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Risk factors for neonatal death in Sleman Regency: analysis of Sleman HDSS data for 2015-2020

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Abstract

Purpose: This study aims to address the critical issue of neonatal mortality, which remains a significant public health concern, particularly in low and middle-income countries where 75% of neonatal deaths occur within the first week of life, and approximately one million newborns die within the first 24 hours, influenced by various maternal and neonatal risk factors. **Methods:** This was an observational study that used a longitudinal design. The sample size was 824 respondents born and living in Sleman, DIY. The purpose of this study was to identify risk factors for neonatal death. Data analysis used descriptive analysis, bivariable, and multivariable. **Results:** Multivariable analysis showed that the risk factors associated with the incidence of neonatal death were the mother's age (OR=143.4; CI: 16.92-1215.36), baby's weight (OR=15.24; CI: 1.8-112.92), and history of abortion (OR=9.27 CI; 1.7-50.33). **Conclusion:** Based on the results of the study, maternal age is the most influential risk factor for the incidence of neonatal death in Sleman Regency. Mothers who are pregnant and give birth aged <18 years have a risk of 143.4 times higher for neonatal death compared to women who are pregnant and give birth aged 18-34 years. Therefore it is necessary to increase education and empower women to prevent early marriage.

Keywords: low birth weight; neonatal mortality; risk factors

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INTRODUCTION

Neonatal death is defined as infant death in the first 28 days of life per 1000 live births in a given year [1]. Neonatal mortality is a public health problem that occurs throughout the world, especially in low and middle-income countries. The majority of all neonatal deaths (75%) occur during the first week of life, and approximately one million newborns die within the first 24 hours [2]. More significant and more extensive efforts are urgently needed to achieve the 2030 sustainable development goal 3.2 of reducing the neonatal mortality rate to 12 per 1,000 live births [3]. The first four weeks of life are the most crucial period in a baby's life. It is in this period that babies are very vulnerable to illness and death, therefore, it is necessary to know from the start the factors that cempower conditions to occur. This is intended so that prevention can be done as soon as possible [4].

In Indonesia, the 2017 Indonesian Demographic and Health Survey (IDHS) showed an infant mortality rate of 24 per 1,000 live births with a neonatal death rate of 15 per 1,000 live births. There was a decrease in the Neonatal Mortality Rate (AKN) in 2017 compared to 2012, which was 19 per 1,000 live births [5]. It is hoped that NMR in Indonesia will continue to decrease with interventions that support survival so that it can reduce NMR according to the national target to 10 per 1,000 live births in 2024 [5].

The causes of neonatal death in Indonesia are caused by several things, such as complications that occur during the intrapartum period (birth asphyxia or lack of breathing at birth) of 27.4%, 3.4% infection, and 11.4% congenital abnormalities, neonatal tetanus 0, 3%. In addition, low birth weight (LBW) is a factor that has a high risk of neonatal death, namely 35.2%, and the remaining 22.5% is caused by other unknown factors, death caused by COVID-19 0.0% [6].

Based on the explanation above, neonatal death can be influenced by several risk factors or determinants. The data described above shows that understanding the risk factors for neonatal death is essential to research. Apart from the increasing share of neonatal deaths in infant deaths, on the other hand, it is also to guide the development of health programs so that they can be focused and evidence-based. Therefore, this research was conducted to examine the risk factors for neonatal death in Sleman Regency, focusing on maternal factors, infant factors, and childbirth. This risk factor was chosen because it is a factor that is felt to have an impact on the incidence of neonatal deaths in Sleman Regency, as well as being something new that can later become reference material for policymakers.

METHODS

This research is a quantitative observational study with a longitudinal study design (Cohort Retrospective). This research is a secondary data analysis that uses data from HDSS Sleman, which is a longitudinal survey of Sleman Regency. The secondary data that will be used is Sleman HDSS data from the first cycle to the sixth cycle.

The sample size in this study was 824 respondents who were live-born babies. The research site based on the HDSS survey was conducted in Sleman Regency, Yogyakarta Special Region, Indonesia. Sleman Regency has 17 districts and 86 villages with a coverage of 574.82 km^2. This research was conducted in November 2022.

The dependent variable in this study was neonatal death, while the independent variables in this study were: mother's age, mother's education, occupation, economic status, number of children born during delivery, parity, gestational age (premature), birth attendant, method of delivery, history of abortion, and LBW status. Data analysis was carried out through descriptive analysis, bivariable analysis using a simple regression test, and multivariable analysis using a logistic regression test.

