

Asphyxia a major risk factors of early neonatal mortality

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ABSTRACT

Objective: The purpose of this study to examine risk factors determination early neonatal mortality. **Method:** This type of research is a retrospective analytical study design with a case-control approach. The number of samples in this study was 114 events. With a total sampling technique. The data collection tool uses a checklist with logistic regression analysis. **Results:** The factors that influenced the incidence of early neonatal mortality were asphyxia, birth weight and gestational period. That the asphyxia has a chance of 218,3, birth weight has a chance of 33.9 and the incidence of the gestational period has a chance of 20.9 times for the occurrence of early neonatal mortality. **Conclusions** in this study are the factors that influence the incidence of early neonatal mortality are asphyxia, birth weight and gestational period.

Keywords: Asphyxia, Low Birth Weight, Gestational Period, infant Mortality, Hospital.

INTRODUCTION

According to WHO, a neonatal definition is neonatal until the age of 28 days or the first 4 weeks of life. Neonatal can be divided into 2 times namely early neonatal and advanced neonatal. Early neonatal is neonatal until 7 days old [19, 25]. The number of data from the WHO shows that globally in 2018, there are approximately 7000 neonatal deaths every day and globally 2,5 million children died in the first month of life. In addition, 2.6 million babies die in the last 3 months of pregnancy or during childbirth (stillbirths). The majority of all neonatal deaths (75%) occur during early neonatal age, and about 1 million neonatal die within the first 24 hours. In southern Asia, known the proportion of neonatal deaths is among the highest (62%) [21, 22].

In Indonesia, in 2017 a known number of neonatal death is 15/1000 live birth [11]. Based on the health profile book of the province of Central Java in 2018, it is known that the neonatal mortality rate is 6.1 / 1000 live births for the province of Central Java. Regencies/cities with the highest neonatal mortality rate were Rembang at 11.7 per 1,000 live births, followed by Grobogan (11,5 per 1,000 live births) and Banjarnegara regency (10.7 per 1,000 live births). Regency/city with the lowest neonatal mortality rate was Surakarta City 1.8 per 1,000 live births [1].

In Cilacap regency 2018 known that mortality neonatal rate was 3,6 per 1,000 live birth [1]. That figure is lower than in 2017, which is 3,7 per 100

live birth [2]. Referring to several research results showing that risk factors for early neonatal mortality are asphyxia, birth weight, congenital anomalies, septicemia, maternal anemia, ANC, immunization status, parity, early marriage, pregnancy complications, and gestational age [3]–[7]. The top cause of neonatal death is prematurity, complication during birth, severe infection, intrapartum-related complications (birth asphyxia or lack of breathing at birth), and birth defects[8], [9]. Asphyxia is a condition where a newborn baby does not immediately cry. The results of research in West Nusa Tenggara Hospital, 4 Banjarnegara health centers, and in Jember Regency are known that asphyxia affects neonatal mortality, with OR values ranging from 1.45 - 26.10 [4], [10], [11] Several factors that influence the occurrence of asphyxia are known among others: placental abruption, placenta previa, tingling, umbilical cord disorders, birth age, baby weight, maternal socioeconomic, sepsis, complications, prolonged labor, premature rupture of membranes, breech placement and maternal parity [12]–[15]

Another cause of early neonatal death is known as Prematurity. Prematurity conditions impact on early neonatal body weight. It is known at the Maharashtra Hospital in India, that low birth weight contributes 80% to early neonatal deaths. In Indonesia, it is known that neonatal with low birth weight risk is 9.89 times compared to neonatal with normal birth weight. In the neonatal unit of Combined Military Hospital Kharian, Pakistan, it is

known that neonatal with low birth weight is 231.5 / 1000 live births. of these figures, it is known that 89.7% are early neonatal [5], [16], [17].

Low birth weight is a condition where a neonatal baby weighs less than 2500 grams. Overall, it is estimated that 15% to 20% of all births worldwide are low birth weight, representing more than 20 million births per year. Most births with low birth weight occur in low and middle-income countries and especially in the most vulnerable populations (6, 7). Regional estimates of low birth weight include 28% in South Asia, 13% in sub-Saharan Africa and 9% in Latin America. Globally in 2015, 20.5 million neonatal, an estimated 14.6 percent of all babies born globally that year, suffered from low birth weight. In 2018 an estimated 37.4 million neonatal will be born [18], [19].

