Atonic Postpartum Hemorrhage: Blood Loss, Risk Factors, and Third Stage Management

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Abstract

Objective: Atonic postpartum hemorrhage rates have increased in many industrialized countries in recent years. We examined the blood loss, risk factors, and management of the third stage of labour associated with atonic postpartum hemorrhage.

Methods: We carried out a case-control study of patients in eight tertiary care hospitals in Canada between January 2011 and December 2013. Cases were defined as women with a diagnosis of atonic postpartum hemorrhage, and controls (without postpartum hemorrhage) were matched with cases by hospital and date of delivery. Estimated blood loss, risk factors, and management of the third stage labour were compared between cases and controls. Conditional logistic regression was used to adjust for confounding.

Results: The study included 383 cases and 383 controls. Cases had significantly higher mean estimated blood loss than controls. However, 16.7% of cases who delivered vaginally and 34.1% of cases who delivered by Caesarean section (CS) had a blood loss of < 500 mL and < 1000 mL, respectively; 8.2% of controls who delivered vaginally and 6.7% of controls who delivered by CS had blood loss consistent with a diagnosis of postpartum hemorrhage. Factors associated with atonic postpartum hemorrhage included known protective factors (e.g., delivery by CS) and risk factors (e.g., nulliparity, vaginal birth after CS). Uterotonic use was more common in cases than in controls (97.6% vs. 92.9%, $P < 0.001$). Delayed cord clamping was only used among those who delivered vaginally (7.7% cases vs. 14.6% controls, $P = 0.06$).

Conclusion: There is substantial misclassification in the diagnosis of atonic postpartum hemorrhage, and this could potentially explain the observed temporal increase in postpartum hemorrhage rates.

Key Words: Postpartum hemorrhage, blood loss, risk factors, third stage

Competing Interests: None declared.

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Résumé

Objectif : Au cours des dernières années, le taux d'hémorragies de la délivrance par atonie utérine a augmenté dans de nombreux pays industrialisés. Nous avons examiné les pertes sanguines, les facteurs de risque et la prise en charge du troisième stade du travail associés à ce type d'hémorragies.

Méthodologie : Nous avons mené une étude cas-témoins auprès de patientes de huit hôpitaux de soins tertiaires canadiens, entre janvier 2011 et décembre 2013. Nous avons étudié des femmes ayant reçu un diagnostic d'hémorragie de la délivrance par atonie utérine (cas); nous avons apparié les témoins (sans hémorragie) aux cas selon l'hôpital visité et la date d'accouchement. Nous avons comparé les pertes sanguines estimées, les facteurs de risque et la prise en charge du troisième stade du travail des deux groupes. Enfin, nous avons utilisé la régression logistique conditionnelle pour tenir compte des variables parasites.

Résultats : L'échantillon à l'étude comprenait 383 cas et 383 témoins. Les pertes sanguines moyennes estimées du premier groupe étaient significativement supérieures à celles du deuxième. Cependant, 16,7 % des cas qui ont accouché par voie vaginale et 34,1 % des cas qui ont accouché par césarienne ont perdu moins de 500 et 1000 ml de sang, respectivement, tandis que 8,2 % des témoins qui ont accouché par voie vaginale et 6,7 % des témoins qui ont accouché par césarienne ont perdu une quantité de sang correspondant à un diagnostic d'hémorragie de la délivrance. Les

facteurs associés à l'hémorragie de la délivrance par atonie utérine comportaient des facteurs de protection connus (p. ex. accouchement par césarienne) et des facteurs de risque (p. ex. nulliparité, accouchement vaginal après une césarienne). L'administration d'utérotoniques était plus fréquente chez les cas que chez les témoins (97,6 % contre 92,9 %; $P < 0,001$), et le clampage tardif du cordon a seulement été réalisé chez des femmes qui ont accouché par voie vaginale (7,7 % pour les cas contre 14,6 % pour les témoins; $P = 0,06$).

