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RISK FACTORS OF BIRTH ASPHYXIA IN PKU MUHAMMADIYAH HOSPITAL, BANTUL

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ABSTRACT

Background: Infant mortality rate particularly in the perinatal period, is significantly high and become a health problem both globally and nationally. The first thousand days of life are the golden periods for a child's growth. Health surveillance before and during pregnancy as well as in the birth process largely determines the quality of the child that will be born. Among four regions in Yogyakarta, Bantul region has the second highest number of infant mortality with 126 cases. The leading cause of infant death in this region is asphyxia which reaching 29 cases. In PKU Muhammadiyah Hospital, Bantul there were 264 (23%) infants from 1131 live births who suffered from asphyxia in 2014.

Aims: To determine the risk factors of birth asphyxia in PKU Muhammadiyah, Hospital Bantul in 2014.

Methods: This was an analytical observational study, with case control study design. The study was conducted in PKU Muhammadiyah Hospital, Bantul. Samples were newborns in PKU Muhammadiyah Hospital, Bantul from January to December 2014. There were 167 respondents in case group and 167 respondents in control group. Data were analyzed using univariate, bivariate with chi-square test and multivariate with conditional logistic regression analysis.

Results: From the results of multivariate analysis, four factors related to asphyxia were abnormal labor (OR=2.304;95%CI=1.402 to 3.787;p-value=0.001), premature rupture of membranes (OR=2.040;95%CI=1.019 to 4.083;p-value=0.044), anemia (OR=1.426;95%CI=1.182 to 1.720;p-value=0.000) and pregnancy spacing <2 years (OR=2.458;95%CI=1.060 to 5.698;p-value=0.036).

Conclusion: Abnormal labor, premature rupture of membranes, anemia and pregnancy spacing <2 years were the risk factors of birth asphyxia in PKU Muhammadiyah Hospital, Bantul in 2014.

Keywords: asphyxia, neonatal, risk factors

INTRODUCTION

Indonesian Doctors Association (IDI) defines birth asphyxia as spontaneous and regular respiratory failure during delivery or after birth that has several symptoms such as hypoxemia, hypercarbia, and acidosis [1]. World Health Organization (WHO) reports that among 120 million newborns annually around the world, 4 million (4.8%) are stillbirths and another 4 million (4.8%) are died less than 30 days after birth (neonatal further). Approximately 3.6 million (3%) of 120 million babies has asphyxia neonatorum that caused death for 1 million (27.78%) of them. In Indonesia, the rate of infant mortality in 2012 was 32 per 1000 live births. The causes of perinatal deaths were prematurity (32%), asphyxia (30%), infection (22%), congenital defects (7%), and others (9%) [2].

In Yogyakarta, there were 449 cases of infant mortality in 2013. Among four regions in Yogyakarta, Bantul has the second highest number of infant mortality with 126 cases, where 29 of them were caused by asphyxia. In PKU Muhammadiyah Hospital, Bantul there were 264 (23%) infants from 1131 live births who suffered from asphyxia in 2014 [3,4].

According to Oswyni et al, newborns asphyxia can induce to respiratory failure, metabolic disorders such as hypoglycemia and hypocalcemia, kidney damage and necrotizing enterocolitis. This was caused by hypoxia fetus in utero is related with factors that appear in pregnancy, childbirth or soon after birth [5].

Factors causing the lack of oxygen intake are hypertension during pregnancy (pre-eclampsia and eclampsia) 24%, antepartum hemorrhage (placenta previa, placental abruption) 28%, anemia (<10%), and overdue pregnancy. Factors of baby condition are prematurity (15%), Low Birth Weight (LBW) (20%), congenital defect (1-3%), and meconium stained amniotic fluid. Placental factors are twisted umbilical cord, short umbilical cord, umbilical cord knot, and umbilical cord prolapse. Neonates' factors are respiratory depression caused by anesthetics or analgesics consumed by mothers, and birth trauma, such as intracranial hemorrhage (2-7%). Delivery factors are prolonged labor (2.8-4.9%), assisted births (malpresentation, twins, shoulder dystocia, vacuum extraction, forceps) 3-4% and premature rupture of membranes (PROM) 10-12%) [6,7].

Safe and effective methods to prevent and overcome newborn death by asphyxia are including early detection of risk factor by performing quality antenatal care, normal or basic delivery care, and neonatal care by health care professionals [8]. Therefore, this study was conducted to determine the risk factors of birth asphyxia in PKU Muhammadiyah Hospital, Bantul, in 2014.