The incidence of low birth weight in Indonesia in 2018 is known to be 6.2 per 1000 live births. There has been a decline from 2015 to 10 per live births. One of the provinces in Indonesia is Central Java. The following is the incidence of low birth weight in Central Java from 2014-2018: the lowest in 2014 was 3.90, then rose rapidly in 2015, amounting to 5.1 and stagnant in 2016-2017 which was 4.4 and in 2018 a decline to 4.3 per 1000 live births was known. Cilacap is one of the districts in Central Java Province. The incidence of low birth weight in Cilacap in 2018 is known to be 3.5 per 1000 live births and is included in the 9th rank of all districts in Central Java, amounting to 35 districts. In terms of numbers, there has been a decline from 2017, which is known to be 3.6 per 1000 live births as well as a decrease in ranking which previously Cilacap was in the top 5 rankings [1], [2], [19].

This study aims to determine the factors that influence early neonatal mortality in Cilacap General Hospital in 2017-2018. The factors studied consisted of maternal factors and neonatal factors. Maternal factors consist of gestation, age,

comorbidities, and delivery complications. Neonatal factors consist of birth weight.

MATERIAL AND METHOD

A. Study Design

The case-control study was performed using data from 2017 – 2018 at Cilacap General Hospital. Inclusion criteria in this study were all mothers who gave birth with newborn babies died with complete medical records data. The number of respondents consisted of 57 mothers who gave birth to early neonatal mortality and 57 mothers who gave birth to a live neonatal. The variables studied in this study consisted of independent variables in the form of maternal and fetal factors. Maternal factors studied were age, parity, gestational age, history of illness and delivery complications. Fetal factors studied were birth weight, asphyxia, congenital abnormalities, and sepsis. Maternal factors and neonatal factors as independent variables and the incidence of early neonatal deaths are dependent variables. Data were collected using a checklist that lists the variables sought. Data obtained from secondary data derived from medical records Cilacap General Hospital.

B. Data Analysis

To test the hypothesis by determining the relationship between independent and dependent variables, through logistic regression tests.

RESULT

Maternal and Neonatal Characteristic

The number of women giving birth in 2017 at the Cilacap Regional Hospital was 2351 mothers. Of 2351 mothers there were 30 (1.27%) mothers who gave birth to an early neonate with death. Furthermore, 2370 mothers who gave birth in 2018, 27 (1.13%) of them gave birth to early neonates with deaths. In this study, the number of both case and control group were 57 mothers.

Table 1: Maternal Characteristics

Variable	Population					
	Case		Control		Total	
	n	%	n	%	n	%
Mother's Age						
16 – 20 y.o	6	10,5	3	5,3	9	8
21 – 25 y.o	12	21,1	21	36,8	33	28,9
26 – 30 y.o	15	26,3	15	26,3	30	26,3
31 – 35 y.o	12	21,1	13	22,8	25	21,9
36 – 40 y.o	8	14	4	7	12	10,5
41 – 45 y.o	4	7	1	1,8	5	4,4

Parity						
1	23	40,4	26	45,6	49	43
2 – 4	30	52,6	30	52,6	60	52,6
>5	4	7	1	1,8	5	4,4
Gestational Period						
<37	35	61,4	4	7	39	34,2
≥37	22	38,6	53	93	75	65,8
Comorbidities						
Yes	11	19,3	3	5,3	14	12,3
No	46	80,7	54	94,7	100	87,7
Birth Complications						
Yes	28	49,1	7	12,3	35	31
No	29	50,9	50	87,7	79	69

The majority of mothers who gave birth to early neonatal death were 26-30 and 21-25 y.o for case and control group, respectively. it is known that both the case and the control of the multipara

majority. When viewed from the characteristics of gestational age, the majority of cases of illness and delivery complications experienced by the case population (Table 1).

Table 2: Maternal factors associated with early neonatal mortality

Variable	Population						
	Case		Control		Nilai		
	n	%	N	%	p	OR	CI 95%
Mother's Age							
Yes	16	28,1	6	10,5	0,10	3,32	1,19-9,23
No	41	71,9	51	89,5			
Parity							
Yes	25	43,9	27	47,4	0,70	0,86	0,41-1,82
No	32	56,1	30	52,6			
Gestational Period							
Yes	37	64,9	3	5,3	0,00	33,30	9,22-120,2
No	20	35,1	54	94,7			
Comorbidities							
Yes	11	19,3	3	5,3	0,02	4,3	1,13-16,4
No	46	80,7	54	94,7			
Birth Complication							
Yes	28	49,1	7	12,3	0,00	6,9	2,7-17,8
No	29	50,9	50	87,7			

Based on the above table, it can be seen that from 5 maternal factors, there are at least 3 factors that influence the incidence of early neonatal death. Of

the 3 factors that have an effect, when viewed from the OR value, the greatest risk is the variable age of the pregnancy.

