Analysis Risk Factors of Asphyxia Neonatorum at Bitung Regional General Hospital

[1]*Indri Marasing,* [1]*Risna Ayu Rahmadani,* [1]*Priska Pandaleke,* [2]*Amelia Donsu,* [3]*Elfredo Josua Halawa*
[1]*Midwifery Department, Trinita University, Indonesia*
[2]*Midwifery Department, Health Polytechnic Ministry of Health Manado, Indonesia*
[3]*Nutrition Department, Health Polytechnic Ministry of Health Manado, Indonesia*

Abstract: *Neonatorum asphyxia* is a condition where newborns cannot breathe spontaneously and regularly immediately after birth so that it can reduce O2 and increase CO2 which causes bad consequences in further life. This study aims to analyze the factors associated with the incidence of asphyxia neonatorum. This research method is descriptive analytic using a retrospective design, namely research that seeks to look back, meaning that data collection starts from the effect that is traced back to the cause or the variables that influence the effect. This study was conducted in the Bitung Regional General Hospital. The samples used were 111 samples which were determined by stratified random sampling. The results obtained = 0.000 for parity, = 0.000 for maternal age, = 0.002 for gestational age, = 0.033 for premature rupture of membranes ($\rho < 0.05$). In conclusion, there is a relationship between parity, maternal age, gestational age and premature rupture of membranes with the incidence of asphyxia neonatorum.

Keywords **:** asphyxia neonatorum, parity, maternal age, gestational age, premature rupture of membranes.

Introduction

Maternal and neonatal health services are one of the determinants of health status. Neonatal health services begin before the baby is born, through health services provided to pregnant women. The growth and development of infants during the neonatal period is the most critical period because it can cause infant morbidity and mortality (Rahmawati dan Ningsih, 2016). The degree of neonatal health is closely related to the level of health during pregnancy, delivery assistance and newborn care. Various efforts are considered to have the greatest impact on reducing mortality, efforts to utilize planning for basic maternal and child health services (MCH) and family planning, including a place-of-service approach by placing competent village midwives and private practice midwives (Syaiful dan Khudzaifah, 2016).

According to the World Health Organization (WHO, 2018) the infant mortality rate is 29 deaths per 1000 live births. In 2018, 4.0 million (75% of all under-five deaths) occurred in the first year of life. The first month of life is the most vulnerable period for child survival, 2.4 million newborns died in 2020. Almost half (47%) of all under-five deaths occur in the neonatal period (the first 28 days of life) (WHO, 2020). Sub-Saharan Africa has the highest neonatal mortality rate in the world (27 deaths per 1000 live births) globally 43% of deaths occur in newborns, followed by central and southern Asia (23 deaths per 1000 live births), globally 36% deaths occurs in newborns. Premature birth, intrapartum-related complications (neonatal asphyxia or inability to breathe at birth), infections and birth defects are the major causes of most neonatal deaths. Children who die within the first 28 days of birth suffer from conditions

[1]Correspondent Author E-mail: marasingindri@gmail.com

and illnesses associated with a lack of quality care at or immediately after birth and in the first days of life. Asphyxia is an unresolved public health problem in the Ethiopia (Ritbano Ahmed, et al. 2021). In Indonesia, based on the Infant Mortality Rate (IMR), it reaches 24 deaths per 1000 live births (BPS, 2017). According to Prawirohardjo (2009) one of the causes of death during the perinatal period is asphyxia neonatorum (Herawati, 2013).