RESULTS

Research that has been done found that there were 12 (1.46%) babies who died in the neonatal period. This study also found that the majority of respondents or mothers were aged 20-34 years, namely 87.01%. This shows that the majority of respondents in this study were of productive age. But apart from that, respondents were also found aged <20 and/or >34 years, which was 12.99%. This age is a risky age for neonatal death.

This study also found that the majority (66.75%) of respondents had secondary education, followed by highly educated respondents (38.03%). Most of the respondents in this study (54.98%) did not work or were housewives. The rest are workers with types of work such as civil servants, laborers, entrepreneurs and so on.

The economic status of the respondents in this study was the majority at the rich level (44.78%). This illustrates that the people at the research location have good welfare. As many as (22.82%) of womene classified into middle economic status, followed by poor economic status (32.4%). Considering the level of economic status and the level of education that tends to be good, it is only natural that the majority of birth attendants they choose are health workers (99.64%). Only 0.36% of women chose birth attendants other than health workers.

The majority of babies in this study (91.75%) had birth weights of 2,500 grams. In addition, this study also found that the majority (58.62%) of women had a history of one parity. For gestational age the majority (81.19%) of women gave birth at 37 to 40 weeks' gestation. Meanwhile, the number of women who gave birth at <37 and/or >40 weeks of gestation (18.81%). It was also found that only (1.46%) women with a history of giving birth to twins in their last delivery. Another risk factor that was also considered in this study was the method of delivery. The majority (60.56%) of women gave birth by normal vaginal method while the rest (39.44%) used a different cesarean method. Another factor that was also considered in this study was a history of abortion. This study found that (12,38%) women had a history of abortion.

Table 1. Characteristics of variables

Variable	n	%
Neonatal death		
Die	12	1.46
Not Died	812	98.54
Mother's age (years)		
High risk (<20 and/or >34)	107	12.99
Low risk (20-34)	717	87.01
Education		
Low	43	5,22
Intermediate	550	66.75
Tall	231	38.03
Work		
Doesn't work	453	54.98
Work	371	45.02
Economic status		
Poor	267	32,40
Mid	188	22,82
Rich	369	44.78
Baby's weight		
<2500 grams	68	8,25
≥2500 grams	756	91.75
Parity		
1 time	483	58,62
≥2 times	341	41.38
Gestational age (weeks)		
High risk (<37 and/or >40)	155	18,81
Low risk (37-40)	669	81,19
Twin birth		
Singleton	812	98.54
Multiple	12	1.46
Childbirth helper		
Not health workers	3	0.36
Health workers	821	99.64
Labor method		
Vaginal normal	499	60,56
C-section	325	39,44
Abortion history		
Never	722	87,62
Once	102	12.38

Furthermore, the risk factor variables were analyzed bivariably using simple regression. The analysis that has been carried out shows that the factors are mother's age, economic status, baby's weight, gestational age, method of delivery, and abortion.

Based on the results of the analysis in table 2, it shows that 9.35% of respondents aged <20 and/or >34 years experienced neonatal death. 83.3% of neonatal deaths were in mothers aged <20 and/or >34 years. There is a significant relationship between risk factors for maternal age and neonatal death. This analysis shows that pregnant women aged <20 and/or >34 years have a 36.85 times higher chance of neonatal death compared to pregnant women aged 20-34 years.

Neonatal deaths are often found in families with poor economic levels. 3.37% of 267 families with a poor economic level experienced neonatal deaths and 1.06% of 188 families with a middle economic level experienced neonatal deaths. Data analysis showed that there was a significant relationship between economic status and neonatal mortality. Families with poor economic status have a 12.8 times chance of neonatal death compared to mothers or families with rich economic status. Meanwhile, mothers or families with middle economic status have a 3.94 times chance of neonatal death compared to mothers or families with rich economic status.

Data analysis that has been carried out and presented in table 2 shows that neonatal deaths are mostly found in babies with birth weight <2,500 gr. 11.8% of 68 babies with birth weight <2,500 gr experienced neonatal death. Data analysis showed that there was a significant relationship between infant weight and neonatal death. Babies born weighing <2,500 grams have a 25.06 times higher chance of neonatal death compared to babies born weighing >2,500 grams.

