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Risk Factors Associated with Birth Asphyxia in Phramongkutklao Hospital

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ABSTRACT

Objective: To determine the risk factors for birth asphyxia

Materials and Methods: After obtaining the approval from the Institutional Review Board, a retrospective case-control study recruited 450 women who delivered at Phramongkutklao Hospital between January 1, and December 31, 2009 were recruited by consecutive selection. The study sample comprised 150 women who delivered newborns with an APGAR score at 1 minute of 7 or less, while the control comprised 300 women who delivered newborns with an APGAR score at 1 minute more than 7. The risk factors for birth asphyxia were determined.

Result: The risk factors associated with birth asphyxia included moderate to thick meconium (OR 5.51, 95% CI 2.58-11.77), breech presentation (OR 4.53, 95% CI 1.72-11.92), birth weight < 2,500 grams (OR 2.46, 95% CI 1.4-4.29), sedation with morphine or pethidine (OR 2.29, 95% CI 1.37-3.84) and preterm delivery (OR 2.08, 95% CI 1.24-3.51).

Conclusion: Most risk factors associated with birth asphyxia can be prevented. Therefore the correct, quick and accurate diagnosis and proper management can reduce severe birth asphyxia.

Keywords: birth asphyxia, risk factor

Introduction

Asphyxia is a condition that occurs when there is an impairment of blood-gas exchange, resulting in hypoxemia (lack of oxygen) and hypercapnia (accumulation of carbon dioxide). The combination of the decrease in oxygen supply (hypoxia) and blood supply (ischemia) results in a cascade of biochemical changes inside the body, whose events lead to neuronal cell death and brain damage. Continuous asphyxia will also lead to multiple organ systems dysfunction. Thus, birth asphyxia is a serious clinical problem worldwide and contributes greatly to neonatal mortality and morbidity[1] The World Health Organization (WHO) estimates that globally, between four and nine million newborns suffer birth asphyxia each year. Birth asphyxia leads to an estimated 1.2 million deaths and about the same number of infants who develop severe consequences, such as epilepsy, cerebral palsy, and developmental delay. WHO estimates for global neonatal deaths caused by birth asphyxia are 29%[2].

Birth asphyxia can be caused by events that have their roots in either the antepartum or intrapartum and involve fetal factors or combinations thereof.

The WHO's classification of diseases according to ICD 10 (The International Classification of Disease 10) defines birth asphyxia where the APGAR score at 1 minute is less than or equal to 7 by the two levels. Severe birth asphyxia is defined where the APGAR score at 1 minute is 0-3 and slight or moderate (mild or moderate birth asphyxia) is defined where the APGAR score at 1 minute is 4-7[3]. Other risk factors associated with birth asphyxia were moderate to thick meconium-stained amniotic fluid, breech presentation, birthweight <2,500 g, intrapartum sedation with morphine or pethidine and preterm delivery.

According to the Tenth Thai National Health Development Plan, birth asphyxia should be reduced to less than 30 per 1,000 live births. However, the incidence of birth asphyxia in Phramongkutklao Hospital is higher. In 2008 and 2009, the incidence of birth asphyxia was 100.76 and 90.20 per 1,000 live births, respectively.

Therefore, we conducted this study to determine the risk factors associated with birth asphyxia in Phramongkutklao Hospital, to be used as basic information for preventing birth asphyxia in the future.

Materials and Methods

After approved by the Institutional Review Board of the Royal Thai Army Medical Department, a retrospective case-control study was conducted. All parturients with a gestational age of 28 weeks or more or fetal birth weight of 1,000 g or more were recruited. However, those who delivered fetuses with a major congenital anomaly or women with intrauterine fetal death or a stillbirth were excluded. The data were collected from January 1, to December 31, 2009 at Phramongkutklao Hospital. A total of 2,306 deliveries occurred during the study period. All pregnant women who delivered newborns with an APGAR score at 1 minute of 7 or less were included in the study group and the control group comprised pregnant women who delivered newborns with an APGAR score at 1 minute > 7. The sample size calculation was determined by two proportion mean formula[4]. Method for selecting the population in each group was consecutive selection with the ratio of 1 to 2 between study and control groups, i.e., 150 cases 300 cases were required in the study and control group, respectively.

