VOLUME - 9, ISSUE - 12, DECEMBER - 2020 • PRINT ISSN No. 2277 - 8160 • DOI : 10.36106/gjra

Original Research Paper

Obstetrics & Gynecology

RISK FACTORS ASSOCIATED WITH PERINATAL ASPHYXIA AT MAHARAT NAKHON RATCHASIMA HOSPITAL

Issares Konyanee* M.D. Department of Obstetrics and Gynecology, Faculty of Medicine, Maharat Nakhon Ratchasima Hospital, Nakhon Ratchasima 30000, Thailand.*Corresponding Author

Siraya Kitiyodom M.D. Department of Obstetrics and Gynecology, Faculty of Medicine, Maharat Nakhon Ratchasima Hospital, Nakhon Ratchasima 30000, Thailand

Weeraporn Rojlakkanawong M.D. Department of Obstetrics and Gynecology, Faculty of Medicine, Maharat Nakhon Ratchasima Hospital, Nakhon Ratchasima 30000, Thailand.

ABSTRACT

Objective: To determine the risk factors associated with perinatal asphyxia in infants born in Maharat Nakhon Ratchasima Hospital. **Materials and methods:** A retrospective case control study was conducted. The data were collected from medical record by using a randomly randomized consecutive sampling technique. A total of 1575 pregnant women who gave birth at Maharaj Hospital between October 1, 2017 and September 30, 2019, were categorized to 2 groups. The study group (diagnosed with birth asphyxia) included 290 women and control group included 1,285 women. The determinants associated with antepartum, intrapatum, maternal and neonatal factors were examined. Multiple logistic regression was analyzed to determine the association between birth asphyxia and risk factors. **Results:** The risk factors associated with perinatal asphyxia included No ANC (OR 6.87,95%CI2.56-18.48), preeclampsia (OR3.01,95%CI1.94-4.68) poor control of DM(OR15.89,95%CI3.25-77.63) antepartum hemorrhage (OR25.27,95%CI9.52-67.09) Breech assisted(OR10.71,95%CI2.04-56.27), referral at active phase of 1ststage of labor(OR3.49,95%CI2.36-5.16), precipitate of labor (OR8.72,95%CI4.87-15.61), thick meconium(OR2.92,95%CI1.34 to 6.38), oligohydramnios (OR5.85,95%CI2.36-14.51), Anhydramnios(OR21.82,95%CI5.85-81.44), postpartum hemorrhage(OR5.07, 95%CI2.05-12.54), preterm birth (OR12.98,95% CI7.65-22), and non-reassuring fetus(OR6.25,95%CI3.75-10.41) **Conclusion:** The risk factors associated with perinatal asphyxia illustrated in this study can assist medical professionals in developing, monitoring, preventing, and providing proper care to reduce the incidence of perinatal asphyxia in newborns.

KEYWORDS : Risk Factor, Birth Asphyxia, Perinatal Asphyxia

INTRODUCTION

Perinatal asphyxia is caused by gas exchange between mother and fetus and the amount of blood delivered to body is insufficient. This results in low levels of oxygen in blood (Hypoxemia) or high levels of carbon dioxide in blood (Hypercapnia). If the condition is prolonged without timely treatment, it can lead to the reduction of oxygen uptake to feed cells and organ damage and dysfunction in newborns. This is a serious clinical problem as a leading cause of malfunction and death in newborns.[1] According to World Health Organization (WHO), it is estimated that hypoxia in newborns worldwide occurred approximately 4-9 million cases per year and 1.2 million mortality per year. However, severe complicated conditions, including cerebral palsy, abnormal development after childbirth are presented in newborns with non-fatal hypoxia.[2]

In 1952, Apgar began using a scoring system called "Apgar score" to assess clinical status of newborns. The assessment is started immediately at the first minute after delivery. The Apgar score consists of 1) Color, 2) Heart rate, 3) Reflex, 4) Muscle tone, and 5) Respiration, in which scoring ranges from 0-2 on a maximum score of 10-point.[3] In addition the WHO classification of International Statistical Classification of Diseases and Related Health Problems 10th Revision (ICD-10) is used to assess whether a newborn is diagnosed with asphyxia when the score is less than or equal to 7 points at 1 minute. Perinatal asphyxia is categorized to 2 levels:1) Mild to moderate level (Apgar score of 4-7 points), and 2) severe (Apgar score of 0-3 points).[4]