Asphyxia causes the baby to look weak, experience a rapid decrease in heart rate, the body becomes blue or pale and reflexes weaken until they disappear (Oxorns and Forte 2010). Many factors cause asphyxia, including gestational age less than 37 weeks, parity, maternal age, premature rupture of membranes, low birth weight (<2500 g), neonatal anemia, and others (Nayeri et al, 2012 & Oxorn and Forte). 2010). The results of the study (Gerungan et al, 2014) stated that of the three variables (parity, maternal age, gestational age) associated with neonatal asphyxia, gestational age showed a significant relationship with the incidence of asphyxia neonatorum. In line with (Syaiful and Khudzaifah, 2016) which states that of the three variables (gestational period, type of delivery, duration of labor) related to neonatal asphyxia, gestational period shows a significant relationship with the incidence of neonatal asphyxia. Katiandagho and Kusmiyati, (2015) concluded that there was a relationship between premature babies, maternal age, prolonged labor and umbilical cord entanglement with the incidence of asphyxia neonatorum.

Literature Review

Asphyxia neonatorum is a condition in which the baby cannot breathe spontaneously and regularly, so that it can decrease O2 and increase CO2 which causes bad consequences in further life. The purpose of treatment for asphyxiated infants is to facilitate the continuity of the baby's breathing, which mostly occurs at the time of delivery (Manuaba, 2007). Signs and symptoms of asphyxia neonatorum can be seen from the level of asphyxia through the APGAR Score whether asphyxia is mild, moderate or severe.

Factors that cause asphyxia neonatorum are the condition of the mother, the condition of the baby and the factor of health workers. Parity one is at risk because the mother is not ready medically (reproductive organs) or mentally. While parity above 4, physically experienced a setback to undergo pregnancy. This situation predisposes to bleeding, placenta previa, uterine rupture, placental abruption which can end in neonatal asphyxia (Purnamaningrum, 2010). The age of 20-35 years is relatively the safest in terms of healthy reproduction where a mother can safely conceive if she gets good care during pregnancy (Saifudin, 2010). Manuaba (2007) determined that the risk factors that can affect the optimization of the mother and fetus are the age of less than 20 years and age over 35 years. Women who are pregnant under the age of 20 years will experience various obstacles because young mothers during pregnancy do not pay attention to their pregnancy, including pregnancy control. This has an impact on increasing the various risks of pregnancy. At the age of the mother 35 years or more, the risk of death increases because women who reach the age of 35 years or more generally experience decreased fertility. This situation predisposes to bleeding, uterine rupture, placental abruption which can end in neonatal asphyxia (Saifudin, 2010).

In addition, gestational age is one of the causes of neonatal asphyxia. The main difficulty in preterm labor is the care of the baby, the younger the gestational age the greater the morbidity and mortality (Saifudin, 2010). Premature babies are associated with what is thought to be placental dysfunction and can be seen by physical signs such as abnormal heart rate and difficulty breathing (Arif and Kristiyanasari, 2009). Similarly, postterm labor or delivery with a gestational age of more than 42 weeks, is associated with placental function that begins to decline after 42 weeks, resulting in an increased incidence of fetal distress with a risk of 3 times that of term delivery. In postterm labor the fetal skin will become wrinkled, the fat under the skin will thin out and even disappear, over time the fetal skin will peel and dry out. Hair and

nails lengthen and amniotic fluid decreases until it runs out. Due to lack of oxygen, fetal distress will occur which causes the fetus to defecate in the uterus which will color the amniotic fluid to become dark green. At the time the fetus is born, aspiration (fluid is sucked in the airway) of amniotic fluid can occur which can cause a collection of symptoms of meconium aspiration syndrome. This situation can cause respiratory problems and will result in death (Saifudin, 2010). However, a baby who looks normal on the outside is not necessarily perfect on the inside. Most likely there are abnormalities in the internal organs, including respiratory disorders (Arif and Kristiyanasari, 2009).

Under normal circumstances 8-10% of pregnant women at term will experience premature rupture of membranes. Premature rupture of membranes is a state of rupture of the membranes before delivery. The amniotic membrane is very strong in early pregnancy. In the third trimester, the membranes break easily. The weakening of the strength of the amniotic membranes has to do with uterine enlargement, uterine contractions and fetal movement. With rupture of the membranes oligohydramnios occurs which compresses the umbilical cord to occur asphyxia or hypoxia. There is a relationship between the occurrence of fetal distress and the degree of oligohydramnios, the less amniotic fluid, the more serious the fetus (Prawirohardjo 2009).