The collected data were divided into three groups; maternal, intrapartum and neonatal factors. Maternal or antepartum factors included maternal age, gestational age, hypertension, diabetes mellitus and antenatal clinic (ANC) follow-up less than 4 visits. Intrapartum factors comprised breech presentation, chorioamnionitis, oligohydramnios, meconium in amniotic fluid, premature rupture of membranes more than 18 hours, sedation with morphine or pethidine and route of delivery. In addition, fetal factors consisted of intrauterine growth restriction (IUGR), twin pregnancy, birthweight less than 2,500 grams, preterm delivery and fetal distress.

The demographic data was determined by mean and percentage. Student t-test was used to compare the significant contributing factors as appropriate. Association between birth asphyxia and risk factors was determined by logistic regression. The potential risk factors were determined by multiple logistic regression. The significant level was defined as a p-value < 0.05. The percentage of risk factors associated with birth asphyxia at different intensity levels was estimated with odds ratio and 95% confidence interval (CI).

Result

The demographic data of the recruited women are shown (Table 1). The average age in the study group and control group was 28.29 and 28.39 years, respectively. The gestational age of the study group was 38.07 weeks and of the control group was 37.35 weeks. The primigravidarum in the study group comprised 80 cases and 132 cases in the control group whereas multigravidarum comprised 70 cases and 168 cases, respectively. Maternal or antepartum factors, of the study group compared with those of the control group are shown (Table 2).

Breech presentation moderate to thick meconium-

stained amniotic fluid, as well as intrapartum sedation with morphine or pethidine were significantly associated with birth asphyxia as shown (Table 3).

Regarding fetal factors, fetal birth weight less than 2,500 grams (OR 2.40, 95% CI 1.42-4.04) and preterm delivery (OR 2.08, 95% CI 1.24-3.51) were significantly related to birth asphyxia as demonstrated in Table 4. However, intrauterine growth restriction, twin pregnancy and diagnosis of fetal distress were not significantly related to birth asphyxia.

Significant risk factors for birth asphyxia were further analyzed by multiple logistic regression model. Factors that were independently associated with birth asphyxia included moderate to thick meconium-stained amniotic fluid (OR 5.51, 95% CI 2.58-11.77), breech presentation (OR 4.53, 95% CI 1.72-11.92), birthweight less than 2,500 grams (OR 2.46, 95% CI 1.40-4.29), sedation with morphine or pethidine (OR 2.29, 95% CI 1.37-3.84) and preterm delivery (OR 2.08, 95% CI 1.24-3.51) (Table 5).

Table 1. Demographic data (mean/percentage)

Demographic data	Study group(n=150)	Control group (n=300)
1. Maternal age (years)	28.29	28.33
2. Gestational age (weeks)	38.07	37.35
3. Primigravidarum	80	132
4. Multigravidarum	70	168

Table 2. Antepartum factors

Maternal factors	Study group (n=150)		Control group (n=300)		OR	(95% CI)	p-value*
	n	%	n	%			
1. Maternal age £ 17 years	9	6.04	22	7.33	0.79	(0.35-1.77)	0.57
2. Maternal age³ 35 years	16	10.74	38	12.67	0.81	(0.43-1.51)	0.52
3. ANC < 4 visits	1	0.67	5	1.67	0.39	(0.04-3.44)	0.40
4. Primigravidarum	80	53.02	132	44.00	1.43	(0.96-2.13)	0.07
5. Multigravidarum	70	46.98	168	56.00	1.00	(0.96-2.13)	0.07
6. Hypertension	9	6.04	14	4.67	1.31	(0.55-3.10)	0.53
7. Diabetes mellitus	9	6.04	13	4.33	1.41	(0.59-3.39)	0.43

