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Risk factors for post-partum hemorrhage following vaginal delivery

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Abstract
Background and Aim: Several risk factors for Postpartum hemorrhage (PPH) are known, such as multiple pregnancy, operative delivery and chorionamnionitis, however PPH may occur among patients with no known risk factors. In this research, we study the effect of operative vaginal delivery on maternal post-partum hemorrhage (PPH) and the associated risk factors.
Material and Methods: Total numbers of vaginal deliveries in this period were 5235. Out of these, 1500 patients underwent assisted vaginal delivery using vacuum/ forceps/ sequential use of instrument. 200 out of 1500 patients were suspected to have PPH (blood loss of more than 500 ml) by visual estimation of blood loss by the attending consultant was noted to have PPH. Maternal comorbidities of preeclampsia, chronic hypertension, gestational hypertension, gestational diabetes, previous LSCS were noted. Using logistic regression, we applied a pragmatic strategy to identify independent risk factors for severe PPH.
Results: Out of 1500 patients, 200 patients had post-partum hemorrhage. The chi-squared test showed that there was no statistically significant difference between the two distributions of age groups. The logistic regression model identifies multiparity, maternal age, neonatal birth weight more than 3.5 kg, application of forceps in women with hypertensive disorders, III-degree tear, cervical tear to significantly increase the risk of PPH in our study population.
Conclusion: Presence of cervical tear and III-degree tear increased the chances of PPH. Further the study also showed that application of forceps in women with hypertension increases the risk of PPH though hypertension by itself did not seem to increase the risk in a statistically significant way. Any patient in labor might need assistance in the second stage.

Keywords: Cervical tear, gestational hypertension, postpartum hemorrhage, vaginal delivery

Introduction

Postpartum hemorrhage (PPH), a leading cause of maternal morbidity and mortality [1, 2], has been occurring with increasing frequency in well-resourced countries.[3] Consequently, PPH has received increasing attention as a quality indicator for obstetric care. Furthermore, evidence exists that the incidence of PPH is increasing in high-income countries [4-10]. An increase in the prevalence of known maternal and obstetric risk factors for PPH could play a role, but the supporting evidence from the published studies is limited. For example, in a Canadian study[6], induction of labor, augmentation of labor, and cesarean section partially explained the increasing rate of PPH. These findings may indicate that women undergoing these interventions need closer monitoring for severe PPH in the early postpartum period.

PPH per se contributes to high risk of severe maternal morbidity and mortality, in the form of ICU admissions, risk of multi organ dysfunction, need for massive blood transfusion and possible transfusion related lung injury. Late consequences include chronic fatigue, anemia in next pregnancy and poor wound healing. Historically, the etiology of PPH is classified according to the 4 "Ts"-tone, trauma, tissue, and thrombin. 70% cases of PPH are attributed to poor uterine tone [11]. Multiple antenatal and intrapartum factors have been identified as risk factors for occurrence of PPH. But it is also well established that 20% of patients with PPH have no risk factors at all.

Several risk factors for PPH are known, such as multiple pregnancy, operative delivery and chorionamnionitis, however PPH may occur among patients with no known risk factors [12, 13]. Our ability to reduce the risk of PPH depends on ongoing investigations of previously unaccounted for causes and risk factors. There is conclusive evidence to suspect PPH occurrence in women with history of prior PPH and multifetal pregnancy.

We focus our attention at the group of women who have undergone operative vaginal delivery and risked PPH using multivariate analysis. The possible structural neonatal adverse outcomes due to operative vaginal delivery are well quantified. Through this paper, we would like to analyze the possible maternal complication of post-partum hemorrhage during operative vaginal delivery and the specific contribution of traumatic PPH to it, which seems to cause major maternal morbidity during operative vaginal delivery. Improved surveillance during labor and immediate postpartum period for all parturients, like presence of qualified birth attendant in case of need of operative assistance, arranging adequate blood and blood products for all women in labor and ensuring delivery in a wellequipped maternity center with ICU and blood bank facilities will go a long way in reducing maternal morbidity due to PPH.

In this research, we study the effect of operative vaginal delivery on maternal post-partum hemorrhage (PPH) and the associated risk factors.

Material and Methods

This was a retrospective study carried out for the period of 2 years at Tertiary care institute of India. Total numbers of vaginal deliveries in this period were 5235. Out of these, 1500 patients underwent assisted vaginal delivery using vacuum/ forceps/ sequential use of instrument. 200 out of 1500 patients were suspected to have PPH (blood loss of more than 500 ml) by visual estimation of blood loss by the attending consultant was noted to have PPH.