Methodology

This research was conducted at Bitung Regional General Hospital. The type of research used is descriptive analytic using a retrospective design. The independent variables in this study were parity, maternal age, gestational age and premature rupture of membranes. And the dependent variable is asphyxia neonatorum. The population in this study were all mothers who had babies diagnosed with asphyxia neonatorum based on the diagnosis of birth attendants who were born at Bitung Hospital in 2020, namely 930 babies. The sample in this study was 111 respondents who were determined based on the sample calculation formula for data on the proportion of a limited population according to Lemeshow, et al. (1997).

Table 1
Characteristics of the Sample

Variable	Amount	Percentage (100%)
Parity		
1 dan >4	56	50,5
2-3	55	49,5
Maternal age		
<20 dan >35	59	53,2
20-35	52	46,8
Gestational age (Weeks)		
<37 dan >42	67	60,4
37-42	44	39,6
Premature rupture of membranes (PROM)		
Those who have PROM	47	42,3
Those who do not experience PROM	64	57,7
Asphyxia Neonatorum	46	41,4
Severe asphyxia 0-3	65	58,6
Moderate asphyxia 4-6		
Total	111	100

Table 2
The Relationship of Parity with the Incidence of Asphyxia Neonatorum

Parity	*Asphyxia Neonatorum*				Total	%	P
	Severe asphyxia		Moderate asphyxia				
	n	%	n	%			
1 dan >4	33	71,7	23	35,4	56	50,5	0,000
2-3	13	28,3	42	64,6	55	49,5	
Total	46	100	65	100	111	100	

The interpretation of table 2 shows that the highest number is in parity 1 and >4 with severe asphyxia as much as 33 (71.7%) while moderate asphyxia 23 (35.4%) and parity 2-3 with moderate asphyxia as much as 42 (64.6%). while severe asphyxia was 13 (28.3%). The chi-square statistical test with an accuracy level of = 0.05 shows a value of 0.000. This shows that there is a significant relationship between parity and neonatal asphyxia.

Table 3
Relationship of Maternal Age with Asphyxia Neonatorum

Maternal age	*Asphyxia Neonatorum*				Total	%	P
	Severe asphyxia		Moderate asphyxia				
	n	%	n	%			
<20 dan >35	34	73,9	25	38,5	59	53,2	0,000
20-35	12	26,1	40	61,5	52	46,8	
Total	46	100	65	100	111	100	

The interpretation of table 3 shows that the highest number is at age <20 and >35 years with severe asphyxia as much as 34 (73.9%) while moderate asphyxia is 25 (38.5%) and maternal age 20-35 years with moderate asphyxia is 40 (61 years). .5%) while severe asphyxia 12 (26.1%). The chi-square statistical test with an accuracy level of = 0.05 shows a value of 0.000. This shows that there is a significant relationship between maternal age and the incidence of asphyxia neonatorum.

Table 4
Relationship between Gestational Age and Asphyxia Neonatorum

Gestational age (weeks)	*Asphyxia Neonatorum*				Total	%	P
	Severe asphyxia		Moderate asphyxia				
	n	%	n	%			
<37 dan >42	20	43,5	47	72,3	67	60,4	0,002
37-42	26	56,5	18	27,7	44	39,6	
Total	46	100	65	100	111	100	

The interpretation of table 4 above shows that the highest number is at gestational age <37 and >42 weeks with moderate asphyxia as much as 47 (72.3%) while severe asphyxia is 20 (43.5%) and gestational age 37-42 weeks with severe asphyxia as much as 26 (56.5%) while moderate asphyxia was 18 (27.7%). Chi-square statistical test with an accuracy level of = 0.05 showed value <0.05. This shows that there is a significant relationship between gestational age and the incidence of asphyxia neonatorum.

