

Risk factors of early neonatal death in East Nusa Tenggara, Indonesia: a case-control study

Irene K. L. A. Davidz¹, Kuntoro¹, Hermanto T. Joewono², Irwanto³

Abstract

Background Neonatal mortality in East Nusa Tenggara is still high, contributes up to 75% of all neonatal death and more than 70% of early neonatal death which occurred less than 7 days after birth..

Objective To analyze the risk factors of early neonatal death in East Nusa Tenggara.

Methods This case control study was conducted in 18 districts of East Nusa Tenggara, Indonesia. The case was newborn death, while the control was alive newborn during the early neonatal period. The data was obtained from the maternal and neonatal medical record that was kept in provincial health office and each health district office. An interview with mothers was performed if needed. The observed variables were the early neonatal death as a dependent variable and various independent variables.

Results The early neonatal death was associated with maternal age under 20 or over 35 years old (OR=1.8; 95%CI 1.1 to 3.1; P=0.032), the history of stillbirth (OR=27.5; 95%CI 11.6 to 64.5; P=0.000), mother with tuberculosis (OR=15.3; 95%CI 1.7 to 137.3; P=0.015), mother with hyperthyroid (OR=15.5; 95%CI 2.2 to 107; P=0.006), the risk for premature labor (OR=4.5; 95%CI 2.3 to 8.7; P=0.000), prolonged labor (OR=2.3; 95%CI 1.2 to 4.8; P=0.020), the delivery not in a health facility (OR=18.6; 95%CI= 6.5 to 52.7; P=0.000), low birth weight infants (OR=5.6; 95%CI 3 to 10.3; P=0.000), and asphyxia (OR=25.2; 95%CI 9.9 to 64.5; P=0.000).

Conclusions Increased early neonatal death is associated with maternal age, history of stillbirth, mother with hyperthyroid or tuberculosis, prolonged or risk for premature labor, delivery not in a health facility, low birth weight infants, and asphyxia. [Paediatr Indones. 2022;62:282-90 DOI: 10.14238/pi62.4.2022.282-90].

Keywords: early neonatal death; risk factors

Early neonatal death is the death of a newborn before reaching 7 days after birth.¹ The death can be caused by many factors, including premature birth, complications in maternal pregnancy and childbirth, difficulty in adapting to life outside the uterus, or due to an infection.¹ Globally, neonatal death happened in 2.5 million newborns every year, a third of these death occurs on the first day of life and up to 75% occurs during the first 7 days of life. The first day and the first week of life is a critical period for a newborn baby.²

Besides, UNICEF in 2018 states that the neonatal mortality rate in Indonesia is 12.7/1000 live births; decreasing when compared to data in 2017, which was 13.2/1000 live births.³ East Nusa Tenggara (ENT) is one of the provinces in Indonesia with a relatively high infant mortality rate, including neonatal mortality rate.² The data retrieved from the *ENT Guidelines for Maternal and Child Health Program*

From the Department of Biostatistics and Population, Faculty of Public Health¹, Department of Obstetrics and Gynecology², Department of Child Health³, Universitas Airlangga Medical School, Surabaya, East Java, Indonesia.

Corresponding author: Irene K.L.A. Davidz, Department of Biostatistics and Population, Faculty of Public Health, Universitas Airlangga, Jl. Mayjen. Prof. Dr. Moestopo No. 47, Surabaya, East Java 60132, Indonesia. Phone: (+62 31) 5020251. E-mail: irene.kathreen.l.a.davidz-2014@fkm.unair.ac.id.

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in 2009 showed that before the program was initiated, the infant mortality rate in ENT was higher than the national rate (62/1000 live births vs. 52/1000 live births). The Maternal and Child Health Program has not decreased neonatal death significantly, yet there is an increase in neonatal death in the last 2 years (2016-2017), which the incidence of early neonatal deaths was 77.5% in 2016 and 80% in 2017.⁴

There are limited studies evaluate the risk factors for neonatal death in ENT. A study in ENT, which was performed by the *Australia Indonesia Partnership for Maternal and Neonatal Health*,⁵ found that there were 11 primary risk factors for neonatal death, including: neonate with complications during the labor process, low education level of mother concerning warning sign in newborn babies, low appearance, pulse, grimace, activity, and respiration (APGAR) score, newborn from mother with complications during pregnancy, the delivery not in health facility, newborn from mother with pregnancy with complications history, low birth weight without proper *Kangaroo Mother Care* treatment, newborn that does not undergo early breastfeeding initiation, newborn from high-risk pregnancy, and mother with young age before marriage. From these risk factors, the three risk factors significantly associated with early neonatal death were neonate with complications during labor, neonate with health issues, and neonate with low APGAR score. Maternal complications in pregnancy and labor are the factors that can be detected early so various prevention efforts can be made, including mothers giving birth in adequate health facilities, thus early neonatal deaths can be prevented.