Births that occur at <37 weeks and/or >40 weeks of gestation have a high chance of causing health problems that can lead to death. This analysis also shows that there is a significant relationship between premature birth and the incidence of neonatal death. Mothers who give birth at <37 and/or >40 weeks' gestation have a 4.44 times higher chance of neonatal death compared to mothers who give birth at 37-40 weeks' gestation.

Based on table 2 the results of the analysis show that 2.8% of the 325 mothers who gave birth by cesarean section experienced neonatal death. This analysis showed a p-value of 0.011 with OR: 4.70 in the cesarean delivery method, which means that birth by cesarean section has a 4.7 times higher chance of neonatal death compared to vaginal delivery.

Neonatal deaths were often found in mothers who had a history of abortion as much as 6.86% of the 102 mothers who had a history of abortion experienced neonatal deaths. The analysis that has been carried out shows a p-value of <0.001 with OR: 10.56 in mothers who have had a history of abortion. This means that mothers who have a history of abortion have a 10.56 times higher chance of neonatal death compared to mothers who do not have a history of abortion.

Table 2. Relationship between neonatal death and risk factors (unadjusted)

Variable	Neonatal death n (%)		OR (95% CI)	p-values
	Die	Not Die		
Mother's age (years)				
<20 and or >34	10 (9.35)	97 (90.65)	36.85 (7.95-170.70)	**<0.001**
20-34	3 (0.4)	762 (99.6)	1	
Education				
Low	1(2,3)	42 (97.7)	5.47 (0.33-89.26)	
Intermediate	10 (1,8)	540 (98.2)	4.25 (0.54-33.46)	0.225
Tall	1(0.4)	230 (99.6)	1	
Work				
Doesn't work	8 (1,8)	445 (98.2)	1.64 (0.49-5.52)	0.406
Work	4 (1,1)	367 (98.9)	1	
Economic status				
Poor	9 (3,37)	258 (96.63)	12.80 (1.61-101.67)	**0.005**
Mid	2 (1.06)	186 (98.94)	3.94 (0.35-43.80)	
rich	1 (0.27)	368 (99.73)	1	
Baby's weight (grams)				
<2500	8 (11,8)	60 (88.2)	25.06 (7.33-85.64)	**<0.001**
≥2500	4 (0.5)	752 (99.5)	1	
Parity				
1 time	6 (1.24)	477 (98.76)	1	0.546
≥2 times	6 (1.76)	335 (98,24)	1.42 (0.45-4.44)	
Gestational age (weeks)				
<37 and >40	6 (3.87)	149 (96.13)	4.44 (1.41-13.96)	**0.014**
37-40	6 (0.90)	663 (99.10)	1	
Twin birth				
Singleton	12 (1.5)	800 (98.5)	1	0.671
Multiple	0 (0)	12 (100)	1	
Childbirth helper				
Not health workers	0 (0)	3 (100)	1	0.83
Health workers	12 (1.5)	809 (98.5)	1	
Labor method				
Vaginal normal	3 (0.6)	496 (99.4)	1	**0.011**
C-section	9 (2,8)	316 (97.2)	4.70 (1.26-17.52)	
Abortion history				
Never	5 (0.7)	717 (99.3)	1	**<0.001**
Once	7 (6,9)	95 (93.1)	10.56 (3.28-33.95)	

The six risk factors that have a significant relationship with neonatal mortality as evidenced through bivariable analysis using simple regression statistical tests will then be included in multivariable analysis through logistic regression statistical tests. The multivariable analysis that has been carried out and presented in table 3 found that there were two variables that did not statistically have a significant relationship with the incidence of neonatal death, namely the risk factor for economic status and the risk factor for gestational age. This shows that when the risk factors are taken into account together, economic status and gestational age are not risk factors that affect neonatal mortality.

The results of this multivariable analysis indicate that infant weight is the most influential risk factor for neonatal death compared to other risk factors. Babies who are born with a weight <2,500 g have a 54.97 times chance of neonatal death compared to babies who are born with a body weight> 2,500 g. Then followed by risk factors for maternal age, mothers who give birth at high-risk ages or <20 years and/or >34 years have a 38.44 times chance of neonatal death compared to mothers who give birth at low-risk ages or 20-24 years.

Mothers who give birth by cesarean section have a 7.39 times chance of causing neonatal death compared to mothers who give birth by normal vaginal method. A history of abortion in a mother has a 4.02 times chance of causing neonatal death compared to a mother who does not have a history of abortion.

