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Original Research Article

Modeling of Factors that Influence on Early Neonatal Death due to Asphysia in South Central Timor District

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Abstract: The infant mortality rate is also an important indicator to reflect the state of health status in a society, progress in the field of prevention and eradication of various diseases that cause death will be clearly reflected by the decline in the level of IMR. Thus the infant mortality rate is a sensitive measure of all intervention efforts made by the government, especially in the health sector. The purpose of this study was to find out and analyze what factors had the most influence on early neonatal deaths due to asphyxia in Timor Tengah Selatan Regency in 2021. The design of this study used a case-control research design with a retrospective study approach. The population in this study was divided into 2, namely the case population were all live births that experienced asphyxia and died in early Neonatal and the control population in this study were all live births who had asphyxia and did not die in the 2020 period in the work area of the Health Service. South Central Timor Regency (TTS). The sample size in this study was taken using a total sampling technique, where the entire population was used as the research sample, namely as many as 26 case samples, with a sample size comparison between cases and controls was 1:1, so the total sample size was 52 samples. The results showed that there was an effect of gestational interval (95% CI = 3.20-47.834 p-value = 0.000), history of premature (95% CI = 1.836-20.315 p-value = 0.003) and asphyxia (95% CI = 4.509- 74.539 p-value = 0.000) on Early Neonatal Death in Timor Tengah Selatan Regency (TTS). There was no effect of parity on gestational age (p-value=0.213), anemia (p-value=0.432), Long Parturition (p-value=0.201) and ANC visits (p-value=0.211 on Early Neonatal Mortality in Timor Tengah Selatan Regency (TTS) The most dominant variable and the most influential on the incidence of Early Neonatal mortality is the Asphyxia variable.

Keywords: Early Neonatal Mortality, Pregnancy Distance, Premature History, Asphyxia Gestational Age, Anemia, Long Parturition and ANC Visits.

INTRODUCTION

Maternal mortality and morbidity, maternity, and postpartum are still a big problem for developing countries, including Indonesia. The high rate of maternal and child mortality explains that the national health status of a country is low. If the maternal and child mortality rates are still high, maternal health services are still lacking and vice versa if the maternal mortality rate is low then maternal health services are good (BKKBN, 2018). Maternal health services during pregnancy are important for pregnant women and their babies. This service effort is one of the prevention efforts against bad conditions that can occur in a pregnant woman (Kementerian Kesehatan Republik Indonesia, 2019).

Globally, 2.4 million children died in the first month of life in 2019. There are about 6,700 newborn deaths every day, or 47% of all deaths of children under 5 years of age, up from 40% in 1990. World has made substantial progress in child survival since 1990. Globally, the number of neonatal deaths decreased from 5.0 million in 1990 to 2.4 million in 2019. However, the decline in neonatal mortality from 1990 to 2019 was slower than that of reduction in post-natal mortality under 5 years the share of neonatal mortality among under-five deaths remains relatively low in sub-Saharan Africa (36 percent), which remains the region with the highest under-five mortality. In Europe and North America, which have one of the lowest under-five mortality rates among the SDG regions, 54 percent of all under-five deaths occur during the neonatal period.

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The exception is South Asia, where the proportion of neonatal deaths is among the highest (62 percent) despite a relatively high under-five mortality rate (World Health Organization 2020).

The Neonatal Mortality Rate (AKN) in developed countries is in the United States at 4 per thousand live births, United Kingdom/England, 3 per thousand live births, Australia 3 per thousand live births, and Japan 1 per thousand live births. While in ASEAN countries, Myanmar ranks first (30 per thousand live births), followed by Timor Leste (24 per thousand live births), Cambodia (19 per thousand live births), Laos (17 per thousand live births) and Indonesia ranks sixth. five (World Health Organization, 2018).

Until now, AKN in Indonesia is still relatively high compared to other ASEAN countries. This indicates that neonatal health problems need special attention. Based on the results of the Indonesian Demographic and Health Survey (SDKI) in 2017, the AKN is 15 per thousand live births. This figure decreased from 19 per 1000 live births in 2012 but is still above the national AKN target according to the RPJMN 2024, which is 10/1000 KH (Survei Demografi dan Kesehatan Indonesia, 2017).

