Primary Postpartum Hemorrhage and Maternal Outcome

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Background: Primary postpartum hemorrhage (PPH) is a significant cause of maternal morbidity and mortality. The value of reviewing the care of women with severe PPH is to improve the obstetric practice.

Objective: To evaluate maternal outcome after postpartum hemorrhage.

Design: A Retrospective Data Analysis.

Setting: Bahrain Defence Force Hospital, Bahrain.

Method: Data analysis of PPH from 1 January 2015 to 31 December 2016 was performed. Data were obtained from all patients who delivered during this period including born before arrival (BBA), home deliveries and stillborns. All relevant maternal complications, including postpartum events, morbidities correlation of maternal outcomes with Hb drop, blood transfusion, length of hospital stay, ICU admission, coagulopathy, organ failure, hysterectomy and management were recorded. The data were analyzed using StatDirect. A P-value of less than 0.05 was considered statistically significant.

Result: During the study period, 8,449 women had given birth. Seventy-two (0.85%) cases of PPH were identified. A significant correlation between estimated blood loss (EBL) and the need for blood transfusion and length of hospital stay was discovered, P-value<0.0001 and P-value<0.0001, respectively. However, no correlation was discovered between EBL and hemoglobin drop, P-value= 0.12. Receiver Operating Characteristic (ROC) curve analysis of morbidities associated with PPH pointed to the bleeding cutoff point of 2L for morbidity to occur.

Conclusion: PPH is significantly related to maternal need for transfusion and hospital stay. Morbidity occurs once EBL reach 2000 ml.

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Obstetric hemorrhage is a major cause of maternal morbidity and mortality worldwide[1-3]. Primary postpartum hemorrhage (PPH) could lead to postpartum anemia, ICU admission, hysterectomy, organ failure, postpartum Sheehan's syndrome, coagulopathy, respiratory disorder, long hospital stay, post-transfusion blood-borne infections and psychological squelae[4-6].

Primary PPH is genital tract blood loss of 500 ml and more after vaginal birth or 1000 ml and more after cesarean delivery within 24 hours. Minor PPH is blood loss of up to 1000 ml and severe of more than 2000 ml[1]. EBL has a significant influence on maternal outcome[1,7]. Hemorrhage should be considered when signs of hypovolemic shock present even in the absence of revealed bleeding. Immediate resuscitation and intervention should be started to reduce the morbidities and mortalities[1,8,9]. Adverse maternal outcomes could be prevented with prompt recognition and treatment which may involve blood and fluid replacements.

The MBRRACE-UK 2017 (mothers and babies risk-reducing through audits and confidential inquiries across UK and Ireland) revealed 8.8 women fatalities per 100,000 maternities during pregnancy or up to six weeks after delivery in 2013-2015. Twenty-two deaths were directly related to obstetric hemorrhage; 10 were due to PPH, nine due to of uterine atony, and one case of genital trauma. The remaining nine cases died from abnormal placental localization and three from placental abruption[8].

PPH could lead to coagulopathies, organ failure, intensive care unit admissions, hysterectomies, significantly long hospital stay and increased inpatient mortality rates than women without PPH[4,5,10,11,12]. PPH is not a disease but a warning sign of maternal morbidity and mortality.

The aim of this study is to evaluate maternal outcome after postpartum hemorrhage.

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METHOD

A retrospective study of postpartum hemorrhage cases was performed from 1 January 2015 to 31 December 2016.

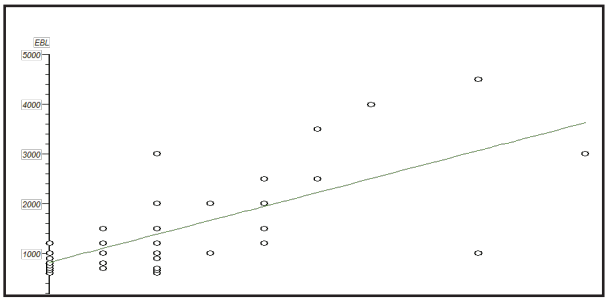
Records were obtained for all primigravidas or multigravidas with singleton or multiple pregnancies who delivered vaginally or via Cesarean sections after 24 weeks of gestation. The study also included women who gave birth at home and cases of born before arrival, including stillborn deliveries. Our criteria for identifying PPH was blood loss of 500 ml or more after a vaginal birth and 1000 ml or more after Cesarean sections. EBL is achieved through visual inspection and soaked packs. All women who delivered vaginally received active management of the third stage. Furthermore, women with previous complicated deliveries and women with prenatal complications received prophylactic management of PPH. Once the patient has been diagnosed with PPH, our standard protocol for PPH was implemented. Early resuscitation was performed with a team of obstetricians, anesthetists and hematologists. According to our protocol, fluid or blood transfusion, oxytocin, Methergine, carboprost, tranexamic acid and Misoprostol were considered. Furthermore, surgical management was considered including repair of genital tract injuries, laparotomy, placental bed hemostasis, B-Lynch suture, uterine and iliac artery ligations, uterine artery embolization, packing, and hysterectomy. The RCOG guideline was followed for the management of massive blood loss to maintain: hemoglobin > 80g/l, platelet count > $50x10^9$/l, prothrombin time of < 1.5 times normal, activated partial thromboplastin time < 1.5 times normal and fibrinogen > 2 g/l[1].