METHODS

This was an analytical observational study, with case control study design [9]. Samples were newborns in PKU Muhammadiyah Hospital, Bantul from January to December 2014. There were 167 respondents in case group and 167 respondents in control group. The study instrument was experiment forms. Secondary data were obtained from patient medical records from January 1st to December 31st 2014. Data was obtained from the hospital after received approval from Ethical Committee Board of Universitas Aisyiyah Yogyakarta with reference number 02/KEP-SAY/Exe./X/2015. Data analysis used univariate, bivariate, and multivariate analysis. Univariate analysis was conducted using frequency distribution table to describe characteristic of each variable (table 1 and 2), bivariate analysis was conducted using Chi-square test (table 3 and 4). Meanwhile, multivariate analysis was conducted condition logistic regression test respectively (table 5)

RESULTS

Table 1. Distribution of Risk Factors of Birth Asphyxia in PKU Muhammadiyah Hospital, Bantul, in 2014

Independent Variable	Asphyxia		Not Asphyxia		Total	
	N	%	N	%	N	%
Antepartum Hemorrhage						
Yes	1	0.6	0	0	1	0.3
No	166	99.4	167	100	333	99.7

Pre eclampsia						
Yes	5	3	2	1.2	7	2.1
No	162	97	165	98.8	327	97.9
LBW						
Yes	22	13.2	15	9	37	11.1
No	145	86.8	152	91	297	88.9
Prematurity						
Yes	17	10.2	6	3.6	23	6.9
No	150	89.8	161	96.4	311	93.1
PROM						
Yes	40	24	15	9	55	16.5
No	127	76	152	91	279	83.5
Meconium stained amniotic fluid						
Yes	8	4.8	2	1.2	10	3
No	159	95.2	165	98.8	324	97
Labor type						
Yes	122	73.1	81	48.5	203	60.8
No	45	26.9	86	51.5	131	39.2
Anemia						
Yes	48	28.7	22	13.2	70	21
No	119	71.3	145	86.8	264	79

As can be seen in Table 1, there are three frequent risk factors of birth asphyxia, which are 122 cases (73.1%) of abnormal delivery, 48 cases (28.7%) of anemia, and 40 cases (24%) of premature rupture of membranes (PROM).

Table 2. Distribution of Risk Factors of Birth Asphyxia in PKU Muhammadiyah Hospital, Bantul, in 2014

External Variable	Asphyxia		Not Asphyxia		Total	
	N	%	N	%	n	%
Maternal Age						
< 20 and > 35	2443	14.4	19	11.4	43	12.9
20 – 35	1	85.6	148	88.6	291	87.1
Maternal Education						
Low	15	9	9	5.4	24	7.2
High	152	91	158	94.6	310	92.8
Maternal Parity						
Multipara	95	56.9	87	52.1	182	54.5
Primipara	72	43.1	80	47.9	152	45.5
Pregnancy Spacing						
< 2 years	23	13.8	10	6	33	9.9
≥ 2 years	144	86.2	157	94	301	90.1
Pregnancy Care						
< 4 times	0	0	0	0	0	0
≥ 4 times	167	100	167	100	334	100

Table 2 shows that the majority of birth asphyxia occurred in mothers with multiparity (95 cases/56.9%), aged less than 20 years old or more than 35 years old (24 cases/14.4%), and pregnancy spacing less than two years (23 cases/13.8%)

Table 3. The Relationship Between Independent and Dependent Variables

Independent Variable	OR	95% CI	P-Value
Antepartum hemorrhage	0	1,80 – 2,23	1,00
Pre eclampsi	2,54	0,48 –13,31	0,445
Low birth weight	1,53	0,76 – 3,07	0,296
Premature birth	3,04	1,16-7,91	0,031
Premature rupture of membrane	3,19	1,68-6,04	0,000
Meconium stained amniotic fluid	4,15	0,86-19,84	0,108
Labor type	2,87	1,82-4,54	0,000
Anemia	2,65	1,51-4,65	0,001

Table 3 above illustrated about the relationship between dependent and independent variable which were tested by using chi-square test analysis and the calculation of odds ration with confidence interval (95%) and the significant level ρ ($<0,05$). The results of statistical test on the table showed that there was no significant relationship between antepartum hemorrhage, pre-eclampsia, low birth weight and meconium stained amniotic fluid with asphyxia due to the range of CI value exceeded 1 and ρ value $>0,05$, which means that women with pre-eclampsia antepartum hemorrhage, low birth weight and meconium stained amniotic fluid have no impact on asphyxia that occurred in PKU Muhammadiyah Hospital, Bantul, in 2014.

The bivariate analysis against the premature birth variable with asphyxia showed a significant relationship (OR=3,04, 95% CI=1,16-7,91) with ρ value 0,031. The relationship is statistically significant because the range of CI value does not exceed 1 and ρ value $<0,05$, which means that infants with premature birth are three times mostly found in asphyxia than those who are not born prematurely. The premature rupture of membranes (PROM) showed a significant relationship against asphyxia (OR=3,19, 95% CI=1,68-6,04) with ρ value $<0,00$, which means that the infants who were born in asphyxia are three times mostly found in a group of mothers with PROM than mothers who were not experiencing PROM.

Meanwhile, on the variable of labor types, the analysis results showed a significant relationship between labor types with asphyxia (OR=2,87, 95% CI=1,82-4,54) with ρ value 0,00. It showed that the infants who experienced asphyxia are mostly found in abnormal labor than the normal labor. The variable of mothers with anemia showed a significant relationship with asphyxia (OR=2,65, 95% CI=1,51- 4,65) with ρ value 0,01, which means that the infants who were born in asphyxia are two times mostly found on mothers with anemia than the mothers who were not anemic.

