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Factors Associated with Early Postpartum Hemorrhage of Singleton Pregnancy in Maharat Nakhon Ratchasima Hospital

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ABSTRACT

Objective: To determine factors associated with early postpartum hemorrhage(PPH) of singleton pregnancy who delivered in Maharat Nakhon Ratchasima Hospital.

Materials and methods: A cross-sectional, descriptive case-control study was conducted. One thousand nine hundred and fifty medical records of singleton pregnancies in Maharat Nakhon Ratchasima Hospital during 1 January 2007 to 31 December 2009 were reviewed. Cases: controls were matched 1:4. The collected data were analyzed to determine factors associated with early PPH by univariate analysis and multiple logistic regression analysis.

Results: There were 390 pregnancies with early PPH, and 1,560 pregnancies without early PPH. The significant factors associated with early PPH were tear of birth canal [Odds ratio(OR) 138.44, 95 %CI 59.32-323.07], coagulopathy (OR 82, 95 %CI 7.06-951.58), retained placenta (OR 47.08, 95 %CI 26.44-83.82), placenta previa (OR 31.76, 95 %CI 15.73-64.11), placental abruption (OR 7.59, 95 %CI 1.85-30.97), prolonged second stage of labor (OR 4.67, 95 %CI 1.79-12.17), intrapartum terbutaline use (OR 4.11, 95 %CI 1.02-16.49), history of dilatation & curettage (OR 3.98, 95 %CI 1.49-10.62). Only one factor, Bachelor's degree education (OR 0.45, 95 %CI 0.2-0.95) was protective factor to early PPH.

Conclusion: Regarding to the strategic care and management to decrease early PPH, special care and awareness should be focused on the pregnant women with history of abnormal placentation, having factors predisposing to uterine atony, coagulopathy and patients with tear of birth canal.

Keywords: early postpartum hemorrhage, PPH, risk factors, maternal deaths

Introduction

The early postpartum hemorrhage (PPH) is excessive blood loss that occurs within 24 hours after delivery and there are many definitions to diagnose PPH including visual estimated blood loss, falling of hematocrit level or anemia requiring blood transfusion.

It is considered to be one of the major obstetric complications occurring after delivery and leading cause of maternal death in both developing and developed countries[1]. Twenty five to thirty persents of maternal deaths in the developing countries were due to PPH[2]. The most common cause of maternal death in many provinces in Thailand was PPH[3,4]. The reported incidences of maternal deaths in Thailand by Ministry of Public Health were 34.1, 43.7 and 21.6% in 2004, 2005 and 2006, respectively. In other word, they can demonstrate more than 70% of maternal postpartum complications was PPH[5]. The worldwide incidence of PPH by WHO in 2000 was 10.5% of total livebirth (10 million cases)[6]. Incidences in each country were around 4-6%[7]. Bhumibol Adulyadej Hospital, Thailand (2009) reported the incidence of early PPH was 1.98%[8].

With high incidence of maternal postpartum deaths due to PPH, its prevention becomes one of the major concerns in many countries. Previous study revealed the risk factors associated with PPH, e.g. prolonged third stage of labor, obesity, tear of birth canal, retained placenta, etc[7]. Some of the risk factors seemed to be preventable, and early management in some factors may be helpful to prevent PPH.

In addition to the aim of the 10th National Economic and Social Development Plan (2007-2011) to reduce the maternal death rate to below 18:100,000 live births, there is still no study concerning the risk factors of early PPH in Maharat Nakhon Ratchasima Hospital. The objective of this study is to determine the factors associated with early PPH in singleton pregnancies who delivered in Maharat Nakhon Ratchasima Hospital which may help to prevent, predict and guide towards early management to decrease early PPH and PPH related maternal deaths.

Materials and methods

A case-control study was conducted. We used PS – Power and Sample Size Program version 3.0 (Visual Components, USA, 2009) to calculate sample size. Cases: controls were matched in ratio 1:4 with 5% α-error, 80% power (β) and discriminate significant odds ratio 2.5 to ensure that sample size could determine statistical significance to studied factors. Then, medical records of singleton pregnancies with gestational age $\geq$ 24 weeks or baby birth weight from this delivery $\geq$ 500 grams in Maharat Nakhon Ratchasima Hospital during 1 January 2007 to 31 December 2009 were reviewed. The definition of early PPH used in this study was estimated blood loss over 500 ml by vaginal delivery and over 1,000 ml by cesarean section[9]. Method to measure blood loss from vaginal delivery was visual estimated by obstetricians. Blood loss from cesarean section was measured from suction container and visual estimation from used gauzes and swabs. Patients who delivered in the other hospitals were excluded. The control group was randomized manually from the labor records every 15 registrations.