This study aimed to identify the risk factors that contribute the early neonatal death in ENT. The results of this study were expected to be recommendations for the decision-maker in the relevant field to increase the quality of health service for mother and newborn babies and increase the quality of children in ENT.

Methods

This case-control study was conducted in 18 districts in ENT, Indonesia, including Kupang City, Kupang Regency, North Central Timor Regency, Belu Regency and Malacca Regency on Timor Island, West Sumba Regency and Southwest Sumba Regency on Sumba

Island, Lembata Regency, East Flores Regency, Sikka Regency, Ende Regency, Nagekeo Regency, Ngada Regency, Manggarai Regency, East Manggarai Regency and West Manggarai Regency on Flores Island, Alor Regency, and Sabu Raijua Regency. The study location was selected purposively. The data was obtained from the maternal and neonatal medical record that was kept in the provincial health office and each district health office. An interview with mothers was performed if needed. The case was newborn death during the early neonatal period (0-7 days), while the control was alive newborn during same period. The minimal sample size was calculated using the case control-sample formula with the minimal sample of 180, but as this study was conducted in a very wide area then the minimal subject number was 600. The inclusion criteria for the samples were babies born alive, dying within the first 7 days, and mothers with certain risk factors. Meanwhile, the criteria for controls were the baby born alive, live within the first 7 days, and the mothers with the same risk factors. The exclusion criteria were neonatal infection or sepsis, and having congenital abnormalities. The data were collected for 9-12 months from September 2017 to Juni 2018. This study was approved by the Ethical Committee of the Public Health Faculty of Universitas Airlangga.

The observed variables in this study consisted of a dependent variable, which was the early neonatal death, and various independent variables. The independent variables were maternal age, mother's height, parity number, birth interval spacing, number of prenatal care performed, the mother with obstetric complication histories (stillbirth baby, cesarean delivery, hypertension in pregnancy, abortion, and hemorrhage during the previous pregnancy), the mother with certain diseases such as anemia, tuberculosis, asthma, hyperthyroid, hypertension during pregnancy, malaria, and protein energy-malnutrition (based on the measurement of the mother's nutritional status based on the arm circumference value during pregnancy), complications during pregnancy and labor (hemorrhage, premature rupture of membranes, meconial membrane aspiration, malposition, multiple gestation, eclampsia/severe pre-eclampsia, antepartum/postpartum hemorrhage, the risk for premature labor, prolonged labor, and induced labor), delivery factors (types of delivery,

place of delivery and birth assistant), and neonate factors (birth weight, asphyxia, and gestational age). Birth weight was distinguished by low and normal birth weight. Asphyxia and gestational age were determined by Apgar score and Ballard score, respectively.

The data analysis was performed using bivariate and multivariate analysis in SPSS version 19 (IBM, USA) using a logistic regression method. The included variables in the multivariate analysis were determined based on the bivariate regression result with a P value of <0.25 . The next stage was evaluation using multivariate logistic regression to see each variable with a value of $P < 0.05$.

Results

This study was conducted with 774 respondents that divided into 129 cases and 645 controls (1:5). The distribution of each independent variable in the case and control group did not show equal distribution, which means that all of these variables were potential to be a risk factor (Table 1). The independent variables that were eligible to be analyzed with multivariate analysis were maternal, birth interval spacing, numbers of prenatal care visit, history of stillbirth, mother with tuberculosis, haemorrhage during pregnancy, meconial membrane aspiration, risk for premature labor, prolonged labor, place of delivery, delivery assistant, low birth weight, asphyxia, and gestational age (Table 2).

Based on the multivariate analysis using the logistic regression method, it was shown that the most affecting variable to early neonatal death in ENT was the history of stillbirth, delivery not in a health facility, the risk for premature labor, low birth weight, and asphyxia ($P=0.000$) as shown in Table 3.

Discussion

The major risk factors for infant's death in ENT was low birth weight, asphyxia, and neonatal infection, with the highest death proportion occurred in early neonatal (0-7 days of life).⁴ These factors were the major cause in most of the districts or cities in ENT, especially for low birth weight and asphyxia. The

intervention for early neonatal death in ENT can be selected based on the most affecting factors.

