (LBW), congenital anomalies, amniotic fluid mixed with meconium, and umbilical cord abnormalities such as cord entanglement or compression between the fetus and the birth canal. Labor-related factors, such as prolonged labor or operative delivery, also increase the risk of neonatal asphyxia (Nufra & Ananda, 2021).

A study conducted by Windasari and Sadnyani (2021) found that infants born to mothers who underwent operative delivery had a 1.975-fold higher prevalence of asphyxia compared with those born through spontaneous delivery. Furthermore, infants born to mothers with placental abnormalities, including placenta previa, had an 8.623-fold higher prevalence of asphyxia compared with infants born to mothers without placental abnormalities.

Similarly, research by Jon Putri et al. (2019) reported that maternal age was associated with a 1.2-fold higher risk of neonatal asphyxia, placenta previa with a 2-fold higher risk, and fetal malpresentation with a 1.6-fold higher risk.

Based on these findings, the present study aims to identify the factors associated with the incidence of neonatal asphyxia at Palembang BARI General Hospital in 2023.

METHODS

This study employed a case–control design with a retrospective approach, in which data on the dependent variable (effect) were collected first, followed by identification of independent variables (causes) that had previously occurred. The relationship between the dependent and independent variables was analyzed by comparing the case group and the control group (Sugiyono, 2017).

This research was conducted at Palembang BARI General Hospital in May 2023. The study population comprised all newborns recorded in the perinatology ward register of Palembang BARI General Hospital during 2021 and 2022, totaling 1,195 newborns, with 72 cases of neonatal asphyxia identified.

A non-probability sampling technique was applied using the total sampling method, which included all newborns who experienced asphyxia and were recorded in the perinatology ward register during 2021–2022, totaling 72 newborns. Thus, the total sample size was 144 newborns, consisting of 72 respondents in the case group and 72 respondents in the control group.

Data were analyzed using the Chi-square (χ^2) test to determine the statistical relationship between variables.

RESEARCH RESULT

1. Univariate analysis

Table 1
Frequency Distribution of Factors (Maternal Age, Placenta Previa, Premature Rupture of Membranes, and Prolonged Labor) at Palembang Bari Regional Hospital

Factor	case		control	
	n	%	n	%
Mother age				
At risk	39	54.2	22	30.6
Not at risk	33	45.8	50	69.4
Total	72	100	72	100

Placenta Previa					
	Placenta Previa	17	23.6	7	9.7
	Not Placenta Previa	55	76.4	65	90.3
	Total	72	100	72	100
PROM					
	PROM	34	47.2	20	27.8
	Not PROM	38	52.8	52	72.2
	Total	72	100	72	100
Prolonged labor					
	Prolonged labor	26	36.1	13	18.1
	Not Prolonged labor	46	63.9	59	81.9
	Total	72	100	72	100

From Table 1, it is known that in the case group consisting of 72 respondents, the majority 39 respondents (54.2%) were in the at-risk age group; most respondents, totaling 55 (76.4%), did not experience placenta previa; the majority, 38 respondents (52.8%), did not experience premature rupture of membranes (PROM); and most respondents, 46 (63.9%), did not experience prolonged labor. Meanwhile, in the control group consisting of 72 respondents, the majority 50 respondents (69.4%) were in the at-risk age group; almost all respondents, 65 (90.3%), did not experience placenta previa; the majority, 52 respondents (72.2%), did not experience PROM; and nearly all respondents, 59 (81.9%), did not experience prolonged labor.

Table 2
Frequency Distribution of Neonatal Asphyxia at Palembang Bari Regional Hospital

Neonatal asphyxia	**n**	**%**
Neonatal asphyxia	72	50.0
Not Neonatal asphyxia	72	50.0
Total	144	100

From table 2 it is known that the respondents are homogeneous, namely 72 respondents each.

2. Bivariate analysis

Table 3
The relationship between maternal age and neonatal asphyxia at Palembang BARI Regional Hospital in 2023

Mother age	Neonatal asphyxia				**Total**		***p value***
	Yes		**No**				
	n	**%**	**n**	**%**	**n**	**%**	
At risk	39	54.2	22	30.6	61	42,3	0,007

Not risk	33	45.8	50	69.4	83	57,7
Total	72	100	72	100	144	100

Analysis of Table 3 Respondents who experienced Neonatal Asphyxia and maternal age at risk were 39 (54.2%) out of 61 respondents, higher than those who experienced Neonatal Asphyxia and maternal age was not at risk, there were 33 (45.8%) out of 83 respondents. From the results of the chi-square statistical test, p value = 0.007 <0.05 was obtained, meaning there was a significant relationship between maternal age and Neonatal Asphyxia at Palembang BARI Regional Hospital in 2023.