The study has been approved by Human Ethics Committee, Maharat Nakon Ratchasima Hospital. We divided the group of studied-factors into 3 categories; antepartum, intrapartum and postpartum factors. All interested factors were analyzed by univariate analysis and multiple logistic regression analysis, by including all of the statistically significant factors from univariate analysis at p-value < 0.20 into the multiple logistic regression models. Then, the correlation between significant factors and early PPH were shown in odds ratio (OR) and 95% confidence interval (95%CI). A p-value of < 0.05 was considered statistically significant. All analyses were performed using STATA version 11.0 (StataCorp. 2009. Stata Statistical Software: Release 11. College Station, TX: StataCorp LP.).

Results

The total cases of 1,950 singleton pregnancies were enrolled : 390 cases were early PPH group, and 1,560 cases in non-PPH group. Prevalence of early PPH was 6.67%. The baseline characteristic data of studies population are shown in Table 1. No statistical significance in baseline characteristic between case and control groups.

Uterine atony was the most common cause of early PPH (42.6%). The second most common cause was retained placenta (14.4%) and the least common cause was coagulopathy (1.6%) (Table 2).

Results of univariate analysis are shown in Table 3. All of interest factors with p < 0.20 were put into

multiple logistic regression model that included antepartum factors, age at delivery, place of antenatal care, education, occupation, income, pregnancy induced hypertension, placenta previa, grand multipara, history of dilatation & curettage (D&C), dead fetus in utero, coagulopathy, chorioamnionitis and polyhydramnios. The intrapartum factors were prolonged second and third stage of labor, intrapartum terbutaline use and mode of delivery, and postpartum factors were retained placenta, tear of birth canal, placenta adherens, placental abruption and precipitate labor (Table 3).

After multiple logistic regression analysis, statistically significant factors associated with early PPH ware shown in Table 4. These factors were involved in antepartum (education level, history of D&C, placenta previa, coagulopathy), intrapartum (prolonged second stage of labor, intrapartum terbutaline use) and postpartum period (tear of birth canal, retained placenta, placental abruption).

Table 1. Patients' baseline characteristic data of PPH and non-PPH groups (N=1950 cases)

Characteristics	PPH Median (Min-Max)	Non PPH Median (Min-Max)
Age at delivery (years)	29 (14-46)	27 (14-48)
Gestational age (weeks)	38 (25-43)	38 (26-43)
Parity	2 (1-10)	2 (1-8)
BMI at delivery (kg/m^2)	26 (17-44)	26 (13-55)

PPH = postpartum hemorrhage

Table 2. Causes of early PPH. (N = 429 cases)

Causes	N by causes *	%
Uterine atony	183	42.6
Retained placenta	62	14.4
Uterine vessels tear in cesarean section	52	12.1
Placenta previa	44	10.2
Tear of birth canal	27	6.2
Placenta adherens	26	6
Placental abruption	10	2.3
Vulvar hematoma	9	2
Uterine rupture	9	2
Coagulopathy	7	1.6

* Some patients might have more than one cause.

Table 3. Univariate analysis comparison of each group factors (antepartum, intrapartum and postpartum) between PPH and non-PPH groups.