Our study showed that mothers under 20- or over 35-year-old were correlated with early neonatal death. An infant born from mothers under 20- or over 35-year-old had a 1.8 times higher mortality rate in the early neonatal period than who were born from mothers between 20- and 35-year-old. The pregnancy in women under 20-year-old was related to the risk of premature labor before 32 weeks of gestation, maternal anemia, lung infection, and urinary tract infection, but had fewer induced labors, vacuum extraction, and caesareans. Uterine hypotonia was also the major cause of post labor hemorrhage and better myometrial function might be responsible for the lower proportion of post labor hemorrhages in women under 18-year-old. Women under 18-year-old had post labor stays longer than 3 days.^{6,7} Gestational diabetes mellitus was more common for pregnancy in women over 35-year-old despite controlling for confounding factors related to decreased insulin sensitivity by ethnicity and obesity.⁸

Several studies also showed a similar result. A previous study shown that mother under 18- or over 35-year-old have a higher risk for neonatal death in developing countries.⁹ Similarly, another study shown that mothers of that age have a higher risk for perinatal death.¹⁰ Mothers under 18-year-old have 1.41 times of higher risk for early neonatal death, with hazard ratio (HR) 4.07 times higher for neonatal death.^{11,12} Interestingly, several studies did not find a significant correlation between mother's age and neonatal death, such as in Brazil,¹³ the differences can occur due to demographic, socio-economic, cultural differences.

The history of stillbirth in the previous pregnancy is one of the risk factors for early neonatal death. Mothers with a history of stillbirth had 27.3 times higher risk than mothers without previously history of stillbirth According to the WHO,¹⁴ a stillbirth baby is a newborn without any signs of life at birth or after 28 weeks of gestation. The main causes of stillbirth are the complications during the labor process, post-term pregnancy, infections during pregnancy (malaria, syphilis, and HIV), mother with hypertension, obesity or diabetes, and intrauterine growth retardation or congenital disorders. More than half of the stillbirth incidence occurs during the labor process. Most of the stillbirth incidence could be prevented and it

Table 1. Characteristics of subject

Characteristics, n(%)	Case n=129	Control n=645
Mother's age		
< 20-year-old	3 (2.3)	11(1.7)
20 to 35-year-old	79 (61.2)	447 (69.3)
> 35-year-old	47 (36.5)	187 (28.9)
Mother's height		
> 145 cm	124 (96.1)	599 (92.9)
< 145 cm	5 (3.9)	46 (7.1)
Parity		
Multipara	129 (100)	643 (99.7)
Primipara	0	2 (0.3)
Birth interval spacing		
> 2 years	82 (63.6)	502 (77.8)
≤ 2 years	47(36.4)	143 (22.2)
Numbers of prenatal care		
< 4 times	31 (24.0)	40 (6.2)
≥ 4 times	98 (76.0)	605 (93.8)
History of stillborn		
Yes	32 (24.8)	14 (2.2)
No	97 (75.2)	631 (97.8)
History of caesarean section		
Yes	7 (5.4)	46 (7.1)
No	122 (94.6)	599 (92.9)
History of hypertension in pregnancy		
Yes	3 (2.3)	3 (0.5)
No	126 (97.7)	642 (99.5)
History of abortion		
Yes	15 (11.6)	88 (13.6)
No	114 (88.4)	557 (86.4)
History of hemorrhage		
Yes	4 (3.1)	35 (5.4)
No	125 (96.9)	620 (94.6)
Anemia		
Yes	15 (11.6)	117 (18.1)
No	114 (88.4)	528 (81.9)
Tuberculosis		
Yes	3 (2.3)	2 (0.3)
No	126 (97.7)	643 (99.7)
Asthma		
Yes	0	7 (1.1)
No	129 (100)	643 (98.9)
Hyperthyroid		
Yes	2 (1.6)	3 (0.5)
No	127 (98.4)	642 (99.5)
Hypertension in pregnancy		
Yes	5 (3.9)	22 (3.1)
No	129 (96.1)	623 (96.6)
Malaria		
Yes	0	1 (0.2)
No	129 (100)	644 (99.8)
Mother with protein energy malnutrition		
Yes	0	9 (1.4)
No	129 (100)	636 (98.6)

Table 1. Characteristics of subject (continued)