Table 3. Relationship between neonatal death and risk factors (adjusted)

Variable	p-Value	OR	CI (95%)
Mother's age (years)			
20 – 34	Ref		
<20 and or >34	<0.001	38,44	5,19-284,72
Economic status			
Rich	Ref		
Mid	0.806	1.42	0.08-23.40
Poor	0.290	3,44	0.34-34.02
Baby's weight (grams)			
≥2500	Ref		
<2500	0.001	54.97	4.90-616.26
Gestational age (weeks)			
37-40	Ref		
<37 and/or >40	0.464	0.42	0.04-4.26
Labor method			
Vaginal Normal	Ref		
C-section	0.034	7,39	1.15-47.26
Abortion history			
Never	Ref		
Once	0.080	4,20	20.96

DISCUSSION

Maternal age risk factors for neonatal death

Maternal age is one of the factors that influence the incidence of neonatal death. Mothers who are too young or too old have a high risk of infant death. The age of the mother who is too young allows the condition of the reproductive organs and physiological and psychological conditions to not work optimally, therefore this will affect the fetus they are carrying, where this is at risk for medical complications [7]. Likewise with mothers who are too old. This condition allows the condition of the reproductive organs, physiological and psychological functions to have decreased so that it is also at risk for medical complications in pregnancy [8].

The ideal age for pregnancy is in the range of 20-34 years. At this age the condition of the reproductive organs, physiology and psychology is in a ready and optimal condition for the development of the fetus in the womb. Therefore, pregnancy at this age has a small risk of developing medical complications that can lead to the death of the mother and baby. Research conducted shows that the majority of mothers who give birth are at the ideal age of 20-34 years. However, the highest incidence of neonatal death was found in mothers aged less than 20 years. These findings were proven through statistical analysis which showed that there was a significant relationship between maternal age and neonatal mortality. This shows that it is true that the mother is too young to have a high risk of causing neonatal death. Another study, also said that women who get pregnant at too young and/or too old ages will have an increased risk of neonatal death [9].

Educational risk factors for neonatal death

Education is closely related to parenting and mindset towards pregnancy. Therefore the level of education can affect the incidence of neonatal death even though it is not a direct risk factor. This study found that the majority of respondents had secondary level education, namely junior high and or high school. It is at this level of education that there are many neonatal deaths. Even so, statistically it did not show a significant relationship between education and neonatal mortality.

The level of education that is at high risk of neonatal death is mothers with low levels of education. Low education level allows limited access to health information and tends not to visit health facilities. In addition, mothers who have low education or have never attended school tend not to vaccinate in childhood and tend to practice prelacteal feeding to their babies which will increase the risk of neonatal death. This shows that the results of the statistical analysis are not in accordance with the existing theory.

This research is in line with the findings which revealed that there was no significant relationship between the education level of the mother and the incidence of neonatal death [10]. This is also the case with research which revealed that there was no

significant relationship between maternal education and neonatal mortality. Mother's level of education, whether not attending school, low, medium or high education in this study did not contribute to the incidence of neonatal death [11].

Occupational risk factors for neonatal death

Mothers who work and have a workload will certainly affect the level of stress they receive. A heavy workload will further increase the level of stress experienced by mothers. Fetal growth and development will be disrupted which will cause fatigue and nutrition for the fetus is not fulfilled so that it can trigger growth and development disorders in the fetus. Psychological conditions have a significant role for the growth and development of the fetus. Therefore, work is a risk factor for neonatal death [12].

This study found that the majority of neonatal deaths were found in mothers who did not work. Where in theory these findings are contradictory. This is also supported by statistical analysis which shows that there is no significant relationship between maternal work and the incidence of neonatal death. The findings in this study are in line with research which states that the mother's occupation has no effect on neonatal mortality [13]. mothers who work or who don't work have no significant difference in influencing the incidence of neonatal death. The same goes for findings which also revealed that the mother's occupation was not proven to have an effect on the incidence of neonatal death [14].

Risk factors of economic status on neonatal mortality

Economic factors are related to a person's ability to perform optimal care for the womb and a person's ability to meet the nutritional needs of mothers and babies. Low economic status will be more at risk of neonatal death. This is because those with low economic status will reduce their ability to meet the needs of mothers during pregnancy, both in terms of access to health and nutritional intake for mother and baby. But on the contrary, those with economic status at the top level will have a lower risk of neonatal death. This is due to the fulfillment of the needs of mothers during pregnancy, both in terms of access to health and meeting the nutritional needs of mothers and babies.

