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Relationship of Preeclampsia History of Pregnant Women with the Incidence of Neonatal Asphyxia

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ABSTRACT

Introduction: The neonate mortality rate (NMR) in Indonesia is still relatively high and has not met the predetermined target. One of the main causes of neonate mortality is neonatal asphyxia which can be caused by maternal factors, namely a history of preeclampsia in pregnant women.

Objective: This study aims to determine the relationship between the history of preeclampsia in pregnant women and the incidence of neonatal asphyxia in RSUD Lanto Dg. Pasewang Jeneponto district for the period 2020-2021.

Method: This study is a quantitative analytic study with a case control approach. the sample selection method is a purposive sampling technique of 364 samples consisting of 182 case samples and 182 control samples obtained from medical record data at Lanto Dg. Pasewang Jeneponto Regency for the period 2020-2021. The analysis technique used in bivariate analysis is the chi square test with a significance level of 5% ($\alpha = 0.05$) with the help of statistical test software and the Odds Ratio (OR).

Result: The results of the study based on the analysis obtained a p-value of 0.000 on the relationship between the history of preeclampsia of pregnant women with the incidence of neonatal asphyxia and the Odds Ratio (OR) value of 22.728.

Conclusion: There is a relationship between the history of preeclampsia of pregnant women with the incidence of neonatal asphyxia at RSUD Lanto Dg. Pasewang Jeneponto Regency for the period 2020-2021 where a history of preeclampsia in pregnant women is 22.728 times more likely to cause neonatal asphyxia.

Keywords: Pregnant Women; Preeclampsia; Neonatal Asphyxia

INTRODUCTION

Neonatal mortality rate (NMR) is one of the indicators that can be used in assessing community welfare and health status based on the Sustainable Development Goal (SDGs). Based on data from the World Health Organization (WHO), the infant mortality rate (IMR) and neonate mortality rate (NMR) in the Southeast Asia region are ranked second highest after Africa. (1) In Indonesia, the MMR in 2017 reached 24 per 1,000 live births. Meanwhile, in 2019 it reached 60,000 cases and in 2020 it was 20,266 cases. (2) Based on data reported by the Directorate General of Public Health of the Indonesian Ministry of Health, the Neonatal Mortality Rate (NMR) in South Sulawesi in 2020 reached a level of 623 and 1,362 deaths in 2021. (3)

Although the overall neonatal mortality rate (IMR) has decreased every year, it has not yet met the neonatal mortality standard set by the Sustainable Development Goal (SDGs). Indonesia currently has a target to reduce neonatal mortality to 12 per 1,000 live births by 2030. (4,5)

The cause of neonate mortality is mostly caused by low birth weight (LBW) with 35.2%, then asphyxia with 27.4%, infection with 3.4%, congenital abnormalities with 11.4%, and tetanus neonatorum with 0.3%. (6) In 2021, the neonatal mortality rate caused by low birth weight (LBW) has decreased by 34.5% while the cause of asphyxia has increased by 27.8%. The World Health Organization (WHO) states that 11% of neonate deaths caused by asphyxia occur annually. (7,8) Asphyxia is the second highest cause of neonate mortality that occurs in Indonesia with an incidence rate in provincial referral hospitals around 41.94%. (9)

Neonatal asphyxia is a condition in which newborns experience failure to breathe spontaneously and regularly. (10) Asphyxia conditions can be caused by uteroplacental perfusion disorders that occur due to damage to the spiral artery and spasm in the blood vessels. In addition, asphyxia can also be caused by the inability of the baby to develop the lungs immediately after birth which causes a lack of oxygen capacity in the body. (4)

The incidence of asphyxia in newborns can have an impact on brain damage causing mortality, morbidity, and disability so that it has a long-term impact because it will hamper growth and development in children. Asphyxia caused by maternal factors can occur due to a history of disease owned by the mother such as preeclampsia. (11)

