

# Risk Factors for Primary Postpartum Hemorrhage in Bhumibol Adulyadej Hospital

Wibool Rueangchainikhom MD\*, Siriwan Srisuwan MD\*\*,  
Sinart Prommas MD\*, Saravut Sarapak BSc (MT)\*

\* Department of Obstetrics and Gynecology, Bhumibol Adulyadej Hospital, Bangkok, Thailand

\*\* Department of Obstetrics and Gynecology, Srinakharinwirot University, Bangkok, Thailand

---

**Background:** Postpartum hemorrhage remains one of the main causes of maternal morbidity and mortality in both developed and developing countries. Hemorrhages account for 28% of all direct maternal deaths and remain the most common cause of direct maternal deaths worldwide.

**Objective:** To study the incidence and risk factors for postpartum hemorrhage (PPH) in Bhumibol Adulyadej Hospital

**Material and Method:** Retrospective cohort study of 19,429 patients who gave birth between 1<sup>st</sup> January 2004 and 31<sup>st</sup> December 2007 at Bhumibol Adulyadej Hospital. One thousand five hundred and thirty women were enrolled in the present study, three hundred and eighty five women had postpartum hemorrhage and one thousand one hundred and forty five had no postpartum hemorrhage. The present study analyzed one postpartum hemorrhage woman compared to three women who gave birth in nearly the same period and had no postpartum hemorrhage both vaginal deliveries and cesarean section.

**Results:** The PPH rate in Bhumibol Adulyadej Hospital was 1.98%. Maternal age, height and fetal birth weight were not different between the PPH group and no PPH group. The strongest risk factors for postpartum hemorrhage in the present study were prolonged 3<sup>rd</sup> stage of labor, retained placenta, lacerations of birth passage, and placenta previa.

**Conclusion:** The strongest risk factors for postpartum hemorrhage in the present study were prolonged 3<sup>rd</sup> stage of labor, retained placenta, lacerations of birth passage, and placenta previa.

**Keywords:** Postpartum hemorrhage, Risk factors

*J Med Assoc Thai* 2009; 92 (12): 1586-90

Full text. e-Journal: <http://www.mat.or.th/journal>

---

Postpartum hemorrhage remains one of the main causes of maternal morbidity and mortality in both developed and developing countries<sup>(1)</sup>. Approximately 40% of pregnant women experience pregnancy-related health problems, and 15% of all pregnant women suffer long term or life threatening complications<sup>(2)</sup>. There are an estimated 14 million cases of pregnancy-related hemorrhage every year; at least 128,000 of these women bleed to death<sup>(3)</sup>. The World Health Organization (WHO) estimates that, in 1995, nearly 515,000 women worldwide died from complications of pregnancy and childbirth especially in developing countries<sup>(4,5)</sup>.

Hemorrhages account for 28% of all direct maternal deaths and remain the most common cause of direct maternal deaths worldwide<sup>(6,7)</sup>. In 1990, the World Health Organization (WHO) defined primary postpartum hemorrhage (PPH) as blood loss equaling or exceeding 500 ml in vaginal deliveries and 1,000 ml in cesarean section, which occurs within 24 hours after deliveries<sup>(8,9)</sup>. Recent maternal death reviews in Australia and the United Kingdom have reported increases in deaths attributable to postpartum hemorrhage<sup>(10,11)</sup>. Postpartum hemorrhage occurs in approximately 4-6% of vaginal deliveries<sup>(12,13)</sup>. Increases in the incidence of postpartum hemorrhage have been reported in Australia<sup>(14,15)</sup> and Canada<sup>(16)</sup>. In Australia, postpartum hemorrhage have increased by 29% from 4.9% of deliveries in 1993 to 6.3% of deliveries in

---

Correspondence to: Rueangchainikhom W, Department of Obstetrics and Gynecology, Bhumibol Adulyadej Hospital, Paholyothin Road, Bangkok 10220, Thailand. Phone: 0-2534-7314-7, E-mail: [wibool199@yahoo.co.uk](mailto:wibool199@yahoo.co.uk)