*Statistically significant if p <0.05

Table 3. Intrapartum factors

Intrapartum factor	Study group (n=150)		Control group (n=300)		OR	(95% CI)	p-value*
	n	%	n	%			
1. Breech presentation	14	9.40	8	2.67	3.78	(1.55-9.23)	0.003
2. Chorioamnionitis	2	1.34	2	0.67	2.02	(0.28-14.53)	0.48
3. Oligohydramnios	3	2.01	4	1.33	1.52	(0.33-6.88)	0.58
4. Mild meconium	4	2.68	22	7.33	0.40	(0.13-1.18)	0.09
5. Moderate to thick meconium	24	16.11	12	4.00	4.39	(2.12-9.08)	0.001
6. PROM > 18 hours	1	0.67	4	1.33	0.50	(0.05-4.51)	0.53
7. Sedation	68	45.64	106	35.33	1.84	(1.14-2.97)	0.01
8. Vacuum or forceps extraction	10	6.71	10	3.33	2.18	(0.87-5.42)	0.09
9. Cesarean section	46	30.87	87	29.00	1.15	(0.74-1.78)	0.51

*Statistically significant if p <0.05

Table 4. Fetal factors

Fetal factors	Study group (n=150)		Control group (n=300)		OR	(95% CI)	p-value*
	n	%	n	%			
1. IUGR	1	0.67	3	1.00	0.66	(0.06-6.48)	0.72
2. Twin pregnancy	7	4.70	8	2.67	1.79	(0.63-5.06)	0.26
3. Birthweight < 2,500 grams	35	23.49	34	11.33	2.40	(1.42-4.04)	0.001
4. Preterm delivery	33	22.15	36	12.00	2.08	(1.24-3.51)	0.006
5. Fetal distress	12	8.05	11	3.69	2.28	(0.98-5.31)	0.055

*Statistically significant if p <0.05

Table 5. Multiple logistic regression analysis

Risk factors	OR	(95% C.I)	p-value*
1. Moderate to thick meconium	5.51	(2.58-11.77)	<0.001
2. Breech presentation	4.53	(1.72-11.92)	0.002
3. Birthweight < 2,500 grams	2.46	(1.40-4.29)	0.002
4. Sedation with morphine or pethidine	2.29	(1.37-3.84)	0.002
5. Preterm delivery	2.08	(1.24-3.51)	0.006

*Statistically significant if p <0.05

Discussion

Risk factors of birth asphyxia in this study included preterm delivery, which was 2.08 times that of the control group. Similar results were reported in prior studies[5-10]. Preterm babies have a variety of morbidities, largely due to organ system immaturity, especially lung immaturation causing respiratory distress syndrome (RDS) in infants after birth. In the case of preterm labor, it is important to make a diagnosis and find the cause to provide appropriate management to prevent preterm delivery.

On the contrary, other factors such as chorioamnionitis, oligohydramnios, route of delivery, PROM longer than 18 hours, IUGR, fetal distress and twins were found to be the risk factors of birth asphyxia in previous studies[5,7] but did not affect the incidence of birth asphyxia in the present study. Possible explanations included the small sample size contributed to the observed negative correlation of this factor and also because of the different studied population.

Maternal age and parity were not associated with birth asphyxia in this study, similar to those in the study of Praditsathawong S, et al[11]. The present study reaffirms that most birth asphyxia results are strongly associated with pregnancy factors such as moderate to thick meconium-stained amniotic fluid, breech presentation, fetal birth weight < 2,500 grams, intrapartum sedation with morphine or pethidine and preterm delivery.

The strongest risk factor associated with asphyxia in this study was moderate to thick meconium-stained amniotic fluid. This factor was associated with asphyxia was 5.51 times higher than clear amniotic fluid which was the same as in previous studies[1,5-7,12]. Those with mild or thin meconium-stained amniotic fluid were not found to relate to birth asphyxia in this study. In healthy, well-oxygenated fetuses, this diluted meconium is readily cleared from the lungs by normal physiological mechanisms. In some cases, however, the inhaled meconium is not cleared, and meconium aspiration syndrome results. It can occur after normal labor, but is more likely when the meconium is thick[13]. If the meconium-stained amniotic fluid was presented, immediate endotracheal meconium suction after delivery could reduce meconium aspiration syndrome.