Regarding the 12th National Health Development Plan (2017-2021), the target rate of perinatal asphyxia should not be above 25 per 1,000 live births. However, the Department of Health, Ministry of Public Health reported that the incidence of asphyxia in newborns was 25.6 per 1,000 live births. Moreover, the incidence rate of newborns with asphyxia was 50 per 1,000 live births at Maharat Hospital between 2017-2019, which was higher than the target rate indicated in the 12th National Health Development Plan (2017-2021).[5-6]

The recent study conducted at Maharat Hospital reported that the occurrence of hypoxia in term newborn infants was significantly associated with several risk factors, including mother over 35 years of age, first childbirth, referral during the latent phase of the first stage of labor last longer than 8 hours, referral during the second stage of labor last longer than 30 minutes, vaginal delivery, use of instrumental vaginal delivery, meconium stain amniotic fluid, male fetus, and unassigned obstetricians to patients.[7]

Several studies were performed in many countries worldwide to assess the risk factors affecting perinatal asphyxia. However, differences in conditions and factors influenced and provided various results, including efficiency of medical practice, restricted access to medical care, and patient beliefs and perceptions. It was presented that factors affected hypoxia differed across different countries.[8-11]

According to Department of Health, Ministry of Public Health, newborns with asphyxia was 25.6 per 1000 live births in 2017[5], which was higher than the expected value. To date, few studies have examined the risk factors affecting perinatal asphyxia. This study determined the relevant risk factors, including maternal and neonatal factors associated with incidence of perinatal asphyxia at Maharat Hospital during antepartum and intrapatum. The findings from this study aimed to assist medical professionals to determine the

prevention and reduction of incidence of perinatal asphyxia.

MATERIALS AND METHODS

A retrospective case control study was performed and approved by the Ethics Review Committee at Maharat Hospital. The data were collected from the medical record by using a randomly randomized consecutive sampling technique. A total of 1,575 pregnant women who delivered at Maharat Hospital between October 1, 2017 - September 30, 2019 were selected in the study. The inclusion criteria were women with at least 28 weeks of gestation, women who delivered infants with a minimum birth weight of 1000 grams. The exclusion criteria excluded women who gave birth to infants with severe congenital anomalies, stillbirth, or fetal deaths. The sample size was calculated in concordance with the study of Phisawuang et al,[14] in which the ratio of study group versus control group was 1:4. The minimum sample sizes were at least 286 for the study group and 1,144 for control group. The study group, a group of population diagnosed with birth asphyxia, contained 290 individuals and a control group included 1,285 individuals. This study examined the determinants associated with antepartum, intrapatum, maternal and neonatal factors. The demographic data were illustrated as means and percentages. Student's t-test analysis was calculated to compare the significant difference of factors between groups. Logistic regression was analyzed to determine the association between birth asphyxia and risk factors. Multiple logistic regression model was performed to evaluate the potential risk factors. The significance level was defined at 5% (p-value < 0.05). Odds ratio and 95% confidence interval (CI) were estimated the percentages of risk factors associated with perinatal asphyxia.

RESULTS

A total of eligible 1,575 pregnant women who gave birth at Maharat Hospital were categorized to 2 groups: study group who diagnosed with birth asphyxia (n=290 people), and control group (n= 1285 people). The demographic characteristic data of the participants are shown in Table 1. The mean age of the study group was 28 (22, 34) and the control group was 28 (23, 32). The mean number of pregnancies of the two groups was equal at 2.The percentages of participants with previous history of miscarriage in the study group and control group were 20% and 17.7%, respectively. The percentages of women who had a previous pre-term birth history in the study group and control group were 0.7% and 1.9%, respectively. The percentages of nulliparous in the study group and control group were 51.4% and 48.3%, respectively. The percentage of multiparous in the study and control group were 48.6% and 51.7%, respectively. The results indicated that there was no statistically significant difference between the two groups in terms of average number of pregnancies, history of miscarriage in previous pregnancy, history of preterm birth in previous pregnancy, nulliparous, and multiparous