Table 4
The relationship between placenta previa and neonatal asphyxia at Palembang BARI Regional Hospital in 2023

Placenta Previa	Neonatal asphyxia				Total		*p value*
	Ya		Tidak				
	n	%	n	%	n	%	
Placenta Previa	17	23.6	7	9.7	24	16,7	0,044
Not Placenta Previa	55	76.4	65	90.3	120	83,3	
Total	72	100	72	100	144	100	

Analysis of table 4.4 Respondents who experienced Neonatal Asphyxia and experienced placenta previa were 17 (23.6%) out of 24 respondents, lower than those who experienced neonatal asphyxia and did not experience placenta previa, as many as 55 (76.4%) out of 120 respondents. From the results of the chi square statistical test, a p value of 0.044 <0.05 was obtained, meaning there was a significant relationship between the incidence of placenta previa and Neonatal Asphyxia at Palembang BARI Regional Hospital in 2023.

Table 5
The relationship between premature rupture of membranes and neonatal asphyxia at Palembang BARI Regional Hospital in 2023

PROM	Neonatal asphyxia				Total		*p value*
	Yes		No				
	n	%	n	%	n	%	
PROM	34	47.2	20	27.8	54	37.5	0.025
Not PROM	38	52.8	52	72.2	90	62,5	
Total	72	100	72	100	144	100	

Analysis of table 4.5 Respondents who experienced Neonatal Asphyxia and experienced PROM were 34 (47.2%) out of 54 respondents, lower than respondents who experienced

Asphyxia and who did not have PROM were 38 (52.8%) out of 90 respondents. From the results of the chi square statistical test, a p value of 0.025 <0.05 was obtained, meaning there was a significant relationship between premature rupture of membranes and neonatal asphyxia at Palembang BARI Regional Hospital in 2023.

Table 6
The relationship between prolonged labor and neonatal asphyxia at Palembang BARI Regional Hospital in 2023

Occurrence of prolonged labor	Neonatal asphyxia				Total		P value
	Yes		No				
	n	%	n	%	n	%	
Prolonged labor	26	36.1	13	18.1	39	27,9	0.024
Not Prolonged labor	46	63.9	59	81.9	105	72,1	
Total	72	100	72	100	144	100	

Analysis of table 6 Respondents who experienced Neonatal Asphyxia and experienced prolonged labor were 26 (36.1%) out of 39 respondents, lower than those who experienced Neonatal Asphyxia and who did not experience prolonged labor were 46 (63.9%) out of 105 respondents. From the results of the chi square statistical test, a p value of 0.024 <0.05 was obtained, meaning there was a significant relationship between the occurrence of prolonged labor and Neonatal Asphyxia at Palembang BARI Regional Hospital in 2023.

DISCUSSION

1. Frequency Distribution of Factors (Maternal Age, Placenta Previa, Premature Rupture of Membranes, and Prolonged Labor) at Palembang BARI General Hospital

Based on the analysis results, in both the case and control groups, respondents with neonatal asphyxia and at-risk maternal age accounted for 39 (54.2%) of 61 respondents. Respondents with neonatal asphyxia and placenta previa totaled 17 (23.6%) of 24 respondents. Respondents with neonatal asphyxia and premature rupture of membranes (PROM) totaled 34 (47.2%) of 54 respondents, while those with neonatal asphyxia and prolonged labor were 26 (36.1%) of 39 respondents.

A study by Utami et al. (2020) found that most mothers whose newborns experienced neonatal asphyxia (55.8%) were in the at-risk age category (<20 or >35 years). Windasari and Sadnyani (2021) reported that most respondents (42.6%) who experienced neonatal asphyxia

did not have placenta previa, and a small proportion (39.5%) did not experience premature rupture of membranes.

According to the researcher, neonatal asphyxia was more common among mothers in the at-risk age group (<20 or >35 years). Mothers younger than 20 years may not have fully developed reproductive organs and may not yet be physically, mentally, or emotionally ready for pregnancy and childbirth. Meanwhile, mothers older than 35 years tend to experience a decline in reproductive function, which can affect fetal well-being during pregnancy.

2. Frequency Distribution of Neonatal Asphyxia at Palembang BARI General Hospital

The study results showed that the respondents were homogeneous, with 72 respondents in each group. Neonatal asphyxia is a condition in which a newborn fails to breathe spontaneously and regularly immediately after birth, leading to decreased oxygen (O_2) and increased carbon dioxide (CO_2) levels. Impaired gas exchange or oxygen transport from the mother to the fetus may have adverse long-term effects (Proverawati, 2017).

According to the researcher, neonatal asphyxia can occur due to maternal risk factors, particularly at-risk maternal age (<20 or >35 years), which is closely related to the mother's physical readiness for pregnancy and childbirth.

3. The Relationship Between Maternal Age and Neonatal Asphyxia at Palembang BARI General Hospital in 2023

The results showed that respondents with neonatal asphyxia and at-risk maternal age accounted for 39 (54.2%) of 61 respondents, which was higher than those with non–at-risk maternal age (33 (45.8%) of 83 respondents). The Chi-square test produced a p-value = 0.007 < 0.05, indicating a significant relationship between maternal age and neonatal asphyxia at Palembang BARI General Hospital in 2023.