Breech presentation exhibited a 4.53 times higher risk of birth asphyxia than other presentations similar to previous studies[5,8,9,12]. The assumption is that breech presentation has a high rate of umbilical cord prolapse, head entrapment, birth trauma and also increased perinatal mortality. This result was supported by the study of Hannah ME and colleagues[14] comparing the planned caesarean section to the planned vaginal birth for breech presentation at term revealing that perinatal mortality, neonatal mortality, or serious neonatal morbidity was significantly lower for the planned caesarean section group than for the planned vaginal birth group. Also, the meta-analysis study of infant outcomes after breech delivery by Gifford DS et al[15] and Su M et al[16] suggests an increased risk of injury and injury or death after a trial of labor.

Risk of asphyxia in fetal birth weight less than 2,500 grams was 2.46 times more at risk compared with fetal birth weight more than 2,500 grams similar to previous reports[12,17-19]. Low birthweight (LBW) infants are often related to maternal complications such as anemia, hypertension, and diabetes that present preconception or antepartum. To decrease the risk of LBW, in the case of previously described maternal conditions, these pregnant women should be advised to take care of themselves or try to cease or decrease their risky activities that cause LBW fetuses (e.g., smoking, alcohol consumption, etc.).

Intrapartum sedation with morphine or pethidine also had significant association with birth asphyxia, as demonstrated in previous studies[5-7,9,10]. These opioids readily cross the placenta and for pethidine - its half-life in the newborn is approximately 13 hours or longer[20]. Narcotics used during labor may cause newborn respiratory depression with the depressant effect in the fetus that follows closely behind the peak maternal analgesic effect. However, parental use of these narcotics during labor is optional for pain relief. The appropriate drug selection and appropriate time of administration with early recognition of problems and concerns after use is important.

Conclusion

Most risk factors associated with birth asphyxia can be prevented. Therefore, the timely and accurate diagnosis and proper management can reduce severe birth asphyxia.

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References

1. Adcock LM, Stark AR. Systemic effects of perinatal asphyxia. Up-To-Date version 18.3. [Internet] 2010 [updated 2010 August 23; cited 2010 Dec 15]. Available from: URL: http://www.uptodate.com.
2. Lawn JE, Cousens S, Zupan J. 4 million neonatal deaths: When? Where? Why? Lancet 2005;365:891-900.
3. The International Classification of Disease 10 Revision Thai Modification Volume 2. Ministry of public health Bureau of policy and strategy office of the permanent secretary, second ed 2006; 265.
4. Lertsakornsiri M. Risk factors associated with birth asphyxia in Lampang Hospital. Lampang Med 2003; 28: 1-11.
5. Wongsang N. Risk factors associated with birth asphyxia in Samutprakarn Hospital. Bull Dept Med Serv 2000; 25: 78-86.
6. Taweethammasathit T. Risk factors associated with APGAR score £ 7 at birth in Mukdahan Hospital. Medical J of Ubon Hospital 2004; 25: 273-82.
7. Lee AC, Mullany LC, Tielsch JM, Katz J, Khatry SK, LeClerq SC, et al. Risk factors for neonatal mortality due to birth asphyxia in southern Nepal: a prospective, community-based cohort study. Pediatrics 2008;121: 1381-90.
8. Chandra S, Ramji S, Thirupuram S. Perinatal asphyxia: multivariate analysis of risk factors in hospital births. Indian Pediatr 1997; 34: 206-12.
9. Kerdarunsree A. Prevalence and factors associated with birth asphyxia in Ratchapiphat Hospital. Vajira Med J 2004; 48: 79-86.
10. Milsom I, Ladfors L, Thiringer K, Niklasson A, Odeback A, back A, Thornberg E. Influence of maternal, obstetric and fetal risk factors on the prevalence of birth asphyxia at term in a Swedish urban population. Acta Obstet Gynecol Scand 2002;81:909–17.
11. Praditsathawong S, Nimitsurachat S. Risk factor associated with low APGAR score of new born at 1 minute. Thai J Obstet Gynaecol 2000; 12: 277-82.
12. Chen ZL, He RZ, Peng Q, Guo KY, Zhang YQ, Yuan HH, et al. Prenatal risk factors for neonatal asphyxia: how risk for each? Zhongguo Dang Dai Er Ke Za Zhi 2009; 11: 161-5.
13. Cunningham FG, Leveno KJ, Bloom SL, Hauth JC, Rouse DJ, Spong CY, editors. Williams Obstetrics. 23rded. New York: McGraw-Hill; 2005. p. 605-45.
14. Hannah ME, Hannah WJ, Hewson SA, Hodnett ED, Saigal S, Willan AR. Planned caesarean section versus planned vaginal birth for breech presentation at term: a randomised multicentre trial. Term Breech Trial Collaborative Group. Lancet 2000 ; 21; 356(9239):1375-83.
15. Gifford DS, Morton SC, Fiske M, Kahn K. A meta-analysis of infant outcomes after breech delivery. Obstet Gynecol 1995; 85:1047-54.
16. Su M, McLeod L, Ross S, Willan A, Hannah WJ, Hutton E, et al. Factors associated with adverse perinatal outcome in the Term Breech Trial. Am J Obstet Gynecol 2003 ;189: 740-5.
17. Panichwattana C, Thammadee S, Khemkhang T. Factors influenced birth asphyxia at Uttaradit Hospital. Region 8 Med J 2000; 8: 53-66.
18. Pajjokkhuppati L. Obstetric risk factors influenced APGAR score £ 7 at 1 minutes after birth and the effect to fetus in Suratthanee Hospital. Region 11 Med J 2002;16: 21-33.
19. Jittawarhodome T. Birth asphyxia in Satul Hospital. Region 12 Med J 2545;13: 43-54.
20. American College of Obstetricians and Gynecologists: Obstetric analgesia and anesthesia. Int J Gynaecol Obstet 2002;78:321-35.

