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Correlation between complications during delivery and neonatal mortality: Data analysis of Indonesia Demographic and Health Survey (IDHS) 2017

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ABSTRACT

Background: Neonatal mortality is a death that occurs during the first twenty-eight days of life after a baby is born. Based on Indonesia Demographic and Health Survey (IDHS data) in 2017, there was a decrease in neonatal mortality between 2012 – 2017, but this has not yet reached the SDG's target of 12 deaths per 1,000 live births. Complications during childbirth are one of maternal factors that directly cause pain and death to a mother and her or newborn due to some disorders resulting from childbirth. One of the factors that can influence neonatal mortality is complications during delivery.

Objective: This study aims to observe correlation between complications during childbirth and neonatal mortality. Also, this is to reveal the neonatal mortality rate in children born from 2012-2017 in Indonesia after controlling for all confounding.

Methods: This was a cross-sectional study with an analytical observational approach using secondary data from the IDHS 2017. Its samples were women of childbearing age (15-49 years) who have been married and gave birth, with the last birth data of 5 years prior to the survey. Its inclusion criteria were children who were born in 2012-2017 and were not twin-birth as big as 15.357. The sample selection used total sampling, and the obtained data were analysed by univariate, bivariate, and multivariate analysis using multiple logistic regression.

Results: The final model indicated that there was a significant relationship between the complications during delivery and neonatal mortality after controlling by variables of age, ANC visits, baby's birth weight, and baby's gender on neonatal mortality. PR 3,90 (95% C.I; 2.467 – 6.187).

Conclusion: The results revealed that there was an influence of childbirth complications, maternal age, ANC visits, baby's birth weight, and baby's gender on neonatal mortality.

Latar Belakang: *Kematian neonatal adalah kematian yang terjadi selama periode dua puluh delapan hari pertama kehidupan setelah bayi dilahirkan. Berdasarkan data SDKI, terdapat penurunan kematian neonatal antara tahun 2012 - 2017 namun hal tersebut masih belum mencapai target SDG's yang hanya sebanyak 12 kematian per 1.000 kelahiran hidup. Komplikasi selama persalinan merupakan salah satu faktor ibu yang secara langsung menyebabkan kesakitan dan kematian pada ibu maupun janin atau bayi baru lahir karena gangguan akibat dari persalinan. Salah satu faktor yang mempengaruhi kematian neonatal adalah komplikasi selama persalinan.*

Tujuan: *Penelitian ini bertujuan untuk mengetahui hubungan komplikasi selama persalinan dengan kematian neonatal serta ingin megetahui angka kematian neonatal di Indonesia pada anak yang lahir 2012-2017 terhadap kematian neonatal setelah dikendalikan seluruh confounding.*

Metode: *Desain penelitian yang digunakan adalah Cross-Sectional dengan pendekatan observasional analitik menggunakan data sekunder SDKI 2017. Sampel penelitian adalah wanita usia subur 15-49 tahun yang pernah menikah dan melahirkan dan menggunakan data kelahiran terakhir dalam 5 tahun sebelum survei. Kriteria inklusi adalah anak terakhir lahir tahun 2012-2017, bukan kelahiran kembar sebesar 15,357. Pemilihan sampel mengunakan total sampling dan data dianalisis secara univariat, bivariat, dan multivariat menggunakan regresi logistik berganda.*

Hasil: *Model terakhir menunjukkan bahwa terdapat hubungan komplikasi selama persalinan dengan kematian neonatal setelah dikontrol oleh variabel usia ibu, kunjungan ANC, berat lahir bayi dan jenis kelamin bayi. PR 3,90 (95% C.I; 2,467 – 6,187).*

Kesimpulan: *Hasil penelitian menunjukkan adanya hubungan antara komplikasi persalinan, usia ibu, kunjungan ANC, berat lahir bayi, dan jenis kelamin bayi terhadap kematian neonatal.*