There are several factors that can cause neonatal asphyxia, namely maternal factors, labor factors, placental factors and infant factors. One of the causes of neonatal asphyxia due to maternal factors is the history of preeclampsia in pregnant women. Preeclampsia is a collection of symptoms or syndromes that occur in pregnant women with gestational age > 200 weeks characterized by systolic blood pressure ≥ 1400mmHg and diastolic ≥ 900mmHg and protein in the urine ≥ 300mg/24 hours. (12) Clinical manifestations of preeclampsia that occur in pregnant women are often slow to detect so that without realizing it in a short time a situation can arise that can endanger the mother and fetus. (13)

Indonesia has an annual incidence of preeclampsia of 128,237 cases and is the second highest cause of maternal death. In 2019, around 1,066 cases of maternal death were caused by hypertension in pregnancy. Based on statistical data from the Ministry of Health of the Republic of Indonesia in 2021, the cause of maternal mortality in South Sulawesi province is mostly due to hypertension in pregnancy. The incidence of preeclampsia in pregnant women can be one of the causes of maternal morbidity and mortality if not treated adequately because it can cause complications for the mother and fetus. One of the complications that can occur in the fetus is neonatal asphyxia. (12).

METHOD

This research was conducted at LantolDg Hospital. Pasewang Jeneponto Regency in November - December 2022 using the type of research in the form of quantitative analytics with Case Control design. The population in this study is divided into a case population, namely infants with an apgar score <7 and diagnosed with neonatal asphyxia and a control population, namely infants with an apgar score ≥ 7 at Lanti Dg. Pasewang Jeneponto Regency for the period 2020-2021. The sampling method was carried out using purposive sampling technique consisting of case groups and control groups with medical record data that met the inclusion and exclusion criteria with a total sample of 364 infants consisting of 182 case samples and 182 control samples.

Inclusion criteria in the case group include; All infants diagnosed with asphyxia with APGAR score <7 and have complete medical records at Lanto Hospital. Dg. Pasewang Jeneponto Regency 2020-2021. Inclusion criteria in the control group: Infants who are not diagnosed with asphyxia, namely APGAR score> 7 and have complete medical records at RSUD Lanto. Dg. Pasewang Jeneponto Regency 2020-2021. As for the exclusion criteria in this study, namely babies born with congenital deformations, babies with birth weight <2500 gr and premature babies.

The instrument used in this study is secondary data in the form of patient medical records with data analysis in the form of univariate analysis used to analyze each variable of the research conducted and bivariate analysis to assess the difference or relationship between two variables conducted using the chi square test and Odds Ratio (OR).

This study has received permission from the Health Research Ethics Committee of the Faculty of Medicine and Health Sciences, UIN Alauddin Makassar with No.B.333/KEPK/FKIK/X/2022.

RESULTS

Based on the research that has been done, the following data is obtained:

Table 1. Characteristics of Respondents at the Lanto Dg. Pasewang

Respondent Characteristics	Neonatal Asphyxia		Non-Asphyxia Neonatorum	
Mother's Age				
<20 Years	11	(6.0%)	8	(4.4%)
20-35 Years	107	(58.8%)	122	(67.0%)
>35 Years	64	(35.2%)	52	(28.6%)
Educational stage				
Elementary school or equivalent	78	(42.9%)	62	(34.1%)
Junior high school or equivalent	33	(18.1%)	32	(17.6%)
High school or equivalent	49	(26.9%)	67	(36.8%)
Diploma/Bachelor's/Master's/PhD	22	(12.1%)	21	(11.5%)
Occupation				
Housewife	148	(81.3%)	144	(79.1%)
Civil servant	6	(3.3%)	10	(5.5%)
Honorary	18	(9.9%)	15	(8.2%)
Entrepreneur	10	(5.5%)	13	(7.1%)
Maternal history of pre-eclampsia				
Yes	93	(51.1%)	8	(4.4%)
No	89	(48.9%)	174	(95.6%)
Total	**182**	**(100%)**	**182**	**(100%)**