Table 3: Neonatal factors associated with early neonatal mortality

Variable	Population						
	Case		Control		Nilai		
	n	%	N	%	p	OR	CI 95%
Birth Weight							
Yes	41	71,9	2	3,5	0,00	70,5	15,3-323,7
No	16	28,1	55	96,5			

Asphyxia							
Yes	50	87,7	2	3,5	0,00	196,4	39-990
No	7	12,3	55	96,5			
Sepsis							
Yes	8	14	0	0	0,00	-	-
No	49	86	57	100			
Congenital Anomalies							
Yes	6	10,5	0	0	0,00	-	-
No	51	89,5	57	100			

The incidence of low birth weight, of asphyxiation, of sepsis and congenital abnormalities, are mostly experienced by mothers born in early neonatal death. Also known from the four factors above that the overall effect on the incidence of early neonatal

death. Of these 4 factors, the incidence of asphyxia provides the greatest opportunity in providing opportunities for the incidence of early neonatal mortality.

Table 4: Parameters that affect Early Neonatal Mortality

Variable	Significance	OR	CI 95%	
			Lower	Upper
Birth Weight	0,01	33,9	1,9	590,7
Gestational Period	0,04	20,9	1,0	424,8
Mother's Age	0,08	0,0	0,0	1,4
Comorbidities	0,88	0,6	0,0	311,3
Birth Complication	0,16	6,1	0,5	74,9
Asphyxia	0,00	218,3	10,4	4595

Based on the results above it can be seen that there are 4 maternal factors and 2 neonatal factors. Of the 6 factors, there are 3 factors that influence the incidence of early neonatal mortality. Of these 3 factors, it is known that the incidence of asphyxia provides the greatest opportunity for early neonatal mortality.

DISCUSSION

The results showed that asphyxia was the first factor affecting the incidence of early neonatal death. Asphyxia contributed to the incidence of early neonatal death with a 218.3 times chance. Asphyxia is a condition where newborn babies do not cry spontaneously.

Several similar studies prove that in 4 public health centers in Banjarnegara District it is known that asphyxia is influential and provides an opportunity of 6.23 times for the incidence of early neonatal deaths. Likewise in the Province of Kurdistan, Iran, asphyxia was influential and gave 7.2 chances. Events in the Kenya Tertiary Hospital found that asphyxia was influential and provided an opportunity 2.5 times [4], [6], [20].

Several factors that influence the occurrence of asphyxia are known among others: placental abruption, placenta previa, tingling, umbilical cord disorders, birth age, baby weight, maternal socioeconomic, sepsis, complications, prolonged labor, premature rupture of membranes, breech placement and maternal parity (Gilang, Notoatmodjo, & Rakhmawatie, 2010; Herawati, 2013; Saptanto & Anggraheny, 2012; Yuliana and Anugrah, 2018).

At the time of neonatal birth, there is a process of chest compressions in vaginal delivery and the fluid in the baby's alveoli changes into the air for the first time. When the lungs fail to expand, then the neonate will experience asphyxiation. If asphyxiation is not helped immediately, the cell tissue will lack oxygen. As a result of the lack of oxygen in cell tissue, there is a great risk of damage to the brain that results in death or disability.

The second factor that contributes to early neonatal death is birth weight. Birth weight contributes 33.9 times the chance to cause early neonatal death. Results in the present study are in concurrence

Budiati, I (2019) which shows that Odds Ratio test results at 95% confident interval values obtained 11,33 and lower limit value (LL) = 2.83 and upper limit (UL) = 45.27 [4]. Another study that is in line with this study is a study in the Northeast of Brazil, which shows the results that the variables associated with neonatal mortality less than 24 hours are neonatal with low birth weight and provide a risk of 2.94 times [21]. Similarly, the results of research in Latvia found that newborns with low birth weight have the potential for the incidence of early neonatal mortality by 3.4 times [22].

Neonatal with low birth weight need more glucose to maintain body warmth. Meanwhile, neonatal metabolic abilities are not as perfect as babies. When neonatal with low birth weight needs to increase the metabolism of which fuel is oxygen and glucose, then the ability to breathe must also be increased where the respiratory organs in neonatal are not functioning optimally and are still running anaerobically. Likewise, the fulfillment of glucose intake is not met in full through breast milk, due to the limited ability to eat and gastric capacity so that the dominant administration through the infusion. Limitations of the ability of respiratory and digestive functions of the neonate if not resolved at great risk of death.