INTRODUCTION

Infant Mortality Rate (IMR) is one of indicators in determining the health status of children. The Millennium Development Goals (MDGs) in the fourth point explain about reducing number of child deaths.[1] The child mortality rate is classified into two categories, the infant mortality rate and the under-five mortality rate.[2] Although in various countries the infant mortality rate decreases, the neonatal mortality rate is higher.[3] Neonatal mortality is a death in a period from live birth to 28 days of age.[4] The first twenty-eight days of the life to the neonatal period are the most vulnerable times for the survival of children. In 2016, 2.6 million deaths, or 46% of total under-five deaths, occurred during this period. This condition indicates that there are 7000 newborn deaths every day.[5] The majority of neonatal deaths occur in the first days and weeks as many as 1 million babies die on the first day and on the next six days.[6] Globally, in 2018 neonatal mortality was 17.7% of all births, while in Southeast Asia neonatal mortality was 20.2%.[7]

Dealing with the data presented in IDHS in 2017, it indicated that the Neonatal Mortality Rate (NMR) in Indonesia was 15 deaths per 1,000 live births. When it was compared with data from IDHS in 2012, the number showed a decrease as previously it was 19 deaths per 1,000 live births. However, this number has not yet reached the Sustainable Development Goals (SDGs) target of 12 deaths per 1,000 live births. The high Neonatal Mortality Rate (NMR) may affect 59% of infant mortality.[8]

Main factors leading to infant mortality in the first week of life are complications of pregnancy and childbirth, including asphyxia, sepsis, and low birth weight. "Asphyxia neonatorum" is a condition of newborns who experience spontaneous and regular respiratory failure shortly after birth.[9] This condition is caused by foetal hypoxia in the uterus which is associated with several factors throughout pregnancy, childbirth, and immediately after birth. In addition, maternal nutritional conditions before and during pregnancy also affect the development of the in the womb.[10]

Some previous studies pointed out that the incidence of neonatal death in a hospital during a period of 2012-2013 was influenced by LBW factors, gestational age, delivery complications, asphyxia and infant complications with p value <0.05. Based on childbirth complications, there were 62.8% of births with birth complications that cause neonatal death, while only 37.4% of births that did not experience childbirth complications but experience neonatal deaths.[11]

Complications in childbirth indicate a risky condition that can endanger the lives of the mother and the foetus due to direct disturbances experienced during a delivery process.[12] Complications of childbirth in Indonesia based on IDHS (2017) consisted of various factors such as anxiety or severe pain (53.5%), prolonged labour (40.6%),

premature rupture of membranes (PROM) (16.1%), no strong straining 10.3%, fever and smelly mucus (was 7.7%), excessive bleeding (7%), seizures (1.5%), and other complications (4.9%). Complications during childbirth are one of maternal factors that directly cause pain and death to the mother and the foetus or the newborn due to some disorders resulting from childbirth.[13]

Based on the discussion above, it can be seen that the number of childbirth complications in Indonesia is high enough, accompanied by high neonatal mortality. Complications of childbirth can affect the survival of the baby during the neonatal period. Responding to this issue, the researchers are motivated to analyse relationships between complications during childbirth and neonatal mortality more deeply through data analysis of the IDHS in 2017. The findings of this study are to contribute and provide information for health institutions to reduce the number of complications during childbirth of neonatal mortality.

METHODS

Research design

This study was an analytical observational quantitative study with a cross-sectional design using the 2017 IDHS data. This study was conducted to reveal relationships and effects of complications during labour and neonatal mortality in Indonesia in 2017. This study was conducted by analysing the 2017 IDHS data in April to June 2021.Especially, the IDHS data in 2017 was from 24 July to 30 September 2017. The research locations were all provinces in Indonesia (34 provinces).

Population and sample

The population in this study were all women of childbearing age (15-49 years) in Indonesia from 34 provinces. Its samples were children who were born alive in the period 2012-2017 from the women of childbearing who were married and gave birth in 34 provinces in Indonesia. They consisted of 15,357 with inclusion criteria including all live born babies (0-28 days) and 15,237 singleton births. Its exclusion criteria included 120 non-twin births, missing data, and 1,067 answers that they did not know. Therefore,analyses on the samples were 14,170 units. The samples were collected by total sampling from all samples in the survey data that were in accordance with the research criteria, with consideration of using secondary data; as a result, the samples had been already available, and the results were more representative of the population. The obtained samples can be seen in Figure 1.