Characteristics, n(%)	Case n=129	Control n=645
Hemorrhage during pregnancy		
Yes	14 (10.9)	35 (5.4)
No	115 (89.1)	610 (94.6)
Premature rupture of membrane		
Yes	5 (3.9)	45 (7.0)
No	124 (96.1)	600 (93.0)
Meconial membrane aspiration		
Yes	6 (4.7)	3 (0.5)
No	123 (95.3)	642 (99.5)
Malposition		
Yes	9 (7.0)	47 (7.3)
No	120 (93.0)	598 (92.7)
Multiple gestation		
Yes	3 (2.3)	12 (1.9)
No	126 (97.7)	633 (98.1)
Pre-eclampsia/eclampsia		
Yes	10 (7.8)	26 (4.0)
No	119 (92.2)	619 (96.0)
Antepartum hemorrhage/postpartum hemorrhage		
Yes	7 (5.4)	21 (3.3)
No	122 (94.6)	624 (96.7)
Risk for premature labor		
Yes	50 (38.8)	46 (7.1)
No	79 (61.2)	599 (92.9)
Prolonged labor		
Yes	27 (21.0)	53 (8.2)
No	102 (79.0)	592 (91.8)
Induced labor		
Yes	7 (5.4)	22 (3.1)
No	122 (94.6)	623 (96.6)
Types of delivery		
With intervention	31 (24.0)	127 (19.7)
Normal	98 (76.0)	518 (80.3)
Place of delivery		
Non health facility	21 (16.3)	9 (1.4)
Health facility	108 (83.7)	636 (98.6)
Birth assistant		
Non health officer	19 (14.7)	6 (0.9)
Health officer	110 (85.3)	639 (99.1)
Low birth weight		
Yes	70 (54.3)	83 (12.9)
No	59 (45.7)	562 (87.1)
Asphyxia		
Yes	35 (27.1)	9 (1.4)
No	94 (72.9)	636 (98.6)
Gestational age		
<37 weeks	65 (50.4)	37 (5.7)
≥37 weeks	64 (49.6)	608 (94.3)

Table 2. Risk factors of early neonatal death (bivariate analysis) for more and varied variables

Variables	Category	P value
Age	< 20- or >35-year-old	0.032*
Height	<145 cm	0.181*
Parity	Primipara	0.999
Birth interval spacing	≤2 years	0.001*
Numbers of prenatal care visit	<4 times	0.000*
History of stillbirth	Yes	0.000*
History of cesarean section	Yes	0.485
History of hypertension in pregnancy	Yes	0.058*
History of abortion	Yes	0.539
History of hemorrhage	Yes	0.673
Anemia	Yes	0.075*
Tuberculosis	Yes	0.027*
Asthma	Yes	0.999
Hyperthyroid	Yes	0.186*
Hypertension in pregnancy	Yes	0.793
Malaria	Yes	1.000
Mother with protein energy malnutrition	Yes	0.999
Hemorrhage during pregnancy	Yes	0.024*
Premature rupture of membrane	Yes	0.198*
Meconial membrane aspiration	Yes	0.001*
Malposition	Yes	0.901
Multiple gestation	Yes	0.727
Pre-eclampsia/eclampsia	Yes	0.072*
Ante-partum hemorrhage/post-partum hemorrhage	Yes	0.2332
Risk for premature labor	Yes	0.000*
Prolonged labor	Yes	0.000*
Induced labor	Yes	0.275
Types of delivery	With intervention	0.265
Place of delivery	Non health facility	0.000*
Birth assistant	Non health officer	0.000*
Low birth weight	<2,500 gram	0.000*
Asphyxia	Yes	0.000*
Gestational age <37 weeks	<37 weeks	0.000*

*P<0.25

is correlated with access to proper maternal health service.¹⁴ In this study, we didn't have the data of the etiology of stillbirth in the previous pregnancy.

Similar results were reported in studies performed in Kenya, Indonesia, Jordan, and Brazil. These studies showed that pregnant women with a previous history of stillbirth have a higher risk of early neonatal death.¹⁵⁻¹⁸ Meanwhile, a study conducted in Scotland resulted in a different conclusion, with

a P-value of 0.0319 because stillbirth in this study was a complication of labor in the first pregnancy. Moreover, it is concluded that intrauterine fetal death during early gestational age increases the obstetric and perinatal complications for the next pregnancy. Based on this conclusion, mothers with a history of stillbirth should perform a complete diagnostic test for the etiology of the stillbirth. It is also recommended to postpone the next pregnancy with the consideration of