Table 1: Demographic characteristics of participants

Demographic data	Study group (n=290)	Case group (n=1285)	p-value*
1. Maternal age(year)	28 (22, 34)	28 (23, 32)	0.507
2. gravida	2 (1, 2)	2 (1, 2)	0.870
3. History of abort	58 (20%)	227 (17.7%)	0.351
4. History of preterm	2 (0.7%)	24 (1.9%)	0.155
5. Nulliparous	149 (51.4%)	621 (48.3%)	0.348
6. Multiparous	141 (48.6%)	664 (51.7%)	0.348

*Statistically significant if p-value < 0.05

Antepartum factor

The percentages of pregnant women who did not receive antenatal care in the study and control groups were 3.8% and 0.5%, respectively (OR 7.2, 95% CI 2.52 to 22.06, p-value <0.001). The percentages of pregnant women who were referred from primary hospital to Maharat Hospital were 42.8% (study group) and 19.1% (control group) (OR 3.15, 95% CI 2.38 to 4.17, p-value <0.001); percentages of preeclampsia were 14.1% (study group) and 4.8% (control group) (OR 3.25, 95% CI 2.08 to 5.02, p-value <0.001); percentages of poor control overt of diabetes mellitus (DM) were 2.8% (study group) and 0.2% (control group) (OR 18.2, 95% CI 3.6 to 176.32, p- value <0.001); percentages of placenta previa were 5.5 % (study group) and 0.9% (control group) (OR 6.76, 95% CI 2.91 to 16.28, p-value <0.001). Percentages of antepartum hemorrhage were 8.6% (study group) and 0.4% (control group) (OR 24.15, 95% CI 8.95 to 81.28, p-value <0.001). All abovementioned factors were statistically significantly associated with perinatal asphyxia. However, the number of antenatal visits was not a risk factor for perinatal asphyxia in this study (as shown in Table 2).

Table 2: Antepartum factor

	Study group (n=290)		Control group (n=1285)		OR	(95 % CI)	p-value*
	n	%	n	%			
1.No ANC	11	3.8%	7	0.5%	7.2	2.52 to 22.06	<0.001*
2.Number of referred cases	124	42.8%	246	19.1%	3.15	2.38 to 4.17	<0.001*
3.Number of ANC visits	9	(6, 12)	10	(8, 12)	0.89	0.86 to 0.93	<0.001*
4.Preeclampsia	41	14.1%	62	4.8%	3.25	2.08 to 5.02	<0.001*
5.Poor control of DM	8	2.8%	2	0.2%	18.2	3.6 to 176.32	<0.001*
6.Placenta previa partialis	16	5.5%	11	0.9%	6.76	2.91 to 16.28	<0.001*
7.APH	25	8.6%	5	0.4%	24.15	8.95 to 81.28	<0.001*

*Statistically significant if p-value <0.05

ANC= antenatal care; DM= Diabetes Mellitus; APH= Antepartum hemorrhage

Intrapartum factors

It was illustrated in the study and control groups that percentages of breech presentation were 14.5% and 3.3%, respectively (OR 5.01, 95% CI 3.11 to 8.05, p-value <0.001). Breech assisted delivery accounted for 4.1% (study group) and 0.2% (control group) (OR 27.69, 95% CI 6.1 to 255.33, p-value <0.001). Cesarean section delivery accounted for 63.4% (study group) and 54.2% (control group) (OR 1.46, 95% CI 1.12 to 1.92, p-value 0.004); referral of pregnant women from primary hospitals to Maharat Hospital during the active phase of 1st stage of labor were 22.1% (study group) and 6.6% (control group) (OR 4, 95% CI 2.75 to 5.77, p-value <0.001); percentages of precipitate of labor were 14.5% (study group) and 1.6% (control group) (OR 10.19, 95% CI 5.77 to 18.41, p-value <0.001). Percentages of premature rupture of membrane were 19% (study group) and 10.4% (control group) (OR 2.01, 95% CI 1.4 to 2.86, p-value <0.001). Percentages of thick meconium amniotic fluid strains were 5.5% (study group) and 1.6% (control group) (OR 3.69, 95% CI. 1.76 to 7.59, p-value <0.001). Percentages of emergency cesarean section were 63%. (study group) and 11.8% (control group) (OR 13.04, 95% CI 9.62 to 17.67, p-value <0.001). Percentages of Late-night infants (00.00-8.00) were 25.2% (study group) and 18.1% (control group) (OR 1.52, 95%. CI 1.11 to 2.07, p-value 0.006), Percentages of polyhydramnios (AFI> 25cm) were 3.4% (study group) and 0.1% (control group) (OR 45.86, 95% CI 6.46 to 1991.21, p-value <0.001), Percentages of severe oligohydramnios (AFI 1-3cm) were 3.8% (study group) and