Variable

Its dependent variable was neonatal mortality, and its independent variable was complications during childbirth. Then the confounding variables were maternal age, parity, pregnancy complications, ANC visits, infant birth weight, baby's sex and types of childbirth.

Data collection

The data used in this study were raw data from the 2017 IDHS, and they were collected by the Central Statistics Agency (BPS) in collaboration with the BKKBN and the Ministry of Health. The IDHS data were collected by using a questionnaire. The researchers selected several lists of questions to form a variable that was in accordance with the research variable. A documentation technique was applied because the data used were obtained by accessing the raw data of IDHS 2017. The IDHS data were in a form of SPSS program input, namely (.sav) which can be downloaded through the official IDHS website https://www.dhsprogram.com. Before downloading, the researchers obtained permission to access the data.

Data analysis

Univariate analysis was performed to identify the frequency distribution of respondents' characteristics. Bivariate analysis to identify the relationships between the independent variable and the dependent variable using a Chi-Square test. Multivariate analysis using the Multiple Logistics Regression test by including all

candidate variables with criteria p <0.25 was to reveal the relationships of labour complications with neonatal mortality after controlling for covariate variables. The data analysis used SPSS.25 software.

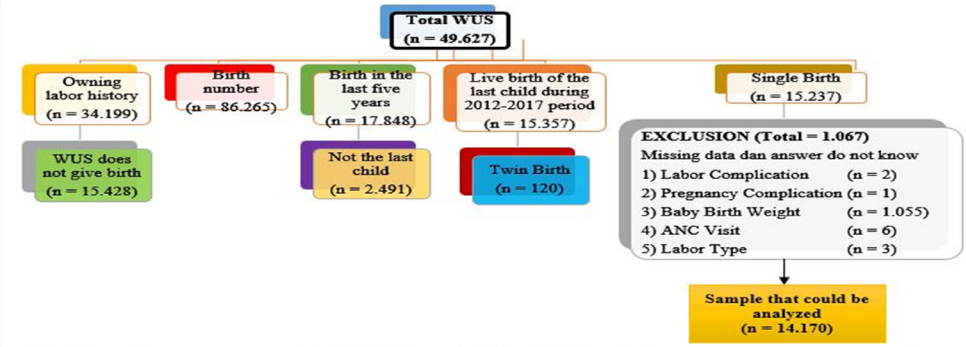

Figure 1. Flow in sampling

Ethical approval

This study was approved by the Research Ethics Committee of the Universitas `Aisyiyah Yogyakarta, No. 1393/KEP-UNISA/IV/2021.

RESULTS

Overview of IDHS 2017

The IDHS Survey was conducted in 2017 by interviewing 49,627 households. The IDHS in 2017 used 4 (four) types of questionnaires; those were household questionnaires, women of childbearing age (WUS), married men (PK), and teenage boys (RP). The subjects in this study were children born alive a period of 2012-2017, from women of childbearing age (15-49 years) who were married and gave birth from 34 provinces in Indonesia. The total number of WUS was 49,627, then WUS who have given birth were 34,199, WUS who have not given birth were 15,428, the total number of births was 86,265, births in the last 5 years were 17,848, non-last child births were 2,491, the last live birth of child in 2012 period – 2017 consisted of 15,357, the birth of twins consisted 120 twins babies, single births consisted of 15,237, missing data and answering not knowing consisted of 1,067, so that the unit of analysis of eligible respondents in this study was 14,170.

Table 1. Proportion of neonatal mortality in Indonesia

Variable	Total	
	N	%
Neonatal death		
Neonatal death	166	11.7
Non neonatal death	14,004	88.3
Total	14,170	100

Table 2. Proportion of complications during childbirth in Indonesia

Variable	Total	
	N	%
Labour complication		
Yes, ever	874	6.2
Never	13,296	93.8
Total	14,170	100

Univariate analysis

Based on Table 1, it showed that there were 166 neonatal deaths of the last children (11.7%) from 14,170 babies born in a period of 2012-2017.