Factors	Group; n (%)		p-value
	PPH 390 (100)	Non PPH 1,560 (100)	
1. Antepartum factors			
Obesity (BMI ≥ 30 kg/m^2)	96 (24.62)	375 (24.04)	0.37
Age at delivery; n (%)			
≤ 19 years	49 (12.56)	202 (12.95)	< 0.05*
20-34 years	256 (65.65)	1,127 (72.24)	
≥ 35 years	85 (21.79)	231 (14.81)	
Gestational age (GA); n (%)			
24-36^{+6} weeks	121 (31.03)	478 (30.64)	0.69
37-41+6 weeks	267 (68.46)	1,078 (69.10)	
GA ≥ 42 weeks	2 (0.51)	4 (0.26)	
Attended antenatal care; n (%)	385 (98.72)	1,539 (98.65)	0.92
Antenatal care's place; n (%)			
No antenatal care	5 (1.28)	21 (1.35)	< 0.05*
Private clinic	90 (23.08)	656 (42.05)	
Primary care unit	45 (11.54)	203 (13.01)	
Hospital	250 (64.10)	680 (43.59)	
Education; n (%)			
No education	4 (1.03)	20 (1.28)	< 0.05*
Pre-primary school	1 (0.26)	1 (0.06)	
Primary school	115 (29.49)	347 (22.24)	
Secondary school	226 (57.95)	865 (55.45)	
Sub-Bachelor	23 (5.89)	129 (8.28)	
Bachelor	21 (5.38)	198 (12.69)	
Occupation; n (%)			
No occupation	113 (28.97)	518 (33.21)	< 0.05*
Agriculture	32 (8.21)	61 (3.91)	
Daily employ	222 (56.92)	864 (55.38)	
Government officer	6 (1.54)	48 (3.08)	
Own business	17 (4.36)	69 (4.42)	
Income; n (%)			
< 5,000 baht	22 (5.64)	342 (21.92)	< 0.05*
5,000 – 8,000 baht	183 (46.92)	667 (42.76)	
> 8,000 baht	185 (47.44)	551 (35.32)	
Pregnancy induced hypertension	55 (14.10)	104 (6.67)	< 0.05*
Previous C/S	48 (12.31)	176 (11.28)	0.55
Placenta previa	44 (11.28)	40 (2.56)	< 0.05*

Grand multipara (Parity > 4)	43 (11.03)	132 (8.46)	0.148*
History of dilatation & curettage (D&C)	32 (8.21)	15 (0.96)	< 0.05*
Abnormal presentation (Non-vertex)	20 (5.13)	95 (6.09)	0.48
DM	9 (2.31)	39 (2.50)	0.83
Dead fetus in utero (at GA ≥ 24 wks)	8 (2.05)	6 (0.38)	< 0.05*
Coagulopathy **	7 (1.79)	1 (0.06)	< 0.05*
Chorioamnionitis	6 (1.54)	12 (0.77)	0.15*
Polyhydramnios (AFI > 24 cm)	3 (0.77)	4 (0.26)	0.13*
History of PPH	2 (0.51)	5 (0.32)	0.56
Hydrops fetalis	0	2 (0.13)	0.48
History of uterine atony	0	0	-
2. Intrapartum factors			
Induction/augmentation with oxytocin	181 (46.41)	670 (42.95)	0.203
Prolonged second stage of labor	30 (7.69)	41 (2.63)	< 0.05*
Prolonged first stage of labor	28 (7.18)	143 (9.17)	0.219
Prolonged third stage of labor	22 (5.64)	29 (1.86)	< 0.05*
Intrapartum terbutaline use	12 (3.08)	9 (0.58)	< 0.05*
Epidural anesthesia	0	1 (0.06)	0.617
Mode of delivery			
Normal labor	133 (34.10)	731 (46.86)	0.03*
Cesarean section	183 (46.92)	682 (43.72)	
Vaginal breech delivery	20 (5.13)	44 (2.82)	
Vacuum extraction	54 (13.85)	99 (6.35)	
Forceps extraction	0	4 (0.25)	
3. Postpartum factors			
Retained placenta	62 (15.90)	60 (3.85)	< 0.05*
Tear of birth canal	27 (6.92)	11 (0.71)	< 0.05*
Placenta adherens	26 (6.67)	0	< 0.05*
Fetal macrosomia (≥ 4,000 grams)	15 (3.85)	61 (3.91)	0.961
Placental abruption	10 (2.56)	17 (1.09)	0.025*
Vulvar hematoma	9 (2.31)	22 (1.41)	0.203
Shoulder dystocia	5 (1.28)	17 (1.09)	0.744
Precipitate labor	2 (0.51)	36 (2.31)	0.022*

* P < 0.20 were put into multiple logistic regression analysis

** Underlying medical diseases, anticoagulant therapy or sequelae from obstetric complications

AFI: Amniotic fluid index

Table 4. Significant factors associated with early PPH from multiple logistic regression analysis.