0.8% (control group) (OR 5.03, 95% CI 1.91 to 13.32, p-value <0.001) Percentages of anhydramnios were 3.1% (study group) and 0.2% (control group) (OR 13.69, 95% CI 3.38 to 78.89, p-value <0.001). Percentages of postpartum hemorrhage were 4.5% (study group) and 0.9% (control group) (OR 4.98, 95% CI 2.07 to 12.06, p-value <0.001). Those factors were found to be statistically significantly associated with perinatal asphyxia. In contrast, the factors of prolonged 2nd stage of labor, artificial rupture of membrane, mild meconium amniotic fluid strain, moderate meconium amniotic fluid strain, maternal fever, infant born in morning (8.00-16.00) or midday (4.00-00.00), mild oligohydramnios (AFI 1-3cm), maternal shock were not the risk factors for perinatal asphyxia in this study (as shown in Table 3).

Table 3: Intrapartum factors

	Study group (n=290)		Control group (n=1285)		OR	(95% CI)	p-value*
	n	%	n	%			
1. Breech present	42	14.5%	42	3.3%	5.01	3.11 to 8.05	<0.001*
2. Vacuum extraction	22	7.6%	70	5.4%	1.42	0.82 to 2.38	0.161
3. Breech assisted delivery	12	4.1%	2	0.2%	27.69	6.1 to 255.33	<0.001*
4. Cesarean section	184	63.4%	697	54.2%	1.46	1.12 to 1.92	0.004
5. Refer at active phase of 1st stage of labor	64	22.1%	85	6.6%	4	2.75 to 5.77	<0.001*
6. Prolong 2nd stage of labor	3	1%	12	0.9%	1.11	0.2 to 4.15	0.873
7. Precipitate of labor	42	14.5%	21	1.6%	10.19	5.77 to 18.41	<0.001*
8. PROM	55	19%	134	10.4%	2.01	1.4 to 2.86	<0.001*
9. ARM	12	4.1%	194	15.1%	0.24	0.12 to 0.44	<0.001*
10. mild Meconium	16	5.5%	71	5.5%	1	0.53 to 1.77	0.996
11. moderate Meconium	8	2.8%	25	1.9%	1.43	0.55 to 3.31	0.383
12. thick Meconium	16	5.5%	20	1.6%	3.69	1.76 to 7.59	<0.001*
13. Maternal fever	6	2.1%	82	6.4%	0.31	0.11 to 0.71	0.004
14. Emergency C/S	184	63.4%	151	11.8%	13.04	9.62 to 17.67	<0.001*
15. Morning shift	127	43.8%	670	52.1%	0.72	0.55 to 0.93	0.010
16. Afternoon shift	90	31%	382	29.7%	1.06	0.8 to 1.41	0.661
17. Night shift	73	25.2%	233	18.1%	1.52	1.11 to 2.07	0.006
18. polyhydramnios	10	3.4%	1	0.1%	45.86	6.46 to 1991.21	<0.001*
19. Normal Amniotic fluid	264	91%	1243	96.7%	0.34	0.2 to 0.59	<0.001*
20. Severe oligohydramnios	11	3.8%	10	0.8%	5.03	1.91 to 13.32	<0.001*
21. Anhydramnios	9	3.1%	3	0.2%	13.69	3.38 to 78.89	<0.001*
22. PPH	13	4.5%	12	0.9%	4.98	2.07 to 12.06	<0.001*
23. Maternal Shock	2	0.7%	1	0.1%	8.92	0.46 to 526.39	0.031