**Table 1.** Demographic data

|                  | PPH+ (n = 385)    | PPH- (n = 1145)   | p-value |
|------------------|-------------------|-------------------|---------|
| Age (years)      | 29.40 ± 9.07      | 31.67 ± 16.63     | 0.663   |
| Height (cm)      | 155.80 ± 4.32     | 157.07 ± 5.89     | 0.548   |
| Birth weight (g) | 2,940.40 ± 407.31 | 3,083.32 ± 498.62 | 0.477   |

PPH+ = postpartum hemorrhage, PPH- = no postpartum hemorrhage

2002<sup>(14)</sup>. Advancing maternal age, and increasing rates of cesarean section, more induction and augmentation of labor and multiple births have been postulated as the causes of increased postpartum hemorrhage rates and postpartum hemorrhage-related deaths<sup>(11)</sup>. There are many risk factors suggested for PPH such as over-distended uterus (multiple gestation, polyhydramnios, macrosomia), primigravida and chorioamnionitis. The present study aimed to investigate risk factors associated with postpartum hemorrhage in Bhumibol Adulyadej Hospital.

#### Material and Method

The present study was a retrospective cohort study of 19,429 patients who gave birth between 1<sup>st</sup> January 2004 and 31<sup>st</sup> December 2007 at Bhumibol Adulyadej Hospital. One thousand five hundred and thirty women were enrolled in the present study, three hundred and eighty five women had postpartum hemorrhage and one thousand one hundred and forty five had no postpartum hemorrhage. The present study analyzed one postpartum hemorrhage woman compared to three women who gave birth in nearly the same period and had no postpartum hemorrhage, both vaginal deliveries and cesarean section. The control groups were selected by matched with time 3:1 cases. Age, height, gravida, parity, income, education, birth weight, previous PPH, failure to progress, cephalopelvic disproportion (CPD), prolonged 2<sup>nd</sup> stage of labor, prolonged 3<sup>rd</sup> stage of labor, lacerations of birth passage, abnormal presentation, multifetal pregnancy, induction of labor, placenta previa, large for gestational age, previous cesarean section, retained placenta, augmentation of labor, pregnancy induced hypertension, hydramnios, and placenta abruption were studied. The main objective of the present study was the prediction of risk factors of postpartum hemorrhage. Results are expressed as mean ± SD or percentage, as appropriate. Univariate and multivariate relative risks were presented with their 95% confidence

**Table 2.** Gravida, parity and abortion related to PPH

|                   | PPH+    | PPH-     | RR   | 95% CI    |
|-------------------|---------|----------|------|-----------|
| G1 P0             | 113/385 | 499/1145 | 0.53 | 0.41-0.69 |
| Previous abortion | 148/385 | 592/1145 | 0.58 | 0.46-0.73 |
| p ≥ 1, A0         | 104/385 | 209/1145 | 0.60 | 0.46-0.79 |

RR = relative risk, 95% CI = 95% confidence interval, G1 P0 = gravida 1, parity 0, p > 1, A0 = parity > 1, no abortion

intervals (CI). The present study was approved by Bhumibol Adulyadej Hospital Ethics Committee.

#### Results

There were 19,429 parturients who gave birth between 1<sup>st</sup> January 2004 and 31<sup>st</sup> December 2007 and 385 patients had postpartum hemorrhage. The PPH rate in Bhumibol Adulyadej Hospital was 1.98%. Maternal age, height and fetal birth weight were not different between the PPH group and no PPH group as shown in Table 1. The maternal gravidity, parity, abortion and postpartum hemorrhage are presented in Table 2. Patients who had gravida 1, parity 0, and no history of abortion had decreased relative risk of postpartum hemorrhage. Seventeen risk factors were identified by univariate logistic regression analysis and found that only ten factors had a significantly increased risk of postpartum hemorrhage as shown in Table 3. There were eight cases of hydramnios and all of them had no postpartum hemorrhage. All four cases of placental abruption had postpartum hemorrhage. Cases of augmentation of labor can reduce the risk of postpartum hemorrhage as shown in Table 3. In the multivariate logistic regression analysis, four significant risk factors emerged for postpartum hemorrhage such as retained placenta, prolonged 3<sup>rd</sup> stage of labor, lacerations of birth passage, and placenta previa as shown in Table 4.

