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CLINICAL ARTICLE

Risk of postpartum hemorrhage among Native American women

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ABSTRACT

Objective: To assess whether Native American women have an increased risk of postpartum hemorrhage (PPH) after vaginal delivery. *Methods:* In a retrospective study, medical charts were reviewed for patients who delivered vaginally at Rehoboth McKinley Hospital in Gallup, NM, USA, between June 1, 2009, and June 30, 2012. Ethnic origin had been determined by self-report. PPH was defined as a visually estimated blood loss of more than 500 mL. Multivariable logistic analysis was undertaken to identify factors independently associated with PPH. *Results:* Among 1062 eligible patients, 751 (70.7%) were Native American and 311 (29.3%) were non-native (white, African American, or Hispanic). A significantly higher proportion of Native Americans than non-native women developed PPH (87 [11.6%] vs 22 [7.0%]; $P = 0.02$). In multivariable analysis, Native American ethnic origin was an independent predictor of PPH (odds ratio 1.8, 95% confidence interval 1.1–3.0; $P = 0.02$). In a comparison with white women only, PPH was significantly more frequent among Native American women (87/751 [11.6%] vs 13/194 [6.7%]; $P = 0.01$). *Conclusion:* Native American women have a higher risk of PPH after vaginal delivery than do non-native women.

1. Introduction

Postpartum hemorrhage (PPH) is defined as a blood loss of more than 500 mL after vaginal delivery, a blood loss of more than 1000 mL after cesarean delivery, or a 10% decrease in hemoglobin concentration from prepartum levels [1–3]. It is categorized as primary PPH (first 24 hours after delivery) or secondary PPH (≥24 hours after delivery) [3]. PPH is a major cause of maternal morbidity and mortality in both high- and low-resource countries. The most common cause of PPH is uterine atony, which itself can be isolated or result from multiple other factors, including overdistention, chorioamnionitis, prolonged labor, and uterine inversion [1–3].

Ethnic origin can be an important determinant of obstetric outcomes. It is well documented that African Americans have an increased risk of preterm delivery [4], hypertensive disorders [5,6], intrauterine growth restriction [7], pregnancy-associated hospitalization [8], and maternal mortality [9,10]. However, the association between ethnic origin and risk of PPH has not been well studied. An analysis of the Nationwide Inpatient Sample by Bryant et al. [11] suggested that Hispanic and Asian or Pacific Islander women in the USA were more prone to atonic PPH than were white women. Their analysis, however, did not include Native Americans—a minority group with an increased risk of overall maternal morbidity [12]. In a secondary analysis of a randomized controlled trial of oxytocin for uterine atony prevention, Wetta et al. [13] noted that, as compared with African Americans, Hispanic and non-Hispanic white ethnic origins were independent risk factors for uterine atony requiring treatment and PPH. Again, however, their study did not examine the Native American population. Conversely, the higher prevalence of some thrombophilic mutations in northern European and Middle Eastern populations has been attributed to the survival advantage associated with protection from PPH [14].

A Native American is as an individual who is a member of an Indian tribe, which in turn is defined as any tribe, band, nation, or organized Indian community that is recognized in the USA. The Department of Obstetrics and Gynecology at Rehoboth McKinley Hospital in Gallup, New Mexico, serves a large community of Native Americans. Overall, its patient population is very diverse, including Hispanic women, white women of European and Middle Eastern origin, and Native American women. During clinical practice, it has been observed that the average delivery-associated blood loss among Native American women tends to exceed the values reported in medical literature. The objective of the present study was therefore to analyze and compare the incidence of PPH between Native Americans and other groups, including white women.

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2. Materials and methods

In a retrospective study, data were assessed from all women who delivered vaginally at Rehoboth McKinley Hospital between June 1, 2009, and June 30, 2012 (the period immediately following introduction of electronic medical records). Women undergoing cesarean delivery and those with twin pregnancies, preterm delivery, or known acquired or hereditary coagulation deficiency were excluded from the analysis. The study protocol was approved by the Western Institutional Review Board. Because the study was a retrospective chart review, no informed consent was needed.

Medical charts were reviewed to extract data for age, gravidity, parity, ethnic origin, estimated blood loss (EBL), total decrease in hemoglobin, gestational age at delivery, fetal weight at delivery, need for induction or augmentation of labor, platelet count, chorioamnionitis, uterine atony requiring treatment, placental delivery mode, magnesium sulfate use, uterine inversion, need for uterotonic drugs, use of Bakri balloon, blood products transfusion, need for hysterectomy, and need for postpartum dilation and curettage.

Ethnic origin was determined by self-report. Patients were allowed to report one ethnic origin. Race and ethnic origin were considered together, allowing a comparison between Native American women and other ethnic groups or races, including white women of European ancestry, white women of Middle Eastern ancestry, African Americans, and Hispanics. Owing to the fairly low number of women who were not of Native American ethnic origin, white women from European and Middle Eastern ancestry, African Americans, and Hispanics were combined into a "non-native" group for the purposes of comparison. Native Americans were also compared with white women of European ancestry, because these two races/ethnic origins constituted the majority of the study population. Native and non-native patients were compared with regard to baseline characteristics, EBL, PPH, uterine atony, mean hemoglobin drop, and need for blood transfusion.

EBL—the most commonly used method to assess blood loss in the USA—was assessed by the obstetric provider and was based on a visual estimation of blood within surgical sponges and drapes. PPH was defined as an EBL of more than 500 mL after a normal birth. Diagnosis of uterine atony required both a clinical diagnosis (which was a recorded variable on the maternal complications form) and the administration of an additional uterotonic agent. Mean hemoglobin drop was calculated by subtracting the first postpartum hemoglobin level from the last prepartum level recorded. Retained placenta was defined as the need for manual removal of the placenta owing to lack of detachment after 30 minutes.