Antenatal women admitted to labor room for delivery were subjected to detailed history taking, complete physical examination and appropriate laboratory investigations. Vitals were regularly monitored with specific attention to fourth hourly blood pressure charting. If patient had 2 or more blood pressure readings greater than 130/90, 4 hours apart, then pre-eclampsia work up was done and antihypertensives were started. 2-pint PRBC was routinely arranged for all women admitted for delivery. If HELLP, severe thrombocytopenia, placenta previa or accreta was suspected, massive transfusion protocol alert was sounded to the blood bank and blood accordingly arranged. After delivery, all women were closely observed for possible PPH and blood loss visually estimated and documented. Patients with blood loss greater than 500 ml have been categorized to have had PPH1.

The exclusion criteria were placenta previa, placenta accreta, 2 or more previous LSCS and women with coagulopathy before delivery.

We use reusable soft silastic vacuum cup and Wrigley's outlet forceps to assist delivery in second stage. Maternal variables like parity, induction of labor or spontaneous labor, use of oxytocin, duration of 1st and 2nd stage of labor, type of instrument applied, indication for assisted vaginal delivery, birth weight of the neonate were charted. Maternal comorbidities of preeclampsia, chronic hypertension, gestational hypertension, gestational diabetes, previous LSCS were noted. Apgar scores were calculated and taken down for 1 and 5 minutes Maternal morbidity was studied with respect to estimate of the amount of post-partum blood loss, incidence of atonic PPH, contribution of trauma to post-partum hemorrhage, in the form of cervical tear, 3rd degree tear and 4th degree tear, retained placenta and combined causes for PPH. In our hospital, routine active management of third stage of labor is practiced, using oxytocin. Number of patients who needed manual removal of placenta and thus suffered PPH were enlisted.

Statistical analysis

The recorded data was compiled and entered in a spreadsheet computer program (Microsoft Excel 2007) and then exported to data editor page of SPSS version 15 (SPSS Inc., Chicago, Illinois, USA). For all tests, confidence level and level of significance were set at 95% and 5% respectively.

Results

Total numbers of vaginal deliveries in this period were 5235. Out of these, 1500 patients underwent assisted vaginal delivery using vacuum/ forceps/ sequential use of instrument. Of these 1500 assisted vaginal deliveries, 1325 (88.3%) were vacuum assisted, 75 (5%) were forceps assisted and 100 (6.6%) were both vacuum and forceps assisted. Of those who had an operative vaginal delivery, 980 (65.3%) received labor analgesia, 300 (20%) received intrathecal alone and 670 (45%) received combined spinal epidural analgesia. Out of 1500 patients, 200 patients had post-partum hemorrhage. The chi-squared test showed that there was no statistically significant difference between the two distributions of age groups.

The average gestational age of mothers in the PPH group was 38.10 weeks while the average in the non-PPH group as 38.38. The distribution had no statistically significant difference. Atonic PPH was for 65.5% of the PPH cases. The next commonest was traumatic PPH. The risk factor distribution for PPH is given in Table 1. A logistic regression model was fitted relating the PPH outcome [yes/no] with the risk factors and hypothesized interaction effects. Parity, gestational age, III-degree tear, cervical tear, oxytocin use, baby birth weight, and forceps application in hypertension patients are found to be significant.

The impact of the risk factors in terms of the model coefficients and odds ratio given shows that increase in gestational age and oxytocin use decrease chances of PPH. On the other hand, increasing parity, 3rd degree tear, cervical tear, and higher birth weight increase the chances of PPH. Further, use of forceps in patients with hypertension, also increases the chances of PPH with an odds ratio of 6.7. Cervical tear has a high degree of impact on PPH with an odds ratio of 6.1.

Table 1: Comparison of risk factors of PPH

Variable	PPH - Blood loss ≥500 ml (n=200)	No PPH - Blood loss <500 ml (n=1300)
Average mothers age (years)	27.12	27.57
Average gestational age (weeks)	38.10	38.38
Parity		
Primiparous	164 (82%)	1250 (96.1%)
Multiparous	36 (18%)	50 (3.9%)
Use of vacuum extractor		
Yes	180 (90%)	1190 (91.5%)
No	20 (10%)	110 (8.4%)
Use of forceps		
Yes	54 (27%)	210 (16.15%)
No	146 (73%)	1090 (83.84%)
Cervical tear		
Yes	14 (7%)	30 (2%)
No	186 (93%)	1270 (97.69)
Hypertension		
Yes	38 (19%)	250 (19.2%)
No	162 (81%)	1050 (80.7%)
Oxytocin used to accelerate labor		
Yes	174 (87%)	1220 (93.84%)
No	26 (13%)	80 (6.15%)