**Table 3.** Risk factors related to PPH (univariate analysis)

|                       | PPH+ (%)    | PPH- (%)    | RR    | 95% CI       |
|-----------------------|-------------|-------------|-------|--------------|
| Previous PPH          | 2 (0.52)    | 3 (0.26)    | 1.96  | 0.33-11.94   |
| Failure to progress   | 16 (4.15)   | 41 (3.58)   | 1.16  | 0.65-21.06   |
| CPD                   | 55 (14.2)   | 73 (6.37)   | 2.45  | 1.69-3.54*   |
| Prolonged 2nd         | 13 (3.37)   | 26 (2.27)   | 1.50  | 0.76-2.95    |
| Prolonged 3rd         | 19 (4.93)   | 3 (0.26)    | 19.76 | 5.81-67.19*  |
| Lacerations           | 43 (11.16)  | 9 (0.78)    | 15.87 | 7.65-32.88*  |
| Abnormal presentation | 48 (12.46)  | 46 (4.01)   | 3.40  | 2.23-5.19*   |
| Multifetal pregnancy  | 13 (3.37)   | 10 (0.87)   | 3.96  | 1.75-9.12*   |
| Induction of labor    | 22 (5.70)   | 24 (2.09)   | 2.83  | 1.56-5.10*   |
| Placenta previa       | 24 (6.24)   | 10 (0.87)   | 7.54  | 3.57-15.92*  |
| LGA                   | 5 (1.29)    | 4 (0.35)    | 3.75  | 1.003-14.01* |
| Previous CS           | 40 (10.38)  | 108 (9.43)  | 1.13  | 0.75-1.62    |
| Augmentation          | 104 (27.01) | 415 (36.24) | 0.65  | 0.50-0.84    |
| Retained placenta     | 51 (14.8)   | 12 (1.04)   | 16.40 | 8.69-30.94*  |
| PIH                   | 41 (10.64)  | 41 (3.58)   | 3.20  | 2.04-5.03*   |

Hydramnios 8 cases, no PPH, CPD = cephalopelvic disproportion, LGA = large for gestational age, CS = cesarean section  
Placenta Abruptio 4 cases, all had PPH (cannot identified RR)

Augmentation can reduce PPH

\* Significant  $p < 0.05$

**Table 4.** Risk factors related to PPH (multivariate analysis)

|                           | Adjusted RR | 95% CI     |
|---------------------------|-------------|------------|
| Prolonged 3 <sup>rd</sup> | 3.17        | 1.92-4.42* |
| CPD                       | 1.03        | 0.63-1.43  |
| Lacerations               | 2.94        | 2.20-3.68* |
| Abnormal presentation     | 1.39        | 0.94-1.85  |
| Multifetal pregnancy      | 1.32        | 0.43-2.21  |
| Induction of labor        | 0.80        | 0.14-1.46  |
| Placenta previa           | 2.40        | 1.63-3.17* |
| Retained placenta         | 2.92        | 2.23-3.61* |
| LGA                       | 1.00        | 0.49-2.47  |
| PIH                       | 1.23        | 0.74-1.71  |

\* Still significant ( $p < 0.05$ )

## Discussion

Although the prevalence of postpartum hemorrhage (PPH) varies between developing and developed countries, it is the leading cause of maternal morbidity and mortality worldwide<sup>(7)</sup>. An estimated blood loss more than 500 ml for a vaginal delivery and more than 1,000 ml for a cesarean section defines early or primary PPH, which occurs within the first 24 hours after delivery<sup>(9,17)</sup>. The postpartum hemorrhage (PPH) rate in the present study (1.98%) is lower than previously