Factors	Adjusted odds ratio	95% CI	p-value
Tear of birth canal	138.44	59.32 – 323.07	< 0.05
Coagulopathy	82.00	7.06 – 951.58	< 0.05
Retained placenta	47.08	26.44 – 83.82	< 0.05
Placenta previa	31.76	15.73 – 64.11	< 0.05
Placental abruption	7.59	1.85 – 30.97	< 0.05
Prolonged second stage of labor	4.67	1.79 – 12.17	< 0.05
Intrapartum terbutaline use	4.11	1.02 – 16.49	0.04
History of dilatation & curettage	3.98	1.49 – 10.62	< 0.05
Bachelor's degree education	0.45	0.20 – 0.95	0.03

Discussion

Previous studies had reported many factors associated with early PPH and our statistically significant factors were also similar to these studies except coagulopathy, placental abruption, intrapartum terbutaline use, history of D&C and Bachelor's degree education were not reported in previous studies[2,7-20]. Some significant factors were retained placenta, prolonged second stage of labor, placental abruption and intrapartum terbutaline use might correlate with uterine atony which was the most common cause of early PPH in our hospital. Myometrial contraction is one of the important mechanism to stop bleeding after delivery[7]. Factors that interfere uterine contraction may lead to PPH.

Tear of birth canal [Odds ratio(OR) 138.44], was the known cause of PPH[7]. This could explain our high odds ratio with about 138 times chance of pregnant women with tear of birth canal to develop PPH. This wide range of 95% CI which was also found in other associated factors of this study indicated the need of larger sample size. Coagulopathy was also another leading cause of PPH (OR 82.0). This condition might come from medical diseases, anticoagulant therapy or obstetric complications such as amniotic embolism, prolonged intrauterine fetal death and placental abruption. Because clot formation is the other important mechanism than myometrial contraction to stop postpartum bleeding[7,20]. Patient with coagulopathy might have increasing risk for PPH.

Many placental causes associated with PPH e.g. placental abruption, retained placenta and placenta previa. Placental abruption (OR 7.59) can cause PPH in the mechanisms of massive concealed intrauterine hemorrhage leading to coagulopathy and uterine overdistention predisposing to uterine atony[7,20]. Retained placenta with 47 times chance to develop PPH with OR 47.08, associated with uterine atony by disturbing adequate uterine contraction[7]. Placenta previa was an important cause with OR 31.76. This abnormal placentation in the lower uterine segment has poorly myometrial contraction to stop bleeding from numerous vessels under placental implantation area[7,20]. Placenta previa was are demonstrated also strongly related to peripartum hysterectomy[21].

The association between prolonged second stage of labor and PPH (OR 4.67) was demonstrated. Prolonged labor might cause uterine exhaustion and leading to uterine atony and, eventually might develop PPH[7,20]. The history of D&C (OR 3.98) was associated with 4 times increased early PPH in this study but we could not explain what direct mechanism was. Many

authors mentioned about the correlation between D&C and placenta accreta or uterine rupture[20,22]. Curettage might produce uterine scar leading to defective placentation by excessive trophoblastic invasion of placenta causing placenta accreta. Uterine scar was also the weak point predisposing to uterine rupture in subsequent pregnancy[20]. Significant relation of 4 times of early PPH of intrapartum terbutaline use was found in the present study. This β-agonist drug was used for inhibition of preterm uterine contraction[20]. Difficulty in selection of appropriate time to stop terbutaline before delivery might cause postpartum uterine atony. The Bachelor's degree education, the highest education level in this study, was the only significant protective factor for PPH (OR 0.45), but it could not be explained. Further subgroup study might explain the correlation between educational level and PPH.

Limitation of this study was the retrospective study design. Some factors has not been clearly defined e.g. tear of birth canal that most occurred in vaginal delivery. Some obstetricians also included tear of birth canal from cesarean section into this definition. Furthermore, visual estimation of blood loss that used in this hospital is inaccuracy and varies by clinicians. These confounders might affect the incidence and results of the study. A next prospective study with more strict definition of each factors and more accurate method to measure blood loss was suggested.

In the future, some of these significant factors can be promising to develop PPH protocol to predict the pregnant women at high risk for early PPH. Early detection and proper management will help to minimize the existing risks, incidence, maternal morbidity and mortality from PPH in Maharat Nakhon Ratchasima Hospital.