Utami et al. (2020) reported that 91% of mothers aged ≥35 years experienced neonatal asphyxia (71.4%), with a significant association (p = 0.002 < 0.05). Similarly, Jon Putri et al. (2019) found that maternal age was 1.2 times more likely to cause neonatal asphyxia.

According to the researcher, pregnancies at age >35 years and <20 years are not recommended because of the high risk involved. Mothers older than 35 years are more likely to experience conditions such as hypertension, uterine fibroids, or degenerative joint diseases, whereas mothers younger than 20 years may have underdeveloped reproductive organs, increasing the risk of complications such as neonatal asphyxia.

4. The Relationship Between Placenta Previa and Neonatal Asphyxia at Palembang BARI General Hospital in 2023

The results showed that respondents with neonatal asphyxia and placenta previa totaled 17 (23.6%) of 24 respondents, which was lower than those with neonatal asphyxia without placenta previa (55 (76.4%) of 120 respondents). The Chi-square test yielded a p-value = 0.044 < 0.05, indicating a significant relationship between placenta previa and neonatal asphyxia at Palembang BARI General Hospital in 2023.

Windasari and Sadnyani (2021) also reported a significant association between placenta previa and neonatal asphyxia (p = 0.018 < 0.05). Similarly, Mansyarif (2019) found that mothers with placenta previa were 1.55 times more likely to deliver asphyxiated infants than those without placenta previa.

According to the researcher, placenta previa can contribute to neonatal asphyxia because it often causes antepartum hemorrhage, which disrupts maternal blood flow to the placenta and reduces oxygen supply to the fetus. Moreover, in cases of total placenta previa, normal vaginal delivery is not possible, necessitating cesarean section. This surgical procedure, combined with the effects of anesthesia, increases the risk of neonatal asphyxia.

5. The Relationship Between Premature Rupture of Membranes and Neonatal Asphyxia at Palembang BARI General Hospital in 2023

The study found that respondents with neonatal asphyxia and PROM totaled 34 (47.2%) of 54 respondents, which was lower than those without PROM (38 (52.8%) of 90 respondents). The Chi-square test showed a p-value = 0.025 < 0.05, indicating a significant relationship between premature rupture of membranes and neonatal asphyxia at Palembang BARI General Hospital in 2023.

According to Betsy (2013), decreased amniotic fluid volume in PROM cases may cause umbilical cord compression, leading to a decrease in fetal heart rate and hypoxia, which can result in asphyxia at birth.

The researcher suggests that PROM contributes to neonatal asphyxia due to umbilical cord compression caused by oligohydramnios, which restricts blood flow and oxygen transport from the mother to the fetus, resulting in neonatal asphyxia.

6. The Relationship Between Prolonged Labor and Neonatal Asphyxia at Palembang BARI General Hospital in 2023

The results showed that respondents with neonatal asphyxia and prolonged labor accounted for 26 (36.1%) of 39 respondents, lower than those without prolonged labor (46 (63.9%) of 105 respondents). The Chi-square test showed a p-value = 0.024 < 0.05, indicating a significant relationship between prolonged labor and neonatal asphyxia at Palembang BARI General Hospital in 2023.

Amalia et al. (2020) also reported a significant association between prolonged labor and neonatal asphyxia (ρ = 0.001 < 0.05), with mothers experiencing prolonged labor being 4.9 times more likely to have infants with neonatal asphyxia than those without prolonged labor.

According to the researcher, prolonged labor is associated with neonatal asphyxia because it can lead to constriction of blood vessels as the fetus remains in the pelvic cavity for an extended period. This reduces oxygen flow from the placenta to the fetus, resulting in hypoxia and impaired gas exchange, which in turn lowers arterial oxygen levels and decreases placental blood flow, ultimately causing neonatal asphyxia.

CONCLUSION

Based on the findings of this study on factors influencing the incidence of neonatal asphyxia at Palembang BARI General Hospital in 2023, it can be concluded as follows:

1. The frequency distribution of factors influencing neonatal asphyxia among 72 case group respondents showed that the majority (54.2%) were of at-risk maternal age, 76.4% did not experience placenta previa, 52.8% did not experience premature rupture of membranes, and 63.9% did not experience prolonged labor. In the control group (72 respondents), the majority (69.4%) were of at-risk maternal age, 90.3% did not experience placenta previa, 72.2% did not experience premature rupture of membranes, and 81.9% did not experience prolonged labor.
2. The frequency distribution of neonatal asphyxia showed that 50% of respondents experienced neonatal asphyxia and 50% did not.
3. There was a significant relationship between maternal age and the incidence of neonatal asphyxia at Palembang BARI General Hospital in 2023.
4. There was a significant relationship between placenta previa and the incidence of neonatal asphyxia at Palembang BARI General Hospital in 2023.

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