Source Secondary Data, 2022

Table 1 shows the characteristics of the respondents in this study. Based on the age of the mother, the average age of the mother is 20-35 years in respondents with neonatal asphyxia and non-neonatal asphyxia, namely 107 (58.8%) respondents and 122 (67%). Based on education, the average education of respondents in the incidence of neonatal asphyxia is elementary school as many as 78 (42.9%) respondents while in the incidence of non-neonatal asphyxia is high school as many as 67 (36.8%) respondents. Based on occupation, the average occupation of mothers as housewives in respondents with neonatal asphyxia and non-neonatal asphyxia is 148 (81.3%) respondents and 144 (79.1%). Based on Maternal History of Preeclampsia, on average there was a history of Preeclampsia in the incidence of neonatal asphyxia, namely 93 (51.1%) respondents while in the incidence of non-neonatal asphyxia on average there was no history of Preeclampsia as many as 174 (95.6%) respondents.

Tabel 2 The Relationship of Preeclampsia History of Pregnant Women with the Incidence of Neonatal Asphyxia at Lanto Dg. Pasewang Hospital

Maternal history of pre-eclampsia	Neonatal Asphyxia	Non-Asphyxia Neonatorum	P-value	OR	CI 95%
	N	N			
Yes	93 (51,1%)	8 (4,4%)	0.000	22,728	10,566 - 48,889
No	89 (48,9%)	174 (95,6%)			
Total	**182 (100%)**	**182 (100%)**			

Sumber SPSS, 2022

Table 2 shows the incidence of neonatal asphyxia based on the mother's medical history, namely preeclampsia and non preeclampsia. Of the total sample of 364 infants, consisting of 182 neonatal asphyxia infants, most had mothers with a history of preeclampsia, namely 93 infants (51.1%) and 89 infants (48.9%) with non-preeclamptic mothers. Meanwhile, out of 182 babies without neonatal asphyxia, most of them had non preeclamptic mothers, namely 174 babies (95.6%) and only 8 babies (4.4%) had mothers with a history of preeclampsia.

Analysis of the relationship between the history of preeclampsia of pregnant women with the incidence of neonatal asphyxia was carried out using the Chi Square formula and obtained a p-value of 0.000 (p < 0.005) which indicates that there is a significant relationship between the history of preeclampsia of pregnant women with the incidence of neonatal asphyxia at RSUD Lanto Dg. Pasewang Jeneponto Regency 2020-2021 period. Odd Ratio (OR) value of 22.728 with 95% CI lower limit (LL) value of 10.566 and upper limit (UL) of 48.889. Based on the results of the study, it can be concluded that pregnant women with a history of preeclampsia have a 23 times greater risk of giving birth to neonatal asphyxia babies compared to non preeclamptic mothers with a confidence level of 10.566 - 48.889 experiencing the incidence of neonatal asphyxia.

DISCUSSION

Neonatal asphyxia is a condition where there is a failure to breathe spontaneously and hormonally immediately after the baby is born. This is caused by intra-uterine fetal hypoxia associated with factors that arise in pregnancy, one of which is a history of preeclampsia in pregnant women. (14) Many factors cause asphyxia, namely maternal factors, umbilical cord factors and infant factors. Maternal factors include preeclampsia and eclampsia, abnormal bleeding, prolonged partus or prolonged Kala II, fever during labour, severe infection, postmature pregnancy, and maternal age. Fetal factors include premature infants, congenital abnormalities and amniotic fluid mixed with meconium. Cord factors include cord entanglement, short cord, cord knots and cord prolapse. Neonatal asphyxia is a neonatal emergency that can result in hypoxia (low oxygen supply to the brain and tissues) and possible brain damage or death if not treated properly. (15).