reported in Australia, the United States of America and Canada. (4-6%)<sup>(12-16)</sup>. The reason for lower PPH rate in the present study may be from underestimate of blood loss by observation. Although PPH occurs in women without risk factors, it is often a predictable event. There are many risk factors suggested for PPH. These include an over-distended uterus, primigravida, chorioamnionitis, prolonged rupture of membranes, fibroid, previous cesarean section, coagulation disorders, labor induction and augmentation, prolonged labor, preeclampsia, obesity, and general anesthetics<sup>(18-20)</sup>. One of the most important risk factors for PPH is a prior PPH. Univariate logistic regression analysis showed that cephalopelvic disproportion (CPD), prolonged 3<sup>rd</sup> stage of labor, retained placenta, lacerations of birth passage, abnormal presentation, multifetal pregnancy, induction of labor, placenta previa, large for gestational age (LGA), and pregnancy induced hypertension were significant risk factors for postpartum hemorrhage (PPH) in the present study. Risk factors for PPH from the present study such as prolonged 3<sup>rd</sup> stage of labor, lacerations of birth passage, multifetal pregnancy, large for gestational age (LGA) and pregnancy induced hypertension are similar to previous studies except retained placenta and augmentation of labor. The present study found that augmentation of labor had decreased risk of postpartum hemorrhage as shown in

Table 3<sup>(12,18)</sup>. Multivariate logistic regression analysis of postpartum hemorrhage risk factors in the present study revealed a significant role of prolonged 3<sup>rd</sup> stage of labor, lacerations of birth passage, retained placenta and placenta previa. The strongest risk factors for postpartum hemorrhage in the present study were prolonged 3<sup>rd</sup> stage of labor, retained placenta, lacerations of birth passage, and placenta previa which correspond to previous studies except retained placenta<sup>(12,21)</sup>. There were 8 cases of hydramnios and all of them had no postpartum hemorrhage. Four cases had placental abruption, all of them had postpartum hemorrhage. Cases of augmentation of labor had decreased risk of postpartum hemorrhage.

### Conclusion

The rate of postpartum hemorrhage in Bhumibol Adulyadej Hospital was 1.98%. The strongest risk factors for postpartum hemorrhage in the present study were prolonged 3<sup>rd</sup> stage of labor, retained placenta, lacerations of birth passage, and placenta previa. When parturients who had risk factors of postpartum hemorrhage as described in the present study especially the strongest risk factors the caregivers should prepare and alert to prevent postpartum hemorrhage as soon as possible to reduce maternal morbidity and mortality.

### References

1. Ford JB, Roberts CL, Simpson JM, Vaughan J, Cameron CA. Increased postpartum hemorrhage rates in Australia. *Int J Gynaecol Obstet* 2007; 98: 237-43.
2. Starrs A. The Safe Motherhood Inter-Agency Group. The safe motherhood action agenda: priorities for the next decade. New York: Family Care International; 1998.
3. World Health Organization. Mother-baby package. Rev. 1. WHO/FHE/MSM/94.11. Geneva: WHO; 1998.
4. World Health Organization. Global estimates of maternal mortality for 1995: Results of an in-depth review analysis and estimate strategy. Geneva: WHO; 2001.
5. World Health Organization. World health report 2005. Make every mother and child count. Geneva: WHO; 2005.
6. United Nations International Children's Emergency Fund (UNICEF). The progress of nations 2001. New York: UNICEF; 2001.
7. AbouZahr C. Global burden of maternal death and disability. *Br Med Bull* 2003; 67: 1-11.
8. World Health Organization. Care in normal birth: a practical guide. Report of a technical working group. Geneva: WHO; 1999.
9. Cunningham FG, Leveno KJ, Bloom SL, Hauth JC, Gilstrap LC III, Wenstrom KD. Williams Obstetrics. 22<sup>nd</sup> ed. New York: McGraw-Hill, 2005: 823-39.
10. Slaytor EK, Sullivan EA, King JF. Maternal death in Australia, 1997-1999. Sydney: AIHW, Nation Perinatal Statistic Unit; 2004.
11. United Nation Children's Fund 2001. Department of Health Welsh Office Scottish Service Northern Ireland. Why mother die: Report on confidential enquiries into maternal death in United Kingdom 2000-2002. London: TSO; 2005.
12. Combs CA, Murphy EL, Laros RK Jr. Factors associated with postpartum hemorrhage with vagina birth. *Obstet Gynecol* 1991; 77: 69-76.
13. Doran JR, O'Brien SA Jr, Randall JH. Repeated postpartum hemorrhage. *Obstet Gynecol* 1955; 5: 186-92.
14. Cameron CA, Roberts CL, Olive EC, Ford JB, Fischer WE. Trend in postpartum haemorrhage. *Aust N Z J Public Health* 2006; 30: 151-6.
15. Haynes K, Stone C, King J. Postpartum hemorrhage and associated hysterectomy in Victoria. Proceeding of the 8<sup>th</sup> Annual Conference Perinatal Society of Australia and NewZeland; Sydney Australia, March 2004.
16. Joseph KS, Rouleau J, Kramer MS, Young DC, Liston RM, Baskett TF. Investigation of an increase in postpartum hemorrhage in Canada. 19<sup>th</sup> Annual Society of Pediatric and Perinatal Epidemiologic Research Meeting; Seattle, Washington, 2006.
17. Raoyton E, Armstrong S. Preventing maternal deaths. Geneva: WHO; 1989.
18. Sheiner E, Sarid L, Levy A, Seidman DS, Hallak M. Obstetric risk factors and outcome of pregnancies complicated with early postpartum hemorrhage: a population-based study. *J Matern Fetal Neonatal Med* 2005; 18: 149-54.
19. Stones RW, Paterson CM, Saunders NJ. Risk factors of obstetric hemorrhage. *Eur J Obstet Gynecol Reprod Biol* 1993; 48: 15-8.
20. Brinsden PR, Clark AD. Postpartum hemorrhage after induced and spontaneous labour. *Br Med J* 1978; 2: 855-6.
21. Reyat FR, Sibony O, Oury J, Luton D, Bang J, Blot P. Criteria for transfusion in severe postpartum hemorrhage: analysis of practice and risk factors. *Eur J Obstet Gynecol Reprod Biol* 2004; 112: 61-4.