Table 5
Relationship between premature rupture of membranes and the incidence of asphyxia neonatorum

Premature rupture of membranes (PROM)	*Asphyxia Neonatorum*				Total	%	P
	Severe asphyxia		Moderate asphyxia				
	n	%	n	%			
Those who have PROM	14	30,4	33	50,8	47	42,3	0,033
Those who do not experience PROM	32	69,6	32	49,2	64	57,7	
Total	46	100	65	100	111	100	

The interpretation of table 5 above shows that the highest number is in those without PROM with severe asphyxia 32 (69.6%) moderate asphyxia 32 (49.2%) and those experiencing PROM with moderate asphyxia 33 (50.8%) severe asphyxia 14 (30.4%). The chi-square statistical test with an accuracy level of = 0.05 shows a value of 0.033, meaning that value <0.05. This shows that there is a significant relationship between premature rupture of membranes and the incidence of asphyxia neonatorum.

Findings & Discussion

Table 2 shows that parity is associated with the incidence of asphyxia neonatorum. This is in line with the research conducted by Selly (2010) in Padang with the research title Factors Associated with the Incidence of Neonatal Asphyxia that more than half (55%) of parity 1 and > 4 gave birth to asphyxia babies compared to parity 2-3. Likewise, a study by Gerungan et al (2014) in Manado with the title Factors Associated with the Incidence of Neonatal Asphyxia that parity 1 and > 4 has a relationship with the incidence of asphyxia neonatorum.

Parity 2-3 is a safe parity in terms of maternal mortality. Meanwhile, parity 1 and parity >4 have a higher maternal mortality rate caused by postpartum hemorrhage. Low parity or parity one, shows the readiness of the mother in the face of the first delivery, which is a factor causing the inability of pregnant women to handle complications that occur in pregnancy, childbirth and postpartum (Wintjosastro, 2007). Low parity or parity one, shows the readiness of the mother in the face of the first delivery, which is a factor causing the inability of pregnant women to handle complications that occur in pregnancy, childbirth and postpartum (Wintjosastro, 2007). Parity one is at risk because the mother is not ready medically (reproductive organs) or mentally. While parity above 4, physically experienced a setback to undergo pregnancy. This situation predisposes to bleeding, placenta previa, uterine rupture, placental abruption which can end in neonatal asphyxia (Purnamaningrum, 2010).

Table 3 shows that maternal age is associated with the incidence of neonatal asphyxia. This is in line with the research conducted by Gerungan et al (2014) in Manado that more than half (61.00%) of mothers aged < 20 and > 35 years experienced neonatal asphyxia compared to mothers aged 20-35 years. Likewise, research conducted by Katiandagho and Kusmiyati (2015) in Tahuna found that maternal age had a relationship with the incidence of neonatal asphyxia. Healthy reproduction known as a safe age for pregnancy is a woman aged 20-35 years. The age of 20-35 years is relatively the safest in terms of healthy reproduction where a mother can safely conceive if she gets good care during pregnancy (Saifudin, 2010). Manuaba (2007) determined that the risk factors that can affect the optimization of the mother and fetus are the age of less than 20 years and age over 35 years. In general, a woman is said to be physically ready if she has completed her body growth, which is about 20 years, when her body stops growing. So that the age of 20 years is used as a guide for physical readiness. Women who become pregnant at a young age, from a biological perspective, the development of reproductive organs is not fully optimal. From a psychological point of view, they are immature in dealing with moral, mental and emotional burdens. From an economic point of view, they are not ready to be independent, from a medical point of view they often have health problems. A woman to get pregnant must have readiness, namely physical readiness, mental readiness, emotional, psychological and social and economic readiness.