Complications that occurred in the mothers during labour include: 1) strong and regular heartburn more than a day and a night, 2) bleeding more than usual (more than 3 cloths), 3) high body temperature and/or smelly mucus, 4) seizures and fainting, 5) amniotic fluid discharge more than 6 hours before the child is born, (6) being unable to push, 7) restlessness or pain, and (8) other complications. The mothers experienced at least 4 types of childbirth complications.

Based on Table 2, it could be seen from the 14,170 respondents studied that the mothers, who had experienced complications during labour during the delivery of their last children, were 874 (6.2%).

Table 3. Proportion of confounding variables of respondents in Indonesia

Variable	Total	
	N	%
Mother's age		
< 20 years old and > 35 years old	4,696	33.1
20 – 35 years old	9,474	66.9
Parity		
With risk	6,740	47.6
Without risk	7,430	52.4
Pregnancy complication		
Yes, ever	7,707	54.4
Never	6,463	45.6
ANC visit		
Not suitable with the standard	3,430	24.2
Suitable with standard	10,740	75.8
Baby birth weight		
< 2.500 gram (LBW)	1,671	11.8
≥ 2.500 gram	12,499	88.2
Baby gender		
Male	7,281	51.4
Female	6,889	48.6
Labour type		
SC	2,559	18.1
Normal	11,611	81.9
Total	14,170	100

Based on Table 3, from the 14,170 respondents, the results demonstrate that the mothers who were in the risk age category (< 20 years and > 35 years) were 4,696 or 33.1% of the total sample. Based on parity (number of deliveries), the mothers in the risk category were 6,740 (47.6%). The number of mothers experiencing pregnancy complications in their last children consisted of 7,707 respondents (54.4%), The number of ANC visits made by

the mothers was at least 4 times during their pregnancy. According to its standard, it should be done at least once in the first trimester, once in the second trimester, and twice in the third trimester; the mothers whose ANC visits not in accordance to the standard (< 4 times) during their last children pregnancy were 3,430 respondents (24.2%). The number of babies of the last children with low birth weight (LBW) of <2.500 gram consisted of 1,671 babies (11.8%). Based on the gender of the baby, it had been found that most of the babies born in the last childbirth were male as many as 7,281 babies (51.4%), and then most of the types of childbirth in the last childbirth, by caesarean section, consisted of 2,559 respondents (18.1%).

Table 4. Relationship of complications during childbirth with neonatal mortality

Variable	Neonatal death				PR	95% C.I.	P-Value
	Yes		No				
	n = 166		n = 14,004				
	N	%	N	%			
Labour complication							
Yes, ever	849	97.1	25	2.9	4.18	2.67 – 6.54	< 0.001
Never	13,205	99.3	91	0.7	1 (Ref.)		

Source: weighted data, PR= prevalence ratio, CI= confidence interval

Analysis of bivariate

Table 4 showed that the proportion of neonatal deaths in the mothers with complications during childbirth was 2.2% higher than the mothers without complications during childbirth. The results of the bivariate test between labour complications and neonatal mortality statistically pointed out that there was a relationship between the two variables with a prevalence ratio (PR) value of 4.18, and it covered a 95% confidence interval between 2.67 and 6.54. This indicated that the mothers experiencing complications during childbirth were 4.18 times at greater risk of experiencing neonatal death than the mothers who do not experience complications during childbirth.

Based on Table 5, the Chi-Square test conveyed that there was a relationship between maternal age and neonatal mortality with a PR value of 1.53 in a 95% interval between 1.06 to 2.21. This implied that the mothers with age < 20 years and > 35 years (risk category) had 1.53 times greater risk of experiencing neonatal death thanthan the mothers aged 20-35 years (not risk category).