This study found that the majority of respondents were in the rich and middle economic status. This condition will certainly have a positive impact on the growth and development of the fetus. This is because all the needs of mothers during pregnancy will be easily fulfilled, both in terms of access to health and also the fulfillment of good nutrition for mothers and babies. This study also found that neonatal death was common in those with middle and poor economic levels. However, when viewed based on its distribution, neonatal deaths can be found at every level of economic status. From this it can be seen that neonatal mortality is not affected by economic status. Statistical analysis proves that there is no significant relationship between the level of economic status and the incidence of neonatal death.

Risk factors for infant weight on neonatal death

The weight of the baby who is at high risk for the occurrence of neonatal death is a baby born weighing less than 2,500 grams. Babies born with this condition are prone to health problems and health complications. Therefore, babies born weighing less than 2,500 grams are at high risk for neonatal death [15]. The results of this study are in line with the statistical analysis that has been carried out, namely that there is a significant relationship between infant weight and the incidence of neonatal death.

Likewise with research conducted byLimaso et al., 2020 which revealed that babies born with smaller sizes compared to the average have a risk of 3.46 times for the occurrence of neonatal death compared to babies born with medium sizes. According to the findings that also said that babies born with low birth weight are at risk of neonatal death, this tends to be prone to health complications, such as hypothermia, infection, asphyxia and so on, where this will further worsen the baby's health condition and can have an impact on death [16].

Parity risk factors for neonatal death

Parity that is at high risk of neonatal death is a parity that is high or more than >2. High parity may increase the risk of the emergence of health problems in infants, where these health problems will lead to death. This study found that the majority of respondents were new partners, so they only had 1 parity. However, the number of neonatal deaths was the same in respondents with parity 1 and >2, and no neonatal deaths were found in respondents who had parity more than 2. This shows that neonatal death was not affected by the number of parities. Statistical analysis proves that there is no significant relationship between the number of parities and the incidence of neonatal death.

This finding is in line with research conducted by [14] and [17] which revealed that there was no significant relationship between parity and the incidence of neonatal death. The first birth, second, third and even so on are not proven to have an effect on neonatal death. But not the case with research by

Kibria, 2018 [15] who found that births or parities of 5 or more had a high risk of neonatal death.

Risk factors for gestational age for neonatal death

Gestational age is related to the readiness of the baby born to live life in the postnatal world. Babies born at less than 37 weeks and/or more than 40 weeks will be vulnerable to the emergence of various diseases. Babies born in this condition are also closely related to low baby weight. Conversely, babies born at 37-40 weeks of gestation have a small risk of neonatal death. In this condition the baby's organs are ready and mature to function optimally.

This study found that the majority of respondents gave birth at 37-40 weeks of gestation. However, there are as many neonatal deaths in women who give birth at a gestational age of less than 37 weeks and/or more than 40 weeks and at 37-40 weeks of gestation. This finding is in accordance with the existing theory that birth at a gestational age of less than 37 weeks has a high risk of neonatal death. This is also supported by the results of statistical analysis which shows that there is a significant relationship between gestational age and the incidence of neonatal death. However, when statistical analysis is carried out on all variables simultaneously and interrelated, gestational age does not have a significant relationship with the incidence of neonatal death taking into account risk factors or other variables.

Risk factors of twin birth against neonatal mortality

Studies show that twins have a higher chance of dying in the first month of life than non-twins. Twin babies are also at risk of premature birth, the occurrence of obstacles to fetal growth, and several other health problems as well as the occurrence of low birth weight babies. This is what triggers the death of newborns.

This study found that the majority of respondents gave birth to a single child or not twins. Twin births that occurred were only 1.46% of all mothers who gave birth in this study. Neonatal deaths encountered in this study all occurred in mothers who gave birth to a single child. This finding is not in line with the theory previously described, in which mothers who give birth to twins have a higher risk of neonatal death compared to mothers who give birth to single babies. This finding is supported by statistical analysis which shows that there is no significant relationship between twin births and the incidence of neonatal death.

Delivery assistance risk factors for neonatal death

Birth attendants are generally divided into two, namely deliveries assisted by medical personnel, such as general practitioners, obstetricians, midwives and nurses and deliveries assisted by non-medical personnel such as dukun beranak. Births assisted by medical personnel are the safest deliveries to be carried out and minimize the risk of negative things such as delivery complications. On the other hand, deliveries assisted by non-medical personnel such as dukun beranak have the risk of negative things happening during and after the birth process. Dukun beranak are not equipped with the medical knowledge and skills to handle such deliveries. It is feared that this will affect the health conditions of mothers and children and may even cause disturbances during the process and after delivery.