The third factor affecting early neonatal death is gestation. The results of this study are supported by research Rachmadiani, A, Shodikin, M and Komariah, C in 2018 which states that there is a relationship between gestational period with neonatal death and provides an opportunity of 2.92 times to experience the incidence of early neonatal death in mothers with abdominal gestation of 37 weeks [11].

Gestation period or gestational age is an indicator of the development and growth of the pregnancy. The older the gestational age, the readiness of the organs of the fetus is getting ready too. but on the contrary, the younger the gestational age, the readiness of the fetal organs to interact with the outside world is not yet optimal. A fetus born at fewer months of age, if viewed from the anatomy of the body ie the lungs, is of course immature. In addition to the immature lung organs, the amount of fat under the skin is also insufficient to overcome the temperature difference that is lower than when they are bleeding and not yet sufficient for the fulfillment of nutrients during the womb. If the neonate is fewer months of birth, then the risk is high for death due to respiratory failure or hypothermia or hypoglycemia.

Risk factors that contribute to low body weight at birth include the condition of pregnant mother with anemia, the condition of pregnant mother with less chronic energy, the condition of pregnant mother with a history of illness, the condition of pregnant mother with birth spacing of less than 2 years, body mass index in pregnancy period and the condition of the fetus with congenital abnormalities detected during pregnancy. A study in California proved several risk factors that influence the incidence of low birth weight, namely age (OR: 1.28), primipara (OR: 1.40), body mass index underweight <18.5 (OR: 1.58) [23].

Other supporting research proves that disease risk factors such as anemia (OR: 4.03), preeclampsia (OR: 1.83), eclampsia (OR: 3.31), hypertension (OR: 2.75) pose a risk to the incidence of low birth weight in neonatal. Aside from illness, birth intervals of less than 2 years (OR: 1.58), multiple pregnancies (OR: 21.38), and gestational age (OR: 77.9) contribute to the incidence of low birth weight in neonatal respectively [24]–[26].

In Indonesia, it is known that not all newborns are weighed. In the profile book of Indonesian children in 2018 it was noted that based on the type of region, more rural areas were not weighed (5.37%) than in urban areas (1.15%). Another phenomenon is also found that in urban areas (14.15%) more experienced low birth weight than in urban areas (13.55%). The high percentage of neonatal events with low birth weight is also related to the high number of pregnant mothers with anemia, especially pregnant mothers aged 15-24 years (84.6%). To overcome the high number of pregnant mothers with anemia, the Indonesian government has promoted an iron tablets program of at least 90 tablets for all pregnant mothers with a national target coverage of 95%. However, coverage throughout Indonesia has only reached 81.16% of the provision of iron tablets. In the Province of Central Java, only 92.29% was achieved in 2018. Whereas In Cilacap district, it is known that the coverage of giving tablet iron is still below the national target in 2018, namely 91.65%.[1], [27], [28].

Indicators of nutritional fulfillment during pregnancy in anticipation of neonatal events with low birth weight, through monitoring weight gain during pregnancy and the size of the circumference of the left arm. Ideally, increase body weight during pregnancy between 10 - 12 kg and the normal circumference of the left arm of a pregnant mother is more than 23.5 cm. If the nutritional intake of pregnant mothers measured by weight gain and the

circumference of the left arm does not meet the standards, it can be categorized as chronic energy deficiency. In reality, in 2016, 53.9% of the pregnant mother was known to experience energy deficits. Efforts from the Indonesian government to overcome pregnant mothers with chronic lack of energy by providing nutritional supplements in the form of biscuits containing protein, linoleic acid, carbohydrates and enriched with 11 vitamins and 7 minerals. In 2018 the target of supplementary feeding is 80% and nationally has exceeded the target of 86.41% [28].

In this study, it was also covered, that there were several neonatal deaths that had congenital abnormalities in the form of multiple congenital abnormalities, laryngomalacia, anencephalus, labiopalatoskizis, and omphalocele. The results of the author's research prove that congenital abnormalities have a 5.4 times chance to experience death during the neonatal period [7]. Meanwhile, the illnesses suffered by mothers who give birth early neonates with death are anemia, superimposed preeclampsia, severe preeclampsia, HIV / AIDS, and asthma.

CONCLUSION

Based on the results of the research above, it can be concluded that the factors that influence the incidence of early neonatal mortality are asphyxia, birth weight and gestational period with $p < 0.05$. That the asphyxia has a chance of 218,3, birth weight has a chance of 33.9 and the incidence of gestation periods has a chance of 20.9 times for the occurrence of early neonatal mortality.

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