Fetal weight at delivery, need for induction or augmentation of labor, platelet count, chorioamnionitis, uterine atony requiring treatment, placental delivery mode, magnesium sulfate use, and uterine inversion were included as baseline characteristics in the multivariate analysis, because these factors were thought clinically to be potentially related to PPH. The outcomes were EBL, hemoglobin drop, need for uterotonic drugs, use of Bakri balloon, transfusion of blood products, need for hysterectomy, need for postpartum dilation, and curettage.

Statistical analysis was performed with Stata 10.0 (StataCorp, College Station, TX, USA). Data are presented as mean ± SD for continuous variables, and as number (percentage) for categorical variables. Unpaired t, χ^2, and Fisher exact tests were used as appropriate. Assessment of means of more than two groups was performed by analysis of variance with post hoc analysis using Bonferroni correction as appropriate. Univariate analysis was used to test covariates predictive of PPH and uterine atony (dependent variables). Interaction and confounding was assessed through stratification and relevant expansion covariates. Factors predictive in univariate analysis ($P < 0.15$) were entered into separate multivariate logistic regression analysis for the above two dependent variables. $P \le 0.05$ was considered statistically significant.

3. Results

Overall, 1062 patients met the inclusion criteria, of whom 751 (70.7%) were Native American and 311 (29.3%) were non-native. Baseline characteristics by ethnic origin are shown in Table 1. Mean age was higher among non-native women (26.5 ± 6.1 years) than among Native Americans (25.1 ± 5.9 years; $P < 0.001$). There was no difference between Native Americans and non-native women in parity (1.4 ± 1.5 vs 1.2 ± 1.2; $P = 0.08$), gravidity (2.7 ± 1.8 vs 2.6 ± 1.6; $P = 0.3$), length of pregnancy (39.0 ± 1.2 weeks vs 39.0 ± 1.2 weeks; $P = 0.4$) or birth weight (3249 ± 437 g vs 3239 ± 439 g; $P = 0.7$).

Labor induction or augmentation was necessary for a similar proportion of Native Americans (283/751 [37.7%]) and non-native women (113/311 [36.3%]; $P = 0.7$). The proportion of patients with chorioamnionitis was similar among Native Americans (29/751 [3.8%]) and non-native patients (9/311 [2.9%]; $P = 0.4$). Baseline platelet level was significantly higher in native (229 ± 58 × 10^9/L) than in non-native women (212 ± 54 × 10^9/L; $P < 0.001$). Retained placenta occurred among 5 (0.7%) Native Americans and 3 (0.9%) non-native women ($P = 0.4$). Magnesium sulfate was used for 23 (3.1%) Native Americans and 3 (1.0%) non-native women ($P = 0.06$).

The outcomes by ethnic origin are shown in Table 2. A significantly higher proportion of Native Americans than non-native women developed PPH (87/751 [11.6%] vs 22/311 [7.0%]; $P = 0.02$). In univariate analysis, the factors associated with PPH were Native American ethnic origin ($P = 0.02$), younger age ($P = 0.1$), low parity ($P = 0.01$), low gravidity ($P = 0.02$), labor induction or augmentation ($P = 0.1$), increasing birth weight ($P = 0.1$), chorioamnionitis ($P = 0.03$), retained placenta ($P < 0.001$), and the use of magnesium sulfate ($P = 0.001$). In multivariable logistic regression analysis, the significant predictors of PPH were Native American ethnic origin ($P = 0.02$), decreased gravidity ($P = 0.008$), increased birth weight ($P = 0.01$), retained placenta ($P < 0.001$), and use of magnesium sulfate ($P = 0.009$) (Table 3).

Uterine atony was recorded in a significantly higher proportion of Native Americans (72/751 [9.6%]) than non-native patients (15/311 [4.8%]; $P = 0.01$). In univariate analysis, factors predicting uterine atony were native race ($P = 0.01$), decreasing gravidity ($P = 0.02$), induction augmentation ($P = 0.1$), increasing birth weight ($P = 0.07$), and chorioamnionitis ($P = 0.08$). In multivariable logistic regression

Table 1
Baseline characteristics by ethnic origin.[a]

Characteristic	Native American (n = 751)	Hispanic (n = 83)	White (n = 194)	Middle Eastern (n = 12)	Asian (n = 13)	Black (n = 9)
Age, y	25.1 ± 5.9	25.3 ± 6.8	26.8 ± 6.2	29.1 ± 6.4	30.6 ± 6.0	30.4 ± 7.1
Gravidity	2.7 ± 1.8	2.7 ± 1.6	2.5 ± 1.5	3.5 ± 1.4	2.2 ± 1.0	3.7 ± 1.9
Parity	1.4 ± 1.5	1.3 ± 1.4	1.1 ± 1.1	2.5 ± 1.5	0.9 ± 0.8	1.5 ± 1.6
Length of pregnancy, wk	39.5 ± 1.2	39.1 ± 1.2	39.3 ± 1.3	39.7 ± 1.5	38.6 ± 1.0	39.1 ± 0.9
Birth weight, g	3249 ± 437	3220 ± 438	3248 ± 440	3479 ± 414	3036 ± 428	3168 ± 375
Magnesium sulfate used	23 (3.1)	1 (1.2)	2 (1.0)	0	0	0

[a] Values are given as mean ± SD or number (percentage).