***Statistically significant if p-value < 0.05**

PROM = Premature rupture of membranes; ARM= Artificial membrane rupture; PPH=Postpartum hemorrhage

Fetal factor

It was demonstrated that infants born at the age of less than 34 weeks of gestation were 45.2% (study group) and 2.8% (control group) (OR 28.58, 95% CI 18.8 to 43.99, p-value <0.001). Non-reassuring fetal status accounted for the study and control groups were 20% and 3.3%, respectively (OR 7.4, 95% CI 4.75 to 11.55, p-value <0.001), percentages of babies with birth weight less than 2500 grams were 56.2% (study group) and 12.9% (control group) (OR 8.65, 95% CI 6.45 to 11.6, p-value <0.001. Twins accounted for 9.3% (study group) and 0.5% (control group) (OR 21.88, 95% CI 8.71 to 65.29, p-value <0.001). The mentioned factors were found to be statistically significantly associated with perinatal asphyxia. The birthweight

Table 4: Fetal factor

	Study group (n=290)		Control group (n=1285)		OR	(95% CI)	p-value*
	n	%	n	%			
1. GA <34weeks	131	45.2%	36	2.8%	28.58	18.8 to 43.99	<0.001*
2. Non-reassuring fetal status	58	20%	42	3.3%	7.4	4.75 to 11.55	<0.001*
3. BW < 2500 gram	163	56.2	166	12.9%	8.65	6.45 to 11.6	<0.001*
4. BW 2500-3999 gram	125	43.1%	1107	86.1%	0.12	0.09 to 0.16	<0.001*
5. BW > 4000 gram	2	0.7%	12	0.9%	0.74	0.08 to 3.34	0.689
6. Twins	27	9.3%	6	0.5%	21.88	8.71 to 65.29	<0.001*

***Statistically significant if p-value < 0.05**

GA= Gestational age; BW= birth weight

Logistic Regression Analysis

Multiple logistic regression was analyzed and

presented all risk factors associated with perinatal asphyxia, including pregnant women who did not receive antenatal care (OR 6.87, 95% CI 2.56 to 18.48, p-value <0.001); preeclampsia (OR 3.01, 95% CI 1.94 to 4.68, p-value <0.001); poor control overt DM (OR 15.89, 95% CI 3.25. to 77.63, p-value 0.001); antepartum hemorrhage (OR 25.27, 95% CI 9.52 to 67.09, p-value <0.001); vaginal childbirth with buttocks (breech assisted delivery) (OR10.71, 95% CI 2.04 to 56.27, p-value0.005); referral of pregnant women from primary hospitals to Maharat Hospital during active phase of 1st stage of labor (OR 3.49 , 95% CI 2.36 to 5.16, p-value <0.001); Precipitate of labor (OR 8.72, 95% CI, 4.87 to 15.61, p-value <0.001); Thick meconium amniotic fluid strain (OR 2.92, 95% CI 1.34 to 6.38. , p-value0.007); Severe oligohydramnios (AFI 1-3cm) (OR 5. 85, 95% CI 2.36 to 14.51, p-value <0.001); Anhydramnios (OR 21.82, 95% CI 5.85 to 81.44, p-value <0.001); Postpartum hemorrhage (OR 5.07, 95% CI 2.05 to 12.54, p-value < 0.001); infants born at less than 34 weeks of gestation (OR 12.98, 95% CI 7.65 to 22, p-value <0.001); and

non-reassuring fetal status (OR 6.25, 95% CI 3.75 to 10.41, p-value <0.001) (as shown in Table 5)

Table 5: Multiple logistic regression analysis

Risk factor	OR	95% CI	p-value*
1. No ANC	6.87	2.56 to 18.48	<0.001*
2. Preeclampsia	3.01	1.94 to 4.68	<0.001*
3. Poor control DM	15.89	3.25 to 77.63	0.001*
4. APH	25.27	9.52 to 67.09	<0.001*
5. Breech assisted delivery	10.71	2.04 to 56.27	0.005*
6. Refer at active phase of 1st stage of labor	3.49	2.36 to 5.16	<0.001*
7. Precipitate of labor	8.72	4.87 to 15.61	<0.001*
8. Thick Meconium	2.92	1.34 to 6.38	0.007*
9. Severe oligohydramnios	5.85	2.36 to 14.51	<0.001*
10. Anhydramnios	21.82	5.85 to 81.44	<0.001*
11. PPH	5.07	2.05 to 12.54	<0.001*
12. GA <34weeks	12.98	7.65 to 22	<0.001*
13. Non-reassuring fetal status	6.25	3.75 to 10.41	<0.001*