Conclusion : La classification du diagnostic de l'hémorragie de la délivrance par atonie utérine est souvent erronée, ce qui pourrait expliquer la hausse observée du taux d'hémorragies de la délivrance.

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INTRODUCTION

Postpartum hemorrhage, a major cause of maternal morbidity and mortality worldwide, is reported to have increased in frequency and severity in several industrialized countries.[1–12] Rising rates of postpartum hemorrhage were first reported from Australia (where rates increased from 4.7 per 100 deliveries in 1994 to 6.0 in 2002)[1,2] and Canada (where rates increased from 4.1 per 100 deliveries in 1991 to 5.1 in 2004[3] and 6.2 in 2010).[11] Other industrialized countries have also shown similar temporal increases[4–12]; in the United States, postpartum hemorrhage rates increased from 2.1 per 100 deliveries in 1994 to 2.9 per 100 deliveries in 2006,[6] and rates of severe postpartum hemorrhage rose from 1.9 per 1000 deliveries in 1999 to 4.2 per 1000 deliveries in 2008.[4]

Although studies have identified the aforementioned increase in postpartum hemorrhage as having occurred mainly because of an increase in atonic postpartum hemorrhage,[3,5,11,12] the reasons behind this rising trend have not been adequately explained. Temporal changes in risk factors such as advanced maternal age, obesity, multi-fetal pregnancy, induction of labour, and delivery by CS do not explain the temporal rise in postpartum hemorrhage.[2–12] Similarly, studies examining medication use in pregnancy have not implicated drug use as contributing significantly to the rising rates of postpartum hemorrhage.[13–15] Although antidepressants, including selective serotonin reuptake inhibitors, appear to modestly increase rates of postpartum hemorrhage,[14–16] the relatively low population-attributable fraction for selective serotonin reuptake inhibitor use among pregnant women means that such drug use does not explain the temporal trends in postpartum hemorrhage.[14]

One hypothesis regarding the increase in atonic postpartum hemorrhage that has not been investigated relates to the management of the third stage of labour. Active management of the third stage of labour includes a package of interventions, including the following: administration of a uterotonic agent (oxytocin and/or ergometrine), umbilical cord clamping and cutting, and controlled cord traction, with uterine massage sometimes included as an additional component.[17–24] However, a lack of consensus on the efficacy of each component of such active management means that these interventions are used variably in clinical practice.[25]

Most of the epidemiologic studies that have investigated the temporal increase in postpartum hemorrhage have used data from large perinatal databases.[2–16] Such data lack detailed clinical information on the active management of labour, and previous studies have also not adequately examined issues related to estimated blood loss, obstetric history, and related factors. We therefore carried out a multicentre medical chart abstraction study to determine the estimated blood loss associated with atonic postpartum hemorrhage and to quantify the association between risk factors (including obstetric history, medication use, and management of the third stage of labour) and atonic postpartum hemorrhage.

METHODS

We conducted a case-control study of women who delivered between January 2011 and December 2013 in eight tertiary hospitals in Canada, with cases of atonic postpartum hemorrhage selected from each hospital and controls sampled from the catchment population of the same hospitals (secondary base[26]). We defined cases as women with a diagnosis of atonic postpartum hemorrhage (ICD-10 code 0721) selected from hospital discharge records. Controls were matched to cases for hospital and date of delivery (± 3 days) and included women without any diagnosis of postpartum hemorrhage (i.e., women without a diagnosis of atonic or other postpartum hemorrhage).

Information about maternal characteristics, obstetric history, pregnancy, labour, and delivery was abstracted from the medical charts of cases and controls. Trained medical record abstractors used standard forms to enter data into customized software (RedCap; Research Electronic Data Capture[27]). The data collection software was programmed to restrict entry of implausible values to enhance accuracy of collected data, and interim analyses were performed to detect discrepant values that were then corrected by reference to the original medical charts.

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