Table 4. The Relationship Between External and Dependent Variables

External Variable	OR	95% CI	P-Value
Maternal age <20 yo and > 35 yo	1,30	0,68 – 2,49	0,513
Low education	1,73	0,73-4,07	0,289
Multiparity	1,21	0,78-1,86	0,445

Pregnancy spacing < 2 year	2,15	1,15-5,44	0,028
Pregnancy care < 4 times	-	-	-

Table 4 above illustrated the relationship between external variables and dependent variables by using chi-square test analysis and the calculation of odds ratio with confidence interval (95%) and the significance level p ($<0,05$). The results of statistical test on the table showed that there was no significant relationship between maternal age, maternal education, and parity with asphyxia because the range of CI value exceeded 1 and p value $>0,05$, which means that the maternal age, education and parity had no impact on asphyxia in Muhammadiyah Hospital, Bantul in 2014. While on the pregnancy spacing < 2 years variable showed a significant relationship with asphyxia (OR=2,15, 95% CI=1,15-5,44) with p value $<0,05$. It showed that the infants who were born in asphyxia were 2 times mostly found in pregnancy spacing < 2 years compared with the pregnancy space > 2 years.

Table 5. Multivariate Analysis with Condition Logistic Regression Test

Variabel	OR	95% C.I	P-value
Premature delivery	2,033	0,715 - 5,780	0,183
Abnormal delivery	2,304	1,402 - 3,787	0,001
Premature rupture of membrane	2,040	1,019 – 4,083	0,044
Anemia	1,426	1,182 – 1,720	0,000
Pregnancy spacing < 2 year	2,458	1,060 – 5,698	0,036
Constanta	0,000	-	-6,556

As can be seen in Table 3, there were four variables that had dominant relation with birth asphyxia. These variables were pregnancy spacing < 2 years, abnormal delivery, premature rupture of membranes (PROM) and anemia. Meanwhile, premature delivery was not a risk factor of birth asphyxia in PKU Muhammadiyah Hospital, Bantul in 2014.

DISCUSSION

The analysis result shows that mothers with premature rupture of membranes (PROM) had 2.0 more risk to have infant with birth asphyxia compared to mothers with normal membrane rupture. Common complication in PROM is asphyxia that occurs to 10-40% newborns. Birth asphyxia in this case is generally caused by umbilical cord compression due to oligohydramnios. Umbilical cord compression causes hypoxia to the fetus [10]. Biarge *et al* also state similar result where mothers with PROM had 4.81 more risk of birth asphyxia than mother with normal membrane rupture [11].

Abnormal delivery had 2.3 more risk to birth asphyxia compared to normal labor. Partus pathology (abnormal) is a pervaginam delivery with the help of medical instruments or by abdomen wall (caesarean section). Complications for the mother and the fetus that could occur from abnormal delivery are infection, mother's fatigue, fetal distress and hemorrhage [12]. Konishi *et al* state that caesarean section increase the risk of birth asphyxia by 3.24 times compared to normal delivery [13].

Mothers with anemia had 1.4 more risk of birth asphyxia than mothers who did not have anemia. Hemoglobin concentration decrease causes decline of oxygen transformation from lungs to peripheral tissues. The loss of oxygen transformation ability subsequently causes inadequate oxygen consumption that leads to complications on the mother and the fetus such as decreased immune function, fatigue, fetal growth restriction, prematurity, fetus hypoxia, stillbirth,

disablement, and low birth weight. Kiyani *et al* similarly explain that mothers with anemia had 58.84% higher incidence of birth asphyxia compared to mothers who did not have anemia [14].

Pregnancy spacing less than 2 years was a risk factor of birth asphyxia. Pregnancy spacing is the interval between the delivery dates of one infant to the following infant. Proper pregnancy spacing is two to three years. Delivery of pregnancy with interval less than 24 months has high risk of hemorrhage, maternal and neonatal mortality [15]. In this study, there was no relation between independent variables (antepartum hemorrhage, pre-eclampsia, LBW, premature delivery, meconium stained amniotic fluid) and external variables (maternal age, maternal education, parity and pregnancy care) on birth asphyxia. Regular and proper pregnancy care could reduce the risk of various disruption to mother and the fetus, including asphyxia.

CONCLUSION

Abnormal delivery had 2.3 more risk of birth asphyxia than normal delivery. Premature rupture of membranes had 2.0 more risk of birth asphyxia than normal membrane rupture. Mothers with anemia had 1.4 more risk of birth asphyxia than mothers who did not have anemia. Pregnancy spacing < 2 years had 2.4 more risk of birth asphyxia than pregnancy spacing \geq 2 years. Antepartum hemorrhage, pre-eclampsia, LBW, premature delivery, meconium stained amniotic fluid, parity, maternal education, and pregnancy care were not risk factors of birth asphyxia. After completing this study, we would like to suggest for policy makers to improve the mother and children care, particularly in Emergency Unit by providing resuscitation kit and staffs who are proficient to treat asphyxia and to improve the quality of pregnancy care and counseling regarding the importance of nutrition for pregnant mothers by involving husband during the counseling.

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