*Statistically significant if p-value < 0.05

ANC= Antenatal care; APH= Antepartum hemorrhage; PPH=Postpartum hemorrhage

DISCUSSION

Perinatal asphyxia can cause malfunction and death when timely assistance is not received. It is detectable during pre-delivery and delivery periods; however, closely monitoring and providing timely and appropriate care is necessary and required to decrease the incidence of perinatal asphyxia. It was demonstrated that during 2017-2019, the rate of perinatal asphyxia occurred at Maharat Hospital was 50 per 1000 live births. The findings from this study indicated that the perinatal asphyxia risk rate in the pregnant women who did not receive antenatal care was 6.87 times higher than those in the women with antenatal care visit group. This finding was consistent with the findings from previous studies.[10,18,19] Pregnant women who did not receive antenatal care led to not receiving regular check-ups and prenatal testing for abnormalities of fetus. Moreover, pregnant women lacked self-care skill to assess fetus abnormalities by themselves. As a result, antenatal care attendance is encouraged for pregnant women to reduce the occurrence of perinatal asphyxia.

Preeclampsia

The risk of perinatal asphyxia in women with preeclampsia was 3.01 times higher than those without preeclampsia. This finding was consistent with previous studies.[9,10,16,17] Preeclampsia associated with impaired uteroplacental blood flow affecting pregnancy and fetus, including fetal growth restriction, oligohydramnios, placental abruption, and non-reassuring fetal status. Fetuses of women with preeclampsia increase risk of spontaneous or indicated preterm delivery. The rate of hypoxia in newborns can be decreased when appropriate treatment is provided in preeclampsia or deliver at appropriate gestational age.[20]

Poor controlled overt DM

Poor controlled overt DM was found to be 15.89 times of risk of hypoxia higher than women with non-Poor controlled overt DM. Moreover, poor controlled overt DM can lead to preterm delivery, malformation, altered fetal growth, and unexplained fetal demise.[21] Nevertheless, complications and hypoxia in infants can be decreased in women with well-controlled diabetes. Antepartum hemorrhage increased the risk of neonatal asphyxia at 25.27 times higher than those of the non-antepartum hemorrhage group, in consistent with the previous study of Tasew Hagos et al.[9] Antepartum hemorrhage with large amount of bleeding can decrease blood flow level to placenta and result in increasing the incidence of hypoxia in newborns.

Vagina breech delivery

Vagina breech delivery had a 10.71 times higher risk of developing perinatal asphyxia than those in other methods of delivery. It is consistent with previous studies.[8,14,15,16,19] This might be attributable to the fact that breech presentation increased the risk of umbilical cord prolapse, head entrapment, and birth injury causing oxygen deprivation. The referral of pregnant women from primary hospitals to Maharat Hospital during active phase of the 1st stage of labor had 3.49 times higher risk of perinatal asphyxia than the control group and was consistent with previous studies of Puernngooluerm.[8] This is because obstetrical complication or existing medical complications occurred and causing hypoxia of newborns.

Precipitate labor

Precipitate labor is defined as delivery with rapid labor less than 3 hours after contractions. Participate delivery can negatively impact newborns in preventing appropriate uterine blood flow and fetal oxygenation, causing intracranial trauma, leading newborn fall with injury, or increasing the requirement of resuscitation[21]

Thick meconium amniotic fluid strain.