Of the many risk factors that can cause neonatal asphyxia, one of the risk factors studied in this study is the mother's history of preeclampsia during pregnancy. Preeclampsia is a disease with signs of hypertension, edema, and proteinuria that occurs during pregnancy. Based on the results of the study, out of 101 pregnant women with a history of preeclampsia, 93 mothers gave birth to babies with a diagnosis of neonatal asphyxia. Meanwhile, only 8 mothers with a history of preeclampsia gave birth to non-asphyxia babies. This is because the onset of preeclampsia during pregnancy can have a very bad impact on the health of the mother and fetus which causes spasm in the arteriola spiralis decidua so that there is a decrease in blood flow to the placenta which causes fetal hypoxia. (8).

Based on theory, asphyxia due to preeclampsia occurs due to endothelial dysfunction, which alters the balance between vasoconstrictor hormones (endothelin, thromboxane, angiotensin) and vasodilators (nitric oxide, prostacyclin), thus affecting the gas exchange between oxygen and carbon dioxide delivered to the fetus through the placenta, causing neonatal asphyxia. In addition, when hypoxia occurs in neonates, it will cause a change in aerobic to anaerobic metabolism, causing an increase in carbon dioxide, body fluids, and blood acidosis. (16)

Based on the results of the research analysis between the history of preeclampsia in pregnant women and the incidence of asphyxia, there is a significant relationship with a value of p = 0.000 and a history of preeclampsia in pregnant women has a 23 times greater risk of causing neonatal asphyxia with an Odd Ratio (OR) of 22.728. The results of this study are in line with research conducted by Kamila Auliya Nurul, Wathaniah Siti (2021) with a sample of 62 case groups and 62 control groups then obtained a p value = 0.000 which means that there is a significant relationship between the history of preeclampsia in pregnant women and the incidence of neonatal asphyxia. (17)Likewise, the research of Mongdong et al (2021) at Dr Sayidin Magetan Hospital, East Java with a sample of 326 people then obtained the results of p value = 0.000 (p < 0.005) and Odds Ratio (OR) 3.071 which means that there is a significant relationship between the history of preeclampsia in pregnant women and the incidence of neonatal asphyxia and preeclampsia has a 3.071 times greater risk of causing asphyxia babies.(8) Silviani et al (2022) suggested the same thing in their research with a sample of 103 cases and 103 control cases at Siti Aisyah Hospital, Lubuklinggau City. From the results of bivariate analysis there is a relationship between preeclampsia and the incidence of asphyxia in newborns which is statistically significant with p value = 0.000 <0.005.(18) research conducted by Yunarsih & Rahayu (2019) in Kediri Regency with a total of 62 samples, also agrees with the researcher and supports this study based on the results of the Chi Square test obtained a p-value of 0.000 <0.005 with these results meaning there is a relationship between Pre Eclampsia with the incidence of asphyxia.(19)

Neonatal asphyxia occurs when the baby lacks O2 because the placental O2 flow to the fetus is impaired due to failure to adapt in the transition period. Disruption in the exchange of O2 and CO2 is one of them with a history of preeclampsia in pregnant women. A history of preeclampsia causes an increase in tropoblast cell displacement to increase which results in blood transfer through arterial vessels failing until placental ischaemia occurs. (20) The reduced blood flow that occurs in pregnant women with preeclampsia leads to impaired uteroplacental perfusion. As a result of vasospasm and damage to the spiral arteries during pregnancy and impaired exchange of O2 and CO2 when the baby is born, asphyxia occurs in newborns. In acute hypoxic conditions, blood will go to vital organs first such as the brain stem and heart, compared to the cerebrum, choroid plexus, substantia alba, adrenal glands, skin, musculoskeletal tissue, thoracic and abdominal organs such as lungs, liver kidneys, and gastrointestinal tracts.

Changes in blood flow result from a decrease in cerebral vascular resistance to the heart and an increase in vascular resistance to peripheral organs (7).

CONCLUSION

Based on the results of research and discussion that has been described previously, it can be concluded that there is a significant relationship between the history of preeclampsia pregnant women with the incidence of neonatal asphyxia at Lanto Dg. Pasewang Hospital, Jeneponto Regency. Where a history of preeclampsia in pregnant women has a 23 times greater risk of giving birth to babies with neonatal asphyxia compared to non preeclamptic mothers.

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