Women who are pregnant under the age of 20 years will experience various obstacles because young mothers during pregnancy do not pay attention to their pregnancy, including pregnancy control. This has an impact on increasing the various risks of pregnancy. In addition, young mothers during pregnancy often experience blood pressure irregularities which can have an impact on pregnancy poisoning and seizures that result in death. Meanwhile, women who become pregnant at too old age, the function of their reproductive organs has experienced a

decline in organ function and the emergence of degenerative disorders such as hypertension, diabetes mellitus and so on. At the age of the mother 35 years or more, the risk of death increases because women who reach the age of 35 years or more generally experience decreased fertility. This situation predisposes to bleeding, uterine rupture, placental abruption which can end in neonatal asphyxia (Saifudin, 2010).

Table 4 shows that gestational age is associated with the incidence of neonatal asphyxia. In line with the results of research conducted by Syaiful and Khudzaifah (2016) that gestation period has a relationship with the incidence of neonatal asphyxia. The high perinatal mortality (70%) was due to premature delivery (< 37 weeks). In premature babies, their vital organs are not fully developed, which causes them to not be able to live outside the womb, so they often experience adaptation failures that can cause high morbidity and even mortality. Where the lungs are immature, preventing the baby from breathing freely. Premature infants often do not produce sufficient amounts of surfactant, so that the alveoli do not remain open where between breaths the lungs actually deflate, resulting in respiratory distress syndrome (Manuaba, 2007). Postterm delivery is delivery with a gestational age of more than 42 weeks. Perinatal problems in postterm delivery are mainly related to placental function which begins to decline after 42 weeks, resulting in an increase in the incidence of fetal distress with a risk 3 times that of term delivery. In postterm labor the fetal skin will become wrinkled, the fat under the skin will thin out and even disappear, over time the fetal skin will peel and dry out. Hair and nails lengthen and amniotic fluid decreases until it runs out. Due to lack of oxygen, fetal distress will occur which causes the fetus to defecate in the uterus which will color the amniotic fluid to become dark green. At the time the fetus is born, aspiration (fluid is sucked in the airway) of amniotic fluid can occur which can cause a collection of symptoms of meconium aspiration syndrome. This situation can cause respiratory problems and will result in death (Saifudin, 2010). Term labor, also known as term labor, is labor with a gestational age of 37 weeks to 42 weeks. Babies that look normal on the outside are not necessarily perfect on the inside. Most likely there are abnormalities in the internal organs, including respiratory disorders (Arif & Kristiyanasari, 2009). The results of the study by Fitriana Y, et al (2021) showed that the risk factors for asphyxia neonatorum were prolonged labor, prematurity and low birth weight.

Table 5 shows that premature rupture of membranes is associated with the incidence of asphyxia neonatorum. In line with the results of research conducted by Rahmawati and Ningsih (2016) that premature rupture of membranes has a relationship with the incidence of asphyxia neonatorum. Premature rupture of membranes is a state of rupture of the membranes before delivery. Ruptured membranes in labor are generally caused by uterine contractions and repeated stretching. The amniotic membrane ruptures because in certain areas there are biochemical changes that cause the inferior amniotic membrane to be fragile, not because the entire membrane is fragile.

The amniotic membrane is very strong in early pregnancy. In the third trimester, the membranes break easily. The weakening of the strength of the amniotic membranes has to do with uterine enlargement, uterine contractions and fetal movement. In the last trimester there are biochemical changes in the amniotic membrane. Rupture of the membranes at term pregnancy is a physiological thing. Premature rupture of membranes in premature pregnancy is caused by external factors, such as infection that spreads from the vagina. Premature premature rupture of membranes often occurs in polyhydramnios, incompetent cervix, placental abruption. With rupture of the membranes oligohydramnios occurs which compresses the umbilical cord to occur asphyxia or hypoxia. There is a relationship between the occurrence of fetal distress and the degree of oligohydramnios, the less amniotic fluid, the more serious the fetus (Prawirohardjo, 2009).

References

Arief, Z. R. Kristiyanasari, W. (2009). *Neonatus & Asuhan Keperawatan Anak*. Nuha Medika. Yogyakarta.