Data from NTT Province reports that in 2015 there were 909 cases of neonatal death in NTT Province, with details of early neonatal deaths (0-7 days) as many as 752 cases and late neonatal deaths (7-28 days) 157 cases, while data on neonatal deaths in Nusa East Southeast in 2018 as many as 796 cases with 208 cases caused by asphyxia. Based on these data, it can also be seen that TTS Regency ranks first in neonatal deaths due to asphyxia with 30 cases, followed by Manggarai Regency with 26 cases and Kupang Regency with 13 cases. (Dinas Kesehatan Provinsi NTT, 2019). Based on data from the TTS District Health Office (2020), where neonatal deaths in TTS District were 82 cases of death with details of 72 cases of early neonatal death (0-7 days) and 10 cases of late neonatal death (7-28 days). The data also revealed that the most common causes of neonatal death were low birth weight (27 cases), asphyxia (26 cases), sepsis (2 cases), congenital abnormalities (8 cases), aspiration of breast milk (2 cases) and other causes as many as 17 cases. This shows that asphyxia is the second most common cause of neonatal death after LBW (Dinas Kesehatan TTS, 2020).

METHODS

This type of research is an analytical survey research with a case-control design. The research was conducted in the working area of the South Central Timor District Health Office. The population in this study was divided into 2 groups: the case population was 26 infants and the control population was all live births. The sample in this study was divided into 2, namely the case sample totaling 26 infants and the control sample totaling 26 infants so that the overall sample was 52 infants with the determination of the control sample using random sampling technique. Data collection techniques using research questionnaires. Data analysis included univariate, bivariate with simple logistic regression test and multivariate with multiple logistic regression test. Presentation of data in this study in the form of tables and narratives (Sugiyono, 2017).

RESULTS

Table 1: The Effect of Independent Variables on Early Neonatal Mortality in Timor Tengah Selatan Regency in 2021

		B	S.E.	Wald	df	Sig.	Exp (B)	95.0% C.I.for EXP (B)	
								Lower	Upper
Step 1	Pregnancy Distance	2.979	1.419	4.404	1	.036	19.660	1.217	317.500
	Gestational Age	1.704	.367	1.553	1	.213	5.495	.377	80.099
	Premature History	1.438	1.213	4.037	1	.045	11.452	1.062	123.542
	Anemia	1.341	1.705	.619	1	.432	3.822	.135	107.960
	Asphyxia	2.829	1.333	4.505	1	.034	16.932	1.242	230.840
	Long Parturition	2.058	1.611	1.632	1	.201	7.831	.333	184.175
	Visit ANC	2.232	1.785	1.564	1	.211	9.320	.282	308.185
	Constant	-8.718	3.038	8.234	1	.004	.000		

Based on Table 1, it is known that the variables that meet the requirements after being analyzed using simple logistic regression to be able to proceed to the multivariate analysis stage are the variables of gestational distance, history of prematurity and asphyxia. All variables that meet the requirements are then carried out with multivariate analysis.

This analysis uses multiple logistic regression test with 95% confidence level. All independent variables that entered the candidate were analyzed together. The best model was considered with a significant value (p-value < 0.05). The selection of insignificant variable values is removed from the model, carried out gradually one by one from the highest p-value variable.

The analysis used multivariate with multiple logistic regression method to see the effect of several independent variables at once on one dependent

variable which was tested at the same time. The variables that were continued using multivariate were the type of leprosy, treatment, length of illness, disability, stress and stigma. This analysis takes the independent variable which has a p-value <0.05 in bivariate analysis. Table 1 shows that all variables have a p-value > 0.05, meaning that this variable can be continued in multivariate analysis.

Table 2: Variable Multivariate Results Research on Early Neonatal Death in South Central Timor Regency in 2021

	B	S.E	Wald	Df	Sig	Exp (B)	95% CI for EXP (B)	
							Lower	Uper
Pregnancy Distance	3.417	1.204	8.055	1	.005	30.471	2.878	322.564
Premature History	2.406	1.006	5.717	1	.017	11.087	1.543	79.666
Asphyxia	3.969	1.240	10.249	1	.001	52.912	4.660	600.814
Constant	-4.916	1.413	12.111	1	.001	.007		

Based on Table 2, it is known that from the final modeling analysis, 3 research variables, distance of pregnancy, history of prematurity and asphyxia simultaneously affect the incidence of Early Neonatal Death in Timor Tengah Selatan Regency. The most dominant and most influential variable on the incidence of Early Neonatal death is the Asphyxia variable, so that the conclusion is that mothers with a history of asphyxia score have a 52,912 risk or chance of experiencing Early Neonatal death compared to mothers without a history of asphyxia.