Conclusion

Regarding to the strategic care and management to decrease early PPH incidence in our hospital, the special care and awareness should be focused on the pregnant women with history of abnormal placentation, having factors predisposing to uterine atony, coagulopathy and patients with tear of birth canal.

Acknowledgement

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ปัจจัยที่มีความสัมพันธ์ต่อการเกิดภาวะตกเลือดภายใน 24 ชั่วโมงแรกหลังคลอดของสตรีตั้งครรภ์เดี่ยวที่มาคลอดบุตรที่โรงพยาบาลมหาราชนครราชสีมา

พรศักดิ์ สถาพรธีระ, ศักดา อาจองค์, อรพรรณ อัศวกุล

วัตถุประสงค์ *: เพื่อศึกษาปัจจัยที่มีความสัมพันธ์ต่อการเกิดภาวะตกเลือดภายใน 24 ชั่วโมงแรกหลังคลอดของสตรีตั้งครรภ์เดี่ยวที่มาคลอดบุตรที่โรงพยาบาลมหาราชนครราชสีมา*

วัสดุและวิธีการ *: การศึกษาแบบ cross-sectional, descriptive case-control โดยทบทวนเวชระเบียนสตรีตั้งครรภ์เดี่ยวที่คลอดบุตรในโรงพยาบาลมหาราชนครราชสีมา ตั้งแต่ 1 มกราคม 2550 ถึง 31 ธันวาคม 2552 จำนวน 1,950 ราย สัดส่วนสตรีตั้งครรภ์ที่มีภาวะตกเลือด 1 ราย ต่อสตรีตั้งครรภ์ที่ไม่มีภาวะตกเลือด 4 ราย วิเคราะห์ปัจจัยต่าง ๆ ที่มีความสัมพันธ์ต่อการเกิดภาวะตกเลือดภายใน 24 ชั่วโมงแรกหลังคลอดด้วยการวิเคราะห์ univariated และ multiple logistic regression*

ผลการศึกษา *: สตรีตั้งครรภ์ที่มีภาวะตกเลือด 390 ราย และสตรีตั้งครรภ์ที่ไม่มีภาวะตกเลือด 1,560 ราย พบปัจจัยสำคัญที่สัมพันธ์กับภาวะตกเลือดภายใน 24 ชั่วโมงแรกหลังคลอดอย่างมีนัยสำคัญทางสถิติได้แก่ ช่องทางคลอดฉีกขาด [Odds ratio(OR) 138.44, 95%CI 59.32-323.07], ความผิดปกติระบบการแข็งตัวของเลือด (OR 82, 95 %CI 7.06-951.58), รกค้าง (OR 47.08, 95 %CI 26.44-83.82), รกเกาะต่ำ (OR 31.76, 95 %CI 15.73-64.11), รกลอกตัวก่อนกำหนด(OR 7.59, 95 %CI 1.85-30.97), การคลอดระยะที่ 2 นานกว่าปกติ (OR 4.67, 95 %CI 1.79-12.17), การใช้ยาเทอร์บูทาลีนในช่วงเจ็บครรภ์คลอด (OR 4.11, 95 %CI 1.02-16.49), ประวัติเคยขูดมดลูก (OR 3.98, 95 %CI 1.49-10.62) ส่วนการศึกษาระดับปริญญาขึ้นไป (OR 0.45, 95 %CI 0.2-0.95) เป็นปัจจัยที่ลดความเสี่ยงต่อการเกิดภาวะตกเลือดภายใน 24 ชั่วโมงแรกหลังคลอด*

สรุป *: แนวทางในการลดอุบัติการณ์การเกิดภาวะตกเลือดภายใน 24 ชั่วโมงแรกหลังคลอด ควรให้การดูแลและเฝ้าระวังในสตรีตั้งครรภ์ที่มีปัจจัยเหล่านี้เป็นพิเศษ ได้แก่ ผู้ที่มีภาวะการฝังตัวของรกผิดปกติ ผู้ที่มีปัจจัยเสี่ยงต่อภาวะมดลูกไม่หดรัดตัวหลังคลอด มีความผิดปกติระบบการแข็งตัวของเลือด และผู้ที่เกิดภาวะช่องทางคลอดฉีกขาด*