Badan Pusat Statistik, (2017). Angka Kematian Bayi per 1000 Kelahiran Hidup. https://www.bps.go.id/dynamictable/2019/10/06/1688/angka-kematian-bayi-akb-per-1000-kelahiran-hidup-menurut-provinsi-2012-dan-2017.html

Fitriana G, et al. (2021). Risk Factors for Asphyxia Neonatorum in Public Health Centres of Nosarara and Pantoloan, Palu City. Journal Gaceta Sanitaria. 35(2). Doi: 10.1016/j.gaceta.2021.07.009

Gerungan, J, C. Syuul, A. & Losu, F, N. (2014). Faktor-Faktor Yang Berhubungan Dengan Kejadian Asfiksia Neonatorum Di RSUP Prof. Dr. R. D. Kandou Manado. *Jurnal Ilmiah Bidan*. 2 (6:66)

Herawati, R. (2013). Faktor-Faktor Yang Menyebabkan Terjadinya Asfiksia Neonatorum Pada Bayi Baru Lahir Di Rumah Sakit Umum Daerah Kabupaten Rokan Hulu. *Jurnal Maternity and Neonatal*. 1 (2:76-77).

Katiandagho, N. Kusmiyati. (2015). Faktor-Faktor Yang Berhubungan Dengan Kejadian Asfiksia Neonatorum Di RSUD Liun Kendage Tahuna. *Jurnal Ilmiah Bidan*. 3 (2:29).

Kristiyanasari, W. Jitowiyono, S. (2011). *Asuhan Keperawatan Neonatus dan Anak.* Nuha Medika. Yogyakarta.

Manuaba, I.A.C. (2007). *Buku Pengantar Kuliah Obstetri*. Cetakan pertama. EGC, Jakarta.

Nayeri, F & Shariat, M. (2012). Perinatal risk factors for neonatal asphyxia in vali-e- Asr hospital, Tehram-Iran. *jurnal*. 10 (2:137).

Oxorn, H & Forte W. R. (2010). *Ilmu Kebidanan Patologi & Fisiologi Persalinan*. Yayasan Essentia Medika. Yogyakarta.

Purnamaningrum, Y, E. (2010). *Penyakit pada Neonatus, Bayi dan Balita*. Fitramaya. Yogyakarta.

Rahmawati, L dan Ningsih, M, P. (2016). Faktor-Faktor Yang Berhubungan Dengan Kejadian Asfiksia Pada Bayi Baru Lahir Di Ruang Medical Record RSUD Pariaman. *Jurnal Ilmiah Kebidanan*. 7 (1:29).

Ritbano A, et al. 2021. Prevalence and risk factors associated with birth asphyxia among neonates delivered in Ethiopia: A systematic review and meta-analysis. Journal pone. 5;16(8). Doi:10.1371/journal.pone.0255488.

Saifudin. (2010). *Ilmu Kebidanan*. PT Bina Pustaka Sarwono Prawirohardjo. Jakarta.

Selly, F.M. (2010). Faktor-Faktor Yang Berhubungan Kejadian Asfiksia Neonatorum di RSUP DR. M. Djamil Padang. *Jurnal*.

Syaiful, Y. Khudzaifah, U. (2016). Faktor yang Berhubungan dengan Kejadian Asfiksia Neonatorum di RS Muhammadiyah Gresik. *Jurnals of Ners Community*. 7 (1:56-57)

Wintjosastro. (2007). *Ilmu Kebidanan*. Yayasan Bina Pustaka Sarwono Prawirohardjo. Jakarta.

WHO, (2018). Infant Mortality. https://www.who.int/data/gho/data/themes/topics/indicator-groups/indicator-group-details/GHO/infant-mortality

WHO, (2020). Newborn Mortality. https://www.who.int/news-room/fact-sheets/detail/levels-and-trends-in-child-mortality-report-2021