DISCUSSION

Effect of Pregnancy Distance on Early Neonatal Mortality

Pregnancy interval is the interval between two successive births of a woman. The distance between pregnancies that tend to be short can cause several negative effects both on the health of the woman and the health of the baby she is carrying. After giving birth, women need sufficient time to recover and prepare for pregnancy and subsequent childbirth (Rifdiani, 2017).

The results showed that there was an effect between pregnancy interval and Early Neonatal mortality in Timor Tengah Selatan Regency. The condition that causes the high number of deaths is the factor of distance between pregnancies which is still considered by the mother as something not to worry about in giving birth or planning a pregnancy. Based on the data, mothers with cases of Early Neonatal Death have a history of close pregnancy intervals of < 2 years, thereby increasing the risk of death or health problems for the mother and child. Researchers expect couples or mothers to consider health risks such as age, fertility level, access to health services, childcare support and socioeconomic circumstances when making choices for subsequent pregnancies so as to reduce the risk of harm to mother and child.

Research conducted by Fitri *et al*., (2017) shows that the risk of infant mortality will increase when the birth distance is < 18 months and becomes protective when the birth distance is > 36 months and the risk of infant mortality in rural areas is greater than in urban areas (Fitri, 2017). Another study conducted by Sawitri (2014) found that the pregnancy distance variable obtained a p-value of (0.001) < (0.05), meaning that there was an effect of gestational distance on early neonatal mortality. Judging from the coefficient maternal pregnancy distance is negative, which means that every 2 years increase in the distance between a mother's birth will reduce the risk of early neonatal death by 9.738 times (Sawitri, 2014).

Short pregnancy intervals affect the health of mothers and children in addition to providing a high risk of neonatal death, women who give birth consecutively in a short period of time do not have time to recover their health and must share their attention with two children at the same time. In addition, it is necessary to wean large children who should be breastfed to breastfeed their newborns.

Effect of Premature History on Early Neonatal Death

Premature labor is labor that takes place at 20–37 weeks of gestation, counting from the first menstrual period to the last menstrual period. Preterm labor is delivery before the 37th week of gestation with a fetal weight of less than 2500 grams. Women who had a premature birth in a previous pregnancy have a 20 to 40 percent risk of recurrence. Women who gave birth to their first child prematurely increased three times compared to women whose first baby was born at term (Manuaba 2012).

The results showed that there was an influence between a history of prematurity and Early Neonatal mortality in Timor Tengah Selatan Regency. Some mothers with previous cases of early neonatal death have a history of prematurity from one child to another. This condition makes a big impact on the occurrence of cases of death in children. The proportion of women who gave birth prematurely with parity at risk was higher than the proportion with normal deliveries with parity at risk. Risk parity will have an impact on the risk of complications both during pregnancy and delivery, one of which is premature labor.

Diagnosing premature labor too soon or too late has the risk of increasing neonatal morbidity and mortality. The main sign of preterm labor is the presence of contractions, these contractions must be distinguished between true or false contractions, true contractions are always accompanied by cervical dilatation and effacement, and occur at < 37 weeks of gestation. The main way to reduce the risk of preterm labor can be done early, before signs of labor appear. Starting with the introduction of patients at risk for explanation and clinical assessment of preterm labor and recognizing contractions as early as possible so that preventive measures can be taken immediately.

Research conducted by Annisa (2020) that based on the results of medical records obtained, from 25 dead asphyxia and 50 living asphyxia, the history of LBW neonates was 37.3%, premature was 37.3%, and the presence of congenital abnormalities was 16%. There is a relationship between asphyxiated infants with a history of premature birth and infant mortality (p-value 0.0001 with an OR value of 40.0) where asphyxia infants with a history of prematurity are 40 times more likely to die than infants who are not premature (Annisa dkk, 2020).