The risk of perinatal asphyxia was 2.92 times higher than the control group, which was consistent with the recent studies.[8,9,13,14,15,18,22] Obstetricians realized that meconium during labor was the challenge in the prediction of fetal distress or asphyxia. Definitely, labor complicated by meconium accounted for 12-22 percent of labor.[21] It is suggested by American College of Obstetricians and Gynecologists (ACOG) that suctioning should be reserved for newborns with meconium-stained amnionic fluid and airway obstruction. Additionally, availability of team with full resuscitation skills is necessarily required.[23]

Severe oligohydramnios and Anhydramnios

The risk of perinatal asphyxia in severe oligohydramnios and anhydramnios group and control group were 5.85 and 21.82, respectively. Oligohydramnios was associated with adverse pregnancy outcomes, in which the complication was approximately 2 percent of pregnancies. The fetal malformation rates were developed in those with oligohydramnios. Furthermore, anhydramnios, rates of stillbirth, growth restriction, nonreassuring heart rate pattern, and meconium aspiration syndrome were higher than those with non-complicated pregnancies. A recent meta-analysis study performed in over 10,000 pregnancies reported that women with oligohydramnios had a two-fold increased risk of cesarean delivery for fetal distress and a five-fold increased risk of Apgar score <7 at 5 minutes, compared with pregnancies with a normal amniotic fluid index (AFI).[21] As a result, proper care provided can reduce the rate of hypoxia in newborns.

Postpartum hemorrhage

The risk of hypoxia in newborns was 5.07 times higher than those in the control group. Perinatal asphyxia can occur due to maternal hemorrhage.[23] Prompt diagnosis with timely and appropriate treatment can reduce the rate of perinatal asphyxia. Infants born at less than 34 weeks of gestation are at risk of complications since their organs are not fully developed and increase the risk of perinatal asphyxia. The risk of neonatal asphyxia was 12.98 times higher than control group, which was consistent with the previous study.[13,14,16] It is recommended that availability of team with full resuscitation skills can reduce the rate of perinatal asphyxia.[23]

Non-reassuring fetal status

The risk rate of neonatal asphyxia was 6.25 times higher than control group which was consistent with the previous study.[13,14,16,17] Prompt and proper labor and delivery with availability of a team with full resuscitation skills can reduce the rate of perinatal asphyxia.

CONCLUSION

In summary, risk factors associated with perinatal asphyxia identified in this study can assist healthcare professionals planning for medical care, prevention, surveillance, and early diagnosis. Moreover, provision of proper medical care and services can reduce the incidence of hypoxia in newborns.

ACKNOWLEDGMENTS

The authors are grateful to the faculty of Department of Obstetrics and Gynecology, Maharat Hospital, Data Collection Assistant, Statisticians and all participating patients for their support and contribution to the success of this study.