The proportion of neonatal deaths with risk parity was merely slightly higher than the deaths without risk parity, which was 0.3%. Then the results of the Chi-Square test between parity and neonatal mortality statistically revealed that there was a relationship between the two variables with a PR value of 1.40 in the interval between 0.97 and 2.03. The mothers with a number of births (1 and > 4) had 1.40 times greater risk of experiencing neonatal death than the mothers who have given birth 2-3 times.

Pregnancy complication variable with p-value 0.464 implied that there was no relationship between pregnancy complications and neonatal mortality. This indicated that the risks among the categories in pregnancy complications for experiencing neonatal death were almost the same. The proportion of neonatal deaths in the mothers who had non-standardised ANC visits (less than 4) was 0.8% higher than the mothers who had standardised ANC visits (once in the first trimester, once in the second trimester, and twice in the third trimester) with a PR value of 2.3 in a 95% confidence interval between 1.59 to 3.31. This implied that the mothers performing unstandardized ANC visits were2.3 times greater risk of neonatal death than the mothers performing standardised ANC visits.

Table 5. Cross tabulation of confounding variables with dependent

Variable	Neonatal death				PR	95% C.I.	P-Value
	Yes		No				
	n = 166		n = 14,004				
	N	%	N	%			
Mother's Age							
< 20 years old and > 35 years old	4,645	98.9	50	1.1	1.53	1.06 – 2.21	0.022
20 – 35 years old	9,408	99.3	66	0.7	1 (Ref.)		
Parity							
With risk	6,675	99.0	65	1.0	1.40	0.97 – 2.03	0.067
Without risk	7,379	99.3	51	0.7	1 (Ref.)		
Pregnancy Complication							
Yes, ever	7,640	99.1	67	0.9	1.14	0.79 – 1.66	0.464
Never	6,414	99.2	49	0.8	1 (Ref.)		
ANC visit							
Not suitable with the standard	3,381	98.6	49	1.4	2.3	1.59 – 3.31	< 0.001
Suitable with standard	10,673	99.4	67	0.6	1 (Ref.)		
Baby birth weight							
< 2.500 gram (LBW)	1,611	96.4	60	3.6	8.2	5.54 – 11.57	< 0.001
≥ 2.500 gram	12,443	99.4	56	0.4	1 (Ref.)		
Baby gender							
Male	7,200	98.9	81	1.1	2.2	1.48 – 3.27	< 0.001
Female	6,854	99.5	35	0.5	1 (Ref.)		
Labour type							
SC	2,533	99.0	26	1.0	1.31	0.84 – 2.03	0.22
Normal	11,521	99.2	90	0.8	1 (Ref.)		

Source: weighted data, PR= prevalence ratio, CI= confidence interval

Variable of birth weight of the babies statistically had a relationship with neonatal mortality with p-value <0.001; the proportion of neonatal deaths of babies with low-birth-weight (<2.500 grams) was low enough, 3.2% greater than babies with normal birth weight (≥ 2.500 grams) with a PR value of 8.2 in a 95% confidence interval between 5.54 to 11.57. Babies with low birth weight were 8.2 times more likely to experience neonatal death than babies with normal birth weight.

The male babies experienced more neonatal deaths than female babies with a difference in proportion of 0.6%. Their PR value was 2.2 with a 95% confidence interval between 1.48 to 3.27. The male babies had 2.2 times greater risk of neonatal death than female babies.

The proportion of neonatal deaths in mothers who gave birth by Sectio Caesarea (SC) (1.0%) was slightly higher than the mothers who gave birth vaginally (0.8%) with a PR value of 1.31 in a 95% confidence interval ranging from 0. 84 to 2.03. The mothers who gave birth by caesarean section were 1.31 times more likely to experience neonatal death than the mothers who gave birth vaginally.

Table 6. Final model of multivariate analysis

Variable	P-Value	OR	95% C.I.
Labour complication			
Yes, ever	< 0.001	3.907	2.467 – 6.187
Never	1 (Ref.)		
Mother's Age			
< 20 years old and > 35 years old	0.034	1.499	1.030 – 2.180
20-35 years old	1 (Ref.)		
ANC visit			
Not suitable with the standard	0.001	1.895	1.298 – 2.766
Suitable with standard	1 (Ref.)		
Baby birth weight			
< 2.500 gram (LBW)	< 0.001	7.691	5.296 – 11.169
≥ 2.500 gram	1 (Ref.)		
Baby gender			
Male	< 0.001	2.291	1.532 – 3.426
Female	1 (Ref.)		