Development of organs in the fetus. The less the gestational age, the more immature the organs formed, one of which is the lungs. Therefore, in premature infants there is a deficiency of pulmonary surfactant which can cause respiratory failure immediately after birth which is called asphyxia neonatorum. This condition is caused by disturbances during the growth and development of the fetus in the womb. Congenital abnormalities can cause babies to be born with disabilities or functional disorders in certain organs or body parts (Maharani, 2008).

Effect of Asphyxia on Early Neonatal Death

Asphyxia neonatorum is the failure of a newborn to breathe spontaneously regularly, causing further disturbances, which affect the entire body's metabolism. Asphyxia in newborns (BBL) according to IDAI (Indonesian Pediatric Association) is a spontaneous and regular respiratory failure at birth or shortly after birth. Asphyxia neonatorum is a failure to initiate and continue breathing spontaneously and regularly at the time of the newborn or shortly after birth (Manuaba, 2012).

The results of the bivariate test using the Simple Logistics Regression test between the asphyxia variable and early neonatal death obtained a p-value of 0.000, which means that there is a relationship between the asphyxia variable and early neonatal death. The results of statistical tests also obtained an OR value of 18,333, which means that the risk level of mothers with a history of asphyxia is 18,333 times greater for experiencing early neonatal death compared to mothers without a history of asphyxia.

This study is in line with previous research by Masitoh *et al*., (2014) with the title Asphyxia the Dominant Factor of Neonatal Death. The results of this study indicate that there is a significant relationship between asphyxia and neonatal mortality. Neonates with asphyxia have contributed to the occurrence of neonatal mortality 13.6 times compared to neonates without asphyxia. According to the assumptions of Masitoh *et al*., asphyxia as a cause of neonatal death is possible because of help that is not fast and appropriate, fixed procedures that have not been carried out according to standards and delays in handling asphyxia babies so that babies die (Masitoh dkk, 2014).

This study is also in line with research by Kusumawardani *et al*., (2018) which showed the results of the chi-square test with a p-value = 0.000 which means that there is a significant relationship between infants experiencing asphyxia and the incidence of infant mortality with an OR value of 21.614 which indicates that Babies who experience asphyxia at birth have a 21.614 times greater risk of death compared to babies who do not experience asphyxia (Kusumawardani and Handayani, 2018).

This research is also in line with research conducted by Rahayu (2019) with the title Analysis of Asphyxia Cases in Neonatal Deaths at Tugurejo Hospital Semarang which stated that asphyxia is one of the biggest causes of early neonatal deaths. The results showed that the biggest cause of neonatal death in RSU X was asphyxia with 78 (86.7%) and 12 (13.3%) non-asphyxia as a result of aspiration, infection in the form of neonatal pneumonia, birth injury, feeding problems and congenital malformations (Rahayu and Tjahjowati 2019).

Another similar study is the study by Toressy (2020) which states that asphyxia is one of the factors associated with early neonatal death. In testing between asphyxia and the incidence of neonatal death in Dr. M. Haulussy Ambon found that there was a statistically significant relationship between asphyxia and neonatal mortality (p=0.000). Based on the results of this study, there were 29 cases of mild or normal asphyxia, 40 neonates with moderate asphyxia and 47 severe asphyxia. In the control group, 203 neonatal mild or normal asphyxia was found, 25 neonatal asphyxia was moderate and 4 neonatal severe asphyxia was (Toressy, Asmin, and Kailola 2020).

According to the researchers, asphyxia is associated with early neonatal death due to the condition of babies experiencing asphyxia requiring prompt and appropriate help from health workers so that they can anticipate infant deaths. Babies who have asphyxia need proper handling so as not to cause baby defects and disturbances in their growth and development in the future. This happens because of the lack of oxygen intake in the organs of the neonate's

body, so that the organ function is not optimal. Glycogen produced by the body in the liver is reduced which causes jaundice in the long term and death in the short term.

CONCLUSION

The conclusion in this study is that there is an effect of gestational distance, history of prematurity and asphyxia on Early Neonatal Death in Timor Tengah Selatan Regency (TTS). There is no effect of parity of gestational age, anemia, prolonged labor and ANC visits on Early Neonatal Death in Timor Tengah Selatan Regency (TTS). The most dominant and most influential variable on the incidence of Early Neonatal mortality is the Asphyxia variable.

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