---

## ปัจจัยเสี่ยงของการตกเลือดภายใน 24 ชั่วโมงแรกหลังคลอดในโรงพยาบาลภูมิพลอดุลยเดช

วิบูลย์ เรืองชัยนิคม, สิริวรรณ ศรีสุวรรณ, สีนาท พรหมมาศ, สราวุธ สารภักดิ์

**วัตถุประสงค์:** เพื่อศึกษาอุบัติการณ์และปัจจัยเสี่ยงของการตกเลือดภายใน 24 ชั่วโมงแรกหลังคลอดในโรงพยาบาลภูมิพลอดุลยเดช

**วัสดุและวิธีการ:** เก็บข้อมูลย้อนหลังจากรายงานการคลอดและแฟ้มเวชระเบียนของโรงพยาบาลภูมิพลอดุลยเดช ตั้งแต่วันที่ 1 มกราคม พ.ศ. 2547 ถึง วันที่ 31 ธันวาคม พ.ศ. 2550 ได้ผู้คลอดทั้งหมด 19,429 ราย นำมาวิเคราะห์หาอุบัติการณ์และปัจจัยเสี่ยงของการตกเลือดภายใน 24 ชั่วโมงแรกหลังคลอดทั้ง univariate logistic regression และ multivariate logistic regression

**ผลการศึกษา:** พบอุบัติการณ์ของการตกเลือดภายใน 24 ชั่วโมงแรกหลังคลอดในโรงพยาบาลภูมิพลอดุลยเดช ร้อยละ 1.98 พบปัจจัยเสี่ยงของการตกเลือดภายใน 24 ชั่วโมงแรกหลังคลอด ได้แก่ prolonged 3<sup>rd</sup> stage of labor, lacerations of birth passage, multifetal pregnancy, large for gestational age (LGA), pregnancy induced hypertension, retained placenta, abnormal presentation, Induction of labor, placenta previa, cephalopelvic disproportion แต่เมื่อนำมาวิเคราะห์แบบ multivariate พบว่ามีเพียง 4 ปัจจัยเท่านั้นที่สำคัญเช่น prolonged 3<sup>rd</sup> stage of labor, retained placenta, lacerations of birth passage, and placenta previa

**สรุป:** ปัจจัยเสี่ยงของการตกเลือดภายใน 24 ชั่วโมงแรกหลังคลอดที่สำคัญได้แก่ prolonged 3<sup>rd</sup> stage of labor, retained placenta, lacerations of birth passage, and placenta previa

---