Discussion

We had 1500 study participants, of whom 200 suffered PPH (visual estimation of blood loss more than 500 ml), 1325 (88.3%) were vacuum assisted, 75 (5%) were forceps assisted and 100 (6.6%) were both vacuum and forceps assisted. Reichman *et al*. did a study on grouping parturients by parity, previous caesarean, and mode of delivery and concluded the model helps to better identifies groups at risk for PPH. In her study, the crude PPH rate was 7% out of 1,26,693 parturients [14]. Among studies investigating risk factors for PPH after vaginal delivery, differences in PPH risk profiles may be due to: dissimilar patient and obstetric characteristics across study populations, dates of study period, choice and classification of candidate variables and PPH criteria, and selected regression modeling approaches. Other studies have identified other risk factors for PPH after vaginal delivery, including episiotomy, multiple gestation, and prolonged first stage duration [15-19].

Women with a history of severe PPH had nine-fold increased odds of severe PPH in their index pregnancy. Previously reported estimates on recurrence risk are mainly from register-based studies [20-22], presenting lower estimates between 2.2 and 3.3. Having a history of PPH may be less well-reported to the registries than in our data sources. Likewise, a validation study from Australia[23]reported a recurrence rate of 28% from medical record audits, while the reported recurrence rate in register based data was 18%.

Xu *et al*. studied differential effects of different delivery methods on progression to severe PPH between Chinese nulliparous and multiparous women in a retrospective cohort study of 151333 women [24]. They concluded delivery methods are associated with PPH both in primi-parous as well as multi-parous women. Compared to spontaneous vaginal delivery, they identified an adjusted odds ratio of 9.32, with 95% CI of 3.66-23.7, for progression to severe PPH, to be higher in multiparous women due to forceps assisted delivery. Though the current study being reported in this paper does not find significant risk in use of forceps for PPH, the interaction between forceps and hypertension seems to have a significant effect on PPH. Hiersch *et al*. in a retrospective study concluded that in women undergoing vacuum extraction, hypertensive disorders are associated with increased risk for PPH [25].

Hubena *et al*. studied the prevalence and outcome of OVD among mothers who gave birth at Jimma University Medical Centre in Southwest Ethiopia [26]. They found that 98.9% of mothers by undergoing operational vaginal delivery had favorable outcome. They found baby birth weight to be the only predictor of maternal outcome. cases, i.e., 3.3% cases of operational vaginal delivery were complicated with PPH

In an earlier study by Brun Induction of labor was found not be associated with increases blood loss and this is also in conformance with our study where induction of labor did not increase the risk for PPH [27]. In line with previous studies, compared with spontaneous vaginal delivery, the odds of severe PPH were higher among women undergoing either in-labor or planned cesarean delivery [28]. Previous studies have shown conflicting results [29-31]. on whether labor augmentation is a risk factor independent of induction. Oxytocin receptor desensitization may explain why labor augmentation with oxytocin is associated with uterine atony leading to PPH [32-34].

Eskandar identified occipito-posterior position during delivery, primi-gravida and high birth weight as risk factors for third- and fourth-degree perineal tear [35]. Instrumental delivery in an occipito-posterior position can significantly increase risk of tear and cause PPH. Maso *et al*. also found IIIdegree tear to be a significant risk factor for PPH in a study conducted in Friuli Venezia Giulia, Italy [36].

The main limitation of this present study is that there were not sufficient numbers of multiple pregnancies to study its effect on PPH under the application of an instrument. Assessing risk factors in retrospect is a limitation in this study. In order to minimize selection bias, we selected all cases of severe PPH and a random sample of controls from the same source population. There is a possibility that some cases were misclassified.

Conclusion

Presence of cervical tear and III-degree tear increased the chances of PPH. Further the study also showed that application of forceps in women with hypertension increases the risk of PPH though hypertension by itself did not seem to increase the risk in a statistically significant way. Any patient in labor might need assistance in the second stage. RCOG advices to counsel primigravida about possible need of assisted vaginal delivery in II stage after 32 weeks of gestation. Assessment of patients undergoing operative vaginal delivery for risk factors for PPH such as this study will alert the clinician to take adequate measures for prophylaxis and management.

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