REFERENCES

1. Groenendaal, F., & van Bel, F. (2020). Perinatal asphyxia in term and late preterm infants. UpToDate. Topic, 4975.
2. Lawn, J. E., Cousens, S., Zupan, J., & Lancet Neonatal Survival Steering Team. (2005). 4 million neonatal deaths: when? Where? Why?. The lancet, 365(9462), 891-900.
3. Committee on Obstetric Practice American Academy of Pediatrics - Committee on Fetus and Newborn (2015). Committee Opinion No. 644: The Apgar Score. Obstetrics and gynecology, 126(4), e52–e55. https://doi.org/10.1097/AOG.0000000000001108
4. World Health Organization. (1992). International statistical classification of diseases and related health problems: 10th revision (ICD-10). http://www.who. int/classifications/apps/icd/icd.
5. Department of Health. Department of Health Annual Report 2017. 1st ed [Internet]. Bangkok: Department of Health; 2018 [updated 2018; cited 2020 September 20]. Available from: http://www.oic.go.th/FILEWEB/CABINFOCENTER17/DRAWER002/GENERAL/DATA0000/00000849.PDF.
6. Committee on developing the12th National Health Development Plan . 12th National Health Development Plan, 2017-2021 [Internet]. Ministry of Public Health; 2016 [cited 2020 September 20]. Available from: http://wops.moph.go.th/ops/oic/data/20180914162453_1_.pdf
7. Department of Health. Measurable indicators of Ministry, Department of Health 2017 [Internet]. Maternal and child health promotion Bureau of Health Promotion; 2017 [cited 2020 September20]. Available from: file:/// C:/ Users/HP/Downloads/M201600002-1479882138-% E0 % B8 % 95 % E0% B8% B1% E0% B8% A7% E0% B8% 8A% E0% B8% B5% E0% B9% 89% E0% B8% A7% E0% B8% B1% E0% B8% 94% E0% B8% 81% E0% B8% A3% E0% B8% A1% E0% B8% AD% E0% B8% 99% E0% B8% B2% E0% B8% A1% E0% B8% B1% E0% B8%A2-2560-081159.pdf
8. Puernngooluerm, P. (2011). Factors Influenced Birth Asphyxia in Term Pregnancies at Maharat Nakhon Ratchasima Hospital.
9. Tasew, H., Zemicheal, M., Teklay, G., Mariye, T., & Ayele, E. (2018). Risk factors of birth asphyxia among newborns in public hospitals of Central Zone, Tigray, Ethiopia 2018. BMC research notes, 11(1), 496.
10. Wayessa, Z., Belachew, T., & Joseph, J. (2018). Birth asphyxia and associated factors among newborns delivered in Jimma zone public hospitals, Southwest Ethiopia: A cross-sectional study. Journal of Midwifery and Reproductive Health, 6(2), 1289-1295.
11. Aslam, H. M., Saleem, S., Afzal, R., Iqbal, U., Saleem, S. M., Shaikh, M. W. A., & Shahid, N. (2014). Risk factors of birth asphyxia. Italian journal of pediatrics, 40(1), 94.
12.) Ibrahim, N. A., Muhye, A., & Abdulie, S. (2017). Prevalence of birth asphyxia and associated factors among neonates delivered in Dilchora Referral Hospital. Dire Dawa, Eastern Ethiopia. Clinics Mother Child Health, 14(279), 2.
13. Saksangawong, S., & Rattanamongkolgul, S. (2019). Risk Factor and Risk score for Birth Asphyxia in Kumpawapi Hospital, Udonthani Province. Royal Thai Army Medical Journal, 72(1), 41-52.
14. Pitsawong, C., & Panichkul, P. (2011). Risk factors associated with birth asphyxia in Phramongkutklao Hospital. Thai Journal of Obstetrics and Gynaecology, 165-171.
15. Berhe, Y. Z., Kebedom, A. G., Gebregziabher, L., Assefa, N. E., Berhe, L. Z., Mohammednur, S. A., ... & Teka, H. G. (2020). Risk Factors of Birth Asphyxia Among Neonates Born in Public Hospitals of Tigray, Northern Ethiopia. Pediatric Health, Medicine and Therapeutics, 11, 13.
16. Suwannachat, B. (2004). Risk factors for birth asphyxia in Kalasin hospital. Srinagarind Medical Journal, 19(4), 233-240.
17. Panna, S. (2020). Risk Factors for Birth Asphyxia in Newborns Delivered at Nongkhai Hospital. Srinagarind Medical Journal-ศรีนครินทร์ เวช สาร, 35(3), 278-286.
18. Sattayaruk, S., Luengratsameerung, S., Wiriyasirivaj, B., & Phaloprakarn, C. (2014). Antepartum and intrapartum risk factors associated with low one-minute Apgar score: a case-control study. Thai Journal of Obstetrics and Gynaecology, 118-118.
19. Majeed, R., Memon, Y., Majeed, F., Shaikh, N. P., & Rajar, U. D. (2007). Risk factors of birth asphyxia. Journal of Ayub Medical College Abbottabad, 19(3), 67-71.
20. Practice Bulletin No, A. C. O. G. (2019). 202: gestational hypertension and preeclampsia. Obstet Gynecol, 133(1), e1-e25.
21. Williams J, Cunningham F, Leveno K, Bloom S, Spong C, Dashe J. Willium obstetrics. 25th ed. United States: Mc Graw Hill Education; 2018.
22. Saengjun, J. (2015). Risk factors of birth asphyxia.(ปัจจัย เสี่ยง ต่อ ภาวะ ขาด ออกซิเจน ของ ทารก แรก เกิด). Region 11 Medical Journal-วารสาร วิชาการ แพทย์ เขต 11, 393-402.
23. Committee on Obstetric Practice. (2017). Committee Opinion No 689: Delivery of a Newborn With Meconium-Stained Amniotic Fluid. Obstetrics and gynecology, 129(3), e33.
24. Gillam-Krakauer, M., & Gowen Jr, C. W. (2020). Birth Asphyxia. In StatPearls. StatPearls Publishing.