Analysis of multivariate

After applying multivariate analysis with multiple logistic regression, conducted in several stages from bivariate selection to confounding examination, the final model was produced, as seen in table 6.

Thus, Table 6 demonstrated that the variables related and having an effect on neonatal mortality were variables of childbirth complications, maternal age, ANC visits, birth weight and gender. The largest Odd Ratio value was found in the birth weight variable, so it could be concluded that the most influential factor on the incidence of neonatal death was the baby's birth weight.

DISCUSSION

Based on the results of the analysis, there were 166 neonatal deaths (11.7%) after weighting, or the neonatal mortality rate was 12 deaths per 1,000 live births. This neonatal mortality rate is different from the results of the 2017 IDHS (15 deaths per 1,000 live births) because this study is limited to only births in the last 5 years, only the last child and not twins.

The results of data analysis of the relationship between complications during childbirth and neonatal mortality indicated that there was a relationship between complications during labour and neonatal mortality; the complications during childbirth had the second largest tendency after the birth weight variable with a value of 3.9. Complications experienced by the mothers during pregnancy and childbirth were high risk factors for both the mother and the baby. Complications of childbirth that often occur were prolonged labour, premature rupture of membranes, postpartum haemorrhage, pre-eclampsia-eclampsia, sepsis (infection), uterine rupture and retained placenta.[14] This is in accordance with a study stating that mothers who experienced complications during childbirth has an 80-fold higher risk of neonatal death than mothers who did not experience complications during childbirth.[15] Bleeding is the most common cause of maternal death. A sign of bleeding is bleeding from the birth canal > 500cc.[16] Pre-eclampsia and eclampsia are the second leading cause of maternal death in Indonesia.

Symptoms that often appear in pregnant women and childbirth is preeclampsia. This condition is characterised by high blood pressure, namely systolic blood pressure > 140/140-220

mmHg. Preeclampsia can occur because the placenta does not function properly caused by placental abnormalities; therefore, it will be disrupted and lead to pregnancy disorders and health problems for the foetus. Affecting the foetus, preeclampsia decreases blood flow from the mother to the foetus through the placenta so that the baby can be deprived of nutrients and oxygen (hypoxia). This can cause babies to be born with low birth weight (LBW) and other problems in babies such as premature birth to death at birth (perinatal death).[17]

Premature rupture of membranes (PROM) is one of the problems in the field of obstetrics and is associated with birth complications, so it can increase perinatal morbidity and mortality. According to its theory, premature rupture of membranes is the rupture of the membranes before there are signs of starting labour and waiting for an hour before labour occurs.[18] Long term rupture of membranes has potentials to increase risks of transmission of streptococcal bacteria and the occurrence of infection or sepsis. Sepsis can lead to increased neonatal mortality.[19] This is in line with a study finding that mothers who experienced symptoms of complications during labour with premature rupture of membranes had a higher chance of neonatal death.[20]

In another study, neonates born to mothers who experienced labour complications such as prolonged labour, vaginal bleeding, and seizures, had 2 times of neonatal death compared to neonates born to mothers without labour complications.[12] The cause of this long childbirth was because the pelvis is narrow; consequently, there was a head-pelvic disproportion. Long childbirth or prolonged childbirth would pose risks/complicates for both the mother and the baby. Prolonged childbirth could cause the mother to become dehydrated and exhausted, and postpartum haemorrhage occurred and caused asphyxia in newborns because the mother's blood flow through the placenta was reduced: as a result, oxygen flow to the foetus was reduced. Asphyxia could cause the baby to experience a rapid decrease in heart rate; the body became blue or pale and reflexes weakened until they disappeared. This is also in accordance with a study conveying that the mothers who experienced prolonged labour during childbirth would have a 9,609-fold risk with asphyxiated babies, so it would have an impact on neonatal mortality.[21]