This study found that the majority of mothers gave birth with the help of health or medical personnel. Labor performed with the help of non-health or medical personnel was only 0.36%. Neonatal deaths in this study all occurred in mothers who gave birth with the help of health or medical personnel. These findings are certainly not appropriate where those at high risk are mothers who give birth with the help of non-health or medical personnel. Statistical analysis showed that there was no significant relationship between birth attendants and neonatal death. Research conducted by [18] stated that birth assisted by professional health personnel is a protective factor against neonatal death.

Risk factors of method of delivery on neonatal mortality

Method of delivery is a risk factor for neonatal death. In general, delivery can be done in two ways, namely normal vaginal and cesarean section. Labor that is carried out normally vaginally is generally with the condition of the baby being good without anything that prevents normal delivery from being carried out. However, deliveries carried out by cesarean section can generally be triggered by several factors such as babies with health problems, improper baby positions, large baby sizes and so on, so they have to be done by cesarean section. Thus delivery by cesarean section is at risk of neonatal death when viewed from the background of cesarean delivery due to health problems in the baby or other negative factors.

This study found that the majority of deliveries were carried out by the normal vaginal method. However, the majority of neonatal deaths occur in deliveries by cesarean section. This is in accordance with the theory previously described, where delivery by cesarean section has a higher risk of neonatal death compared to delivery by normal vaginal method. Statistical analysis proves that there is a significant relationship between the method of delivery and the incidence of neonatal death.

Risk factors of history of abortion on neonatal death

Mothers who have a history of abortion can affect subsequent pregnancies. A history of abortion is also at risk for premature birth and low birth weight babies. This is certainly at risk of the baby's vulnerability to the emergence of health problems that can worsen the baby's health condition. Therefore, mothers who have a history of abortion have a much higher risk of neonatal death compared to mothers who do not have a history of abortion.

This study found that the majority of respondents had no history of abortion. Mothers who had a history of abortion were found to be 12.38%. This study also found that many neonatal deaths were found in mothers who had a history of abortion. However, it is not statistically proven that there is no significant relationship between the history of abortion and the incidence of neonatal death. This is contrary to research conducted by Lamont et al., 2015 stated that mothers who had a history of abortion had a risk of 4.83 times for the occurrence of neonatal death in subsequent births compared to mothers who did not have a history of abortion.

Apart from the risk factors explained above, social factors are also one of the risk factors that need to be taken into account as a cause of neonatal death. Habits, myths, and culture that develop in society that are not good and have no medical basis can actually be the main cause of neonatal death. Habits, myths, and culture like this often occur and are applied during pregnancy, causing the pregnancy to be risky and have a negative impact on the child she is carrying. By carrying out this research and having it published, it is hoped that it can become a reference for policymakers which will later have a positive impact on people's lives, especially in reducing the risk of neonatal deaths, especially for people in Sleman Regency.

CONCLUSION

The conclusions that can be obtained from the results of research that wants to look at the risk factors for neonatal death in Sleman Regency are as follows: 1) The highest proportion of neonatal deaths that occurred in Sleman Regency during the 2015-2020 period occurred in mothers aged <18 years with a proportion of 17.3% and infant weight <2,500 g with a proportion of 11.8%; 2) Risk factors that have been shown to have a significant relationship with neonatal mortality are the mother's age, baby's weight, method of delivery and history of abortion; 3) The risk factor that has the greatest influence on neonatal death is the age of the mother, where women who are pregnant and give birth at the age of <18 years have a 143.4 times higher risk for the occurrence of neonatal death compared to women who are pregnant and give birth at the age of 18-34 years.

Based on the research that has been carried out, the suggestions that can be given by researchers are: 1) Maternal age <18 years is proven to have a high risk of neonatal death in Sleman Regency, therefore it is necessary to increase women's education and empowerment to prevent early marriage; 2) The magnitude of the risk factors for LBW to neonatal death in Sleman District means that it is necessary to increase the implementation of MTBM, especially for babies with birth weight < 2,500 grams; 3) Conducting further research using a case-control design is used in studies that have a small prevalence of cases (<10%), one of which is neonatal death. Case-control research is generally carried out using primary data, so that the required data will be more adaptable.

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