Table 3. Multivariate analysis result for risk factors of early neonatal death*

Variables	Category	OR	95% CI	P value
Age	<20- and >35-year-old	1.8	1.1 to 3.1	0.032
History of stillbirth	Yes	27.5	11.6 to 64.5	0.000
Mother with tuberculosis	Yes	15.3	1.7 to 137.3	0.015
Mother with hyperthyroid	Yes	15.5	2.2 to 107	0.006
Place of delivery	Non health facility	18.6	6.5 to 52.7	0.000
Prolonged labor	Yes	2.3	1.2 to 4.8	0.020
Risk for premature labor	Yes	4.5	2.3 to 8.7	0.000
Low birth weight	Birth weight <2,500 gram	5.6	3 to 10.3	0.000
Asphyxia	Yes	25.2	9.8 to 64.5	0.000
Constant		0.027		0.000

*only variables with P value <0.05

severe complications risk. Yet if the mother insists to be pregnant, then we recommend to avoid risk factors (smoking, alcohol usage), resolve any infection risk such as malaria and syphilis, undergo routine prenatal care, and repeat the education about the complication warning signs.¹⁵⁻¹⁸

The history of the mother's disease also increases the neonatal death risk. Mother with tuberculosis was also a risk factor for early neonatal death with 15.3 times higher risk than without the disease. Hyperthyroid in pregnancy also increased the risk of early neonatal death by 15.5 times in our study. Several studies also reported that mother with chronic disease (including tuberculosis) was included as a high-risk pregnancy and also have a high risk to experience perinatal death.^{19,20} These results indicate that the importance of early detection of pregnant women with chronic diseases like tuberculosis so that prompt and appropriate treatment can be given to avoid the risks that may arise.

Mothers that experienced prolonged labor had a 2.3 times higher risk for early neonatal death compared to those without. Our study was similar with previous studies performed in different countries.^{16,21-23} Premature labor has a 4.5 higher risk for early neonatal death compared to mature pregnancy. There are various causes of premature labor and the following mechanisms of disease have been implicated: 1) intrauterine infection/inflammation, 2) uterine ischemia, 3) uterine overdistension, 4) abnormal allogenic recognition, 5) allergic-like reaction, 6) cervical disease, and 7) endocrine disorders.²⁴

Pregnancy complications, such as pre-eclampsia,

eclampsia, antepartum hemorrhage, premature rupture of membrane, are some of the risk factors for imminens premature labor that significantly affect perinatal death^{16,21} and neonatal death.^{23,24} Meanwhile, a study reported that preterm labor has a significant correlation with neonatal death (OR 11.43; 95%CI 2.7 to 48.27; P<0.001).²⁵ Complications during pregnancy or labor is a pathologic condition that needs continuous monitoring. Proper antenatal care is expected as early detection for dangerous complications, both for the mother and the fetus.²⁶ Pregnant woman and also her family need to be taught about the warning signs in every pregnancy. Often the family seeks medical assistance for the pregnant mother too late, as the mother ignores the warning signs. Proper antenatal care was not easy to be implemented in several districts in ENT due to the absence of a husband or family members during the process of antenatal care meeting. This issue had influenced the decision process regarding the antenatal care and wasted many times due to the decision not taken by the mother itself, but either by the husband or the whole family member. This can be seen in the results of maternal and perinatal death audits conducted in ENT, especially in rural areas.⁵

The newborn babies had an 18.6 times higher risk for early neonatal death if delivered not in the medical facility, than those delivered in the medical facility. Similar results were also reported in several countries, for example in Brazil, 11 with a 38.4 times higher risk for neonatal death (95%CI 6.7 to 221.5) and in Netherland.²⁷ A study conducted by *Australia Indonesia Partnership for Maternal and Neonatal Health*

in ENT found that mother that gives birth in their house have 4.4 times of higher risk (95%CI 0.9 to 20.7) of neonatal death.⁵

The Maternal and Child Health Program was initiated by the ENT regional government in 2009, which requires all pregnant woman delivery to be done in a proper health facility. But there are still several residents that choose not to do the delivery in a medical facility, especially in rural areas. Most of them were the result of internal family problems, in which the decision of delivery place was taken in the family meeting. This decision is generally taken by the key person of the family, especially if there are still unfinished customs problems in previous marriage, such as marriage dowry, or if the couple who has the child is not legally married.