ปัจจัยเสี่ยงที่สัมพันธ์กับภาวะขาดออกซิเจนของทารกแรกเกิดในโรงพยาบาลพระมงกุฎเกล้า

ชญาศักดิ์ พิศวง, ปริศนา พานิชกุล

วัตถุประสงค์ *: เพื่อศึกษาปัจจัยเสี่ยงต่อภาวะขาดออกซิเจนของทารกแรกเกิด*

วัสดุและวิธีการ *: ภายหลังได้รับการอนุมัติจากคณะอนุกรรมการพิจารณาโครงการวิจัย ได้ศึกษาแบบย้อนหลัง โดยมีกลุ่มเปรียบเทียบ โดยการเก็บข้อมูลจากแบบบันทึกรายละเอียดการฝากครรภ์ในเวชระเบียนและสมุดบันทึกการคลอด ของสตรีจำนวน 450 คนโดยใช้การสุ่มแบบ consecutive selection ตามลำดับเวลาที่คลอดในช่วงวันที่ 1 มกราคม 2552 ถึง 31 ธันวาคม 2552 จำนวน 450 คนแบ่งเป็น 2 กลุ่มคือ กลุ่มศึกษา (APGAR ≤ 7) 150 ราย และกลุ่มควบคุม (APGAR > 7) 300 ราย*

ผลการศึกษา *: ปัจจัยเสี่ยงกับการเกิดภาวะขาดออกซิเจนในทารกแรกเกิดได้แก่ ภาวะขี้เทาในน้ำคร่ำปานกลางถึงเข้ม (OR 5.51, 95% CI 2.58-11.77), ภาวะส่วนนำเป็นก้น (OR 4.53, 95% CI 1.72-11.92), ทารกน้ำหนักแรกคลอด < 2,500 กรัม (OR 2.46, 95% CI 1.4-4.29), การได้รับยาแก้ปวด morphine หรือ pethidine ระหว่างคลอด (OR 2.29, 95% CI 1.37-3.84) และทารกคลอดก่อน 37 สัปดาห์ (OR 2.08, 95% CI1.24-3.51)*

สรุปและวิจารณ์ *: ปัจจัยเสี่ยงที่สัมพันธ์กับภาวะขาดออกซิเจนในทารกแรกเกิด ส่วนใหญ่เป็นปัจจัยที่สามารถป้องกันได้ ดังนั้นการวินิจฉัยที่ถูกต้องรวดเร็ว และให้การดูแลรักษาที่เหมาะสมสามารถลดภาวะการขาดออกซิเจนในทารกแรกเกิดได้*