Maternal age also determines maternal health and is closely related to the conditions of pregnancy, childbirth, postpartum and infant. The age of pregnant women who are too young (<20 years) or too old (> 35 years) is a factor that complicates pregnancy because the condition of the body of a too young pregnant woman is not ready to face pregnancy, childbirth, and postpartum and to take care of her baby. At that age, the uterus and pelvis have not developed properly, so it is possible to experience difficult childbirth complications that will have an impact on the mother and foetus as well as the mother's unpreparedness to accept the roles and responsibilities as parents. In accordance with a literature review study, it is asserted that pregnancy and childbirth at a young age had a higher risk of complications than pregnancy and childbirth in adult mothers. These complications include the incidence of Intra Uterine Foetal Death (IUFD), anaemia, Intra Uterine Growth Retardation (IUGR), postpartum haemorrhage and postpartum depression, and having a baby during adolescence had serious consequences for the health of the girls and their babies.[22] The results of this study indicated that maternal age had a tendency with a value of 1.499 times. This is in line with a study showing that maternal age that is too young (< 20 years) significantly may increased the risk of babies who experienced low birth weight (LBW) and neonatal deaths.[23]

It is in contrast to pregnant women who were too old; they would have risks of congenital abnormalities and have complications during childbirth due to weak muscle tissue in the uterus during pregnancy.[24] This is in line with other studies reporting that maternal age (> 35 years) with an AOR value of 1.4, 95% CI,; 1-1.8 had a positive relationship with neonatal mortality.12 Then maternal age (> 35 years)

would also increase the risk of neonatal death because the the ability of the mother to push during childbirth was reduced. This is in line with a study stating that maternal age with AOR value = 6.4; 95% C.I; 2 -20,5 was a factor strongly associated with asphyxia at birth, causing early neonatal death.[25] From other studies, there was evidence that gestational age more than 35 years had the potential to increase the risk of cases of placenta previa. The development of the endometrium was less optimal,leading to the occurrence of complications for the foetus and contributing to neonatal death.26

Another study revealed that a good marriageable age was around 20 years for women and 25 years for men; at that age a man is an adult and can think carefully, so the men can be responsible for their household economy.[27] This is in line with a study suggesting that a man who will become a father must be able to assume the financial and economic responsibilities of the family and to have a very important involvement in the pregnancy and childbirth process contributing to positive physical and psychological health outcomes, For the mother and the child.[28] The age of the mother that is considered ideal (safe) for pregnancy and childbirth is 20-35 years old. At this age, it is the best condition for pregnancy and childbirth; the mother has psychologically and mentally ready to get pregnant and give birth.[29] The older she is, the level of maturity and strength of a person will be more mature in thinking and working. This in accordance with a study also suggesting that productive age of the mother is between the ages of 20-35 years, while the unproductive age is under 20 years to > 35 years.[30]

Antenatal care (ANC) is a recommended strategy to reduce the risk of neonatal death. The ANCis a health service cof medical experts to pregnant women during pregnancy, with reference to antenatal care standards. The World Health Organization (WHO) recommends that effective ANC services are at least 4 (four) times during pregnancy, namely once in the first trimester, once in the second trimester, and twice in the third trimester.[31]

The results of this study indicated that the variable of ANC visits had a tendency with a value of 1.895 times. This is in line with a study conducted in Ethiopia that mothers who did not perform ANC examinations less than 4 times or do not meet the standards would be at risk of neonatal death.[32] This is also in line with a study explaining that mothers with incomplete ANC visits or less than 4 times had a higher risk of neonatal death.6 Mothers who do not have ANC visits < 4 times (not according to standard) will cause the risk of giving birth to babies with low birth weight by 2.4 times greater than mothers who with ANC visits > 4 times.[33]

The mothers whose examinations during her pregnancy do not meet standards can be influenced by various minimal factors such as family economic status, health conditions during pregnancy and distance to health services. The incidence of neonatal mortality can be reduced by providing qualified and sustainable health services from the time of the baby in the womb or from birth to the neonatal period. A well-conducted ANC visit will provide more information for the mothers about pregnancy, childbirth, postpartum, and newborn care. Thus, it can provide convenience for mothers and their families to understand and know about childbirth complications, so that they can determine the most appropriate action during pregnancy and childbirth.