During the first week of life, newborns were still in medical or family observation. This was a critical period that most of the neonatal death occurred. Newborns with a low birth weight <2500 gram experienced a 5.6 times higher risk for neonatal death than newborns with normal range birth weight. This result was similar to previous study²² that found a 16.2 times risk increase in perinatal death for a neonate with less than 2500 grams birth weight. Another study reported similar result with OR 5.4 (95%CI 3.6 to 8.4; P <0.001).¹⁰

In association with premature organ, either anatomically or physiologically, low birth weight neonate is susceptible to several problems: unstable body temperature due to inability to maintain body temperature caused by body water over evaporation due to the decreased subcutaneous fat tissues; respiratory disorders due to the lesser amount of surfactants and premature growth of lungs respiratory muscles; digestive problems and nutrition problem; abdominal distention; the decrease of gastric volume along with the ability to digest and absorbs fat, vitamins, and several minerals; premature function of esophagus; premature function of the heart that resulted in the susceptibility to hyperbilirubinemia and vitamin K deficiency; premature kidney; susceptibility to hemorrhage, immunologic disorders, and infections.^{28,29}

Newborns with asphyxia had an increased risk for neonatal death up to 25.2 times than without. Similar results were reported that newborn with a severe asphyxia risk was 29.6 times more likely to experience neonatal death compared to non-asphyxia newborn (95%CI 14.6 to 59.8; P<0.001), and it is similar for a newborn with moderate asphyxia (OR 9.8, 95%CI 4.6

to 20.8; P<0.00).¹⁰ Asphyxia in the newborn was the major cause of stillbirth and neonatal death, especially in low birth-weight neonates, aside from neurological disorders.¹¹ Asphyxia neonatorum is a condition where a newborn could not perform spontaneous constant breathing after delivery that resulted in the decrease of O₂ levels and the increase of CO₂ levels. This was caused by intrauterine hypoxia and associated with several factors during the pregnancy, delivery, or immediately after delivery.³⁰ Newborn hypoxia occurs due to problems in gas exchange and O₂ transport from mother to fetus. Severe asphyxia is marked by a 0-3 APGAR score while mild-moderate asphyxia is marked with a 4-6 APGAR score.³¹ Asphyxia neonatorum might be a complication of intrauterine fetal distress. Fetal distress is caused by a disproportion between oxygen needs and fetal nutrition that causes metabolic changes to anaerobic metabolism.³⁰ There were several risk factors to asphyxia neonatorum, both antepartum or intrapartum risk factors. For antepartum risk factors, there were diabetic mother, hypertension in pregnancy, chronic hypertension, fetal anemia or isoimmunization, history of fetal or neonatal death, hemorrhage during the second and third trimester in pregnancy, maternal infection, the mother with heart, kidney, lungs, thyroid or neurologic disorders, polyhydramnios, oligohydramnios, premature membrane rupture, hydrops fetalis, post-term pregnancy, multiple gestation, fetal weight disproportion with gestational age, drug usage like magnesium carbonate, beta-blocker, or anesthetics, malformation or fetal anomaly, fetal movement decrease, the mother that did not attend routine antenatal care, and mother with age under 18- or over 35-year-old.³⁰ For intrapartum risk factors, there were: emergency cesarean section, delivery assistance using forceps or vacuum, breech delivery or abnormal presentation of fetus, preterm labor, precipitates parturition, chorioamnionitis, late rupture of the membrane (>18 hours before delivery), prolonged labor (>24 hours), the prolonged second phase of parturition (>2 hours), macrosomia, persistent bradycardia of the fetus, the fetus' irregular heartbeats, usage of general anesthesia, hyperstimulation of uterus, narcotic drugs usage 4 hours before delivery, presence of meconium in amniotic fluid, umbilical cord prolapse, placental abruption, placenta previa, and intrapartum hemorrhage.³⁰

We used data from the maternal and neonatal

medical record which may incomplete. Direct interview with family was performed in order to complete the data, however the geographical condition in ENT caused the difficulty in the sampling process. Our study was focused on early neonatal death only. Further study is needed to evaluate factors that also influence neonatal death and conducted in all districts in ENT.

Based on the results of our study, it was shown that the risk factors for early neonatal death are mother's age (under 18- or over 35-year-old), the history of stillbirth in previous pregnancy, the mother with diseases (tuberculosis or hyperthyroid), the risk for premature labor, prolonged labor, the delivery place not in a health facility, low birth weight, and asphyxia. Proper antenatal care (ANC) is needed to detect any risk factors of early neonatal death and then continued with delivery in a proper health facility.

Conflicts of interest

None declared.

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