Low birth weight (LBW) is a condition when babies are born with below normal weight. WHO mentions that a baby is declared to have low birth weight if the weight is below 2500 grams; the normal proportion of the weight is 2500 grams and < 4000 grams.[34] Based on the results of this study, the babies' birth weight had the greatest tendency with a value of 7.691. This is in line with a study that babies with low birth weight or less than 2500 grams increased the risks of death in neonates by 32.6 times.[35]

The main factors of low birth weight (LBW) are prematurity, infection, asphyxia, hypothermia and breastfeeding.[36] Not immediately covering the baby after birth and bathing the baby immediately after birth are

habits that can harm the baby, causing the newborn to experience hypothermia.[37] This is in line with other studies mentioning that the causes of postnatal neonatal death were low birth weight (LBW) and premature with 42%.[38] This is in accordance with the results of the study finding that babies born from the age of < 37 weeks or premature births would cause low birth weight (LBW) and were at risk of early neonatal death compared to babies born at term. This is also in line with other studies that the main cause of neonatal death was premature birth with 40.8%, resulting in the majority of early neonatal deaths.[39] Complications of premature birth can cause newborns to experience a lack of oxygen which can harm the nervous system, thereby increasing the risk of cerebral palsy, visual impairment and chronic disease in adulthood; as a result, premature newborns will be treated intensively and will be more at risk for early neonatal.[40]

Babies have various resistance according to gender between male and female. Male babies are more likely to experience disease than female babies. Biologically, female babies have more physiological advantages than male babies. The risk of neonatal death in male babies is greater than that of female babies.[41] The results of this study indicated that the variable of babies' gender had a tendency with a value of 2,291 times. In another study, it was found that neonatal mortality was significantly higher in male babies.[12] This is in line with a study conducted in Ethiopia that male neonates had 2.7 times higher risk of neonatal death than female neonates.[42]

Male babies had a tendency to be more prone to neonatal deaths than female babies, meanwhile female babies had a more biological advantage than the male babies. Basically, men have XY chromosomes and women have XX chromosomes. Thus, if the condition of one of the X chromosomes in the female baby is not in good condition, it can be replaced with the presence of another X chromosome. Then in males, if one of the chromosomes is damaged, it cannot be replaced with another chromosome. Thus, this unfavourable biological condition causes the male babies to be more susceptible to neonatal deaths.[43] This is not in line with a study arguing that there was no relationship between the baby's gender and neonatal mortality.[44] Studiesin other countries also stated that neonatal mortality was higher in female babies than in male babies;,meanwhile, female babies are at risk for mortality, possibly caused by social factors or health care from parents, where women are considered a burden and men are considered a burden. Men as a resource which is again reflected in gender differences in health care for women and male.[45]

This study used survey data of IDHS 2017. The data recorded were based on the respondents' memory (reccal bias), so it is likely that the respondents could not certainly remember the age of the baby at death and will cause information bias, and the results obtained in this study did not reflect the actual conditions at the time of the incident. Then the data were only from women who were still alive at the time of the survey, so the number of neonatal deaths might be lower than the facts. The data available was only for the birth of the last child, such as a history of antenatal care examinations, labour complications and pregnancy complications.

CONCLUSION

The percentage of neonatal mortality in the 2017 IDHS data after weighting was 11.7%. The mothers who experienced childbirth complications were more likely to experience neonatal deaths. Complications of childbirth, maternal age, ANC visits, birth weight and gender of the baby were associated with neonatal mortality. The most dominant factor was the baby's birth weight.

The following researchers need to conduct studies with a different design to see causes and effects of the incidence of neonatal death and need to conduct primary data research to identify levels of the effects related to the incidence of neonatal death.

CONFLICT OF INTEREST

This study does not have conflict of interest.

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