The difference between hemoglobin level on admission and the hemoglobin after PPH were analyzed to identify hemoglobin drop. The need for blood transfusion after the PPH, the duration of hospital stay, ICU admission, coagulopathy, organ failure, respiratory disorders, post-transfusion blood-borne infections, hysterectomy and anemia/psychological sequel were documented.

Data were analyzed using StatsDirect version 3.0.141. A two-sided simple linear regression analysis was used to assess the correlation of maternal outcome to the estimated blood loss; P-values of less than 0.05 were considered statistically significant.

RESULT

During the study period, 8449 births were recorded with 72 cases of primary PPH, an incidence of 0.85%. Forty-three (60%) patients received blood transfusion and 14 (19.4%) of those patients received blood products. We found a significant correlation between EBL and the need for blood transfusion P-value <0.0001, see figure 1.

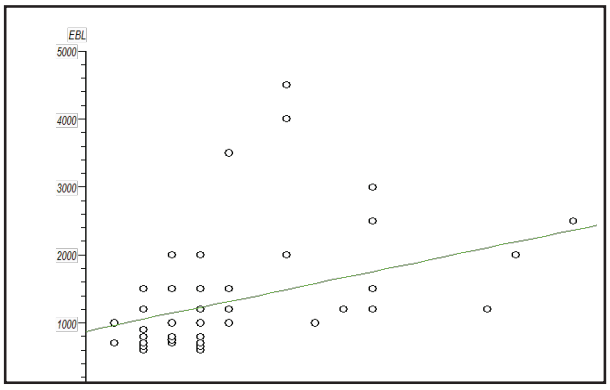


Simple linear regression (P<0.0001).

Equation: EBL = 280.877064 PRBC + 820.017523. Standard Error of slope = 31.583716. 95% CI for population value of slope = 217.869274 to 343.884853. Correlation coefficient (r) = 0.730793 (r^2 = 0.534058). 95% CI for r (Fisher's z transformed) = 0.599743 to 0.823665. t with 69 DF = 8.893097.

Figure 1: Correlation between EBL and Blood Transfusion

We found a significant correlation between the EBL and the duration of hospital stay, P-value <0.0001, see figure 2. Fourteen (19.4%) cases stayed in the hospital for a period exceeding 7 days, 10 patients out of those were in the intensive care unit.

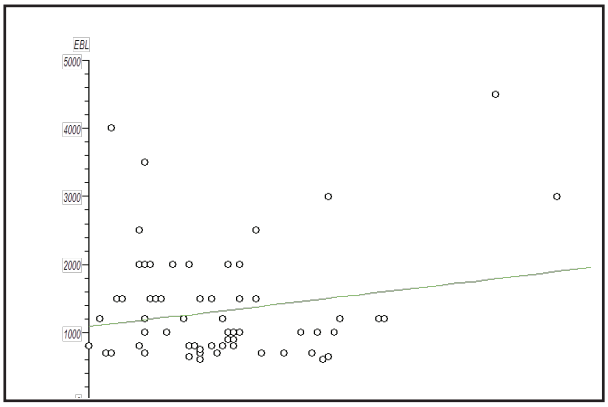


Simple linear regression P <0.0001.

Equation: EBL = 87.516345 stay + 877.774953. Standard Error of slope = 21.128317. 95% CI for population value of slope = 45.355444 to 129.677245. Correlation coefficient (r) = 0.448863 (r^2 = 0.201478). 95% CI for r (Fisher's z transformed) = 0.239107 to 0.618593. t with 68 DF = 4.142135.

Figure 2: Correlation between EBL and Length of Hospital Stay

Significant Hb drop over 2 g was noted in 34 (47%) patients. However, there was no correlation between EBL and Hb drop, P-value= 0.12, see figure 3.

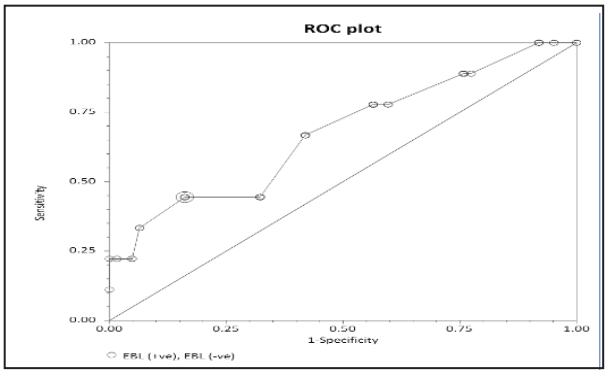


Simple linear regression P= 0.12

Equation: EBL = 96.144127 HB drop + 1089.16106. Standard Error of slope = 60.522506. 95% CI for population value of slope = -24.594969 to 216.883223. Correlation coefficient (r) = 0.187837 (r^2 = 0.035283). 95% CI for r (Fisher's z transformed) = -0.04755 to 0.40346. t with 69 DF = 1.588568.

Figure 3: Correlation between EBL and Hb Drop

Five (7%) patients required a hysterectomy. Those cases included: uterine atony, placenta previa, placentae accreta, uterine rupture and uterine injury. ROC curve analysis of maternal morbidity following PPH was 67% with a cut off of 2L of EBL for any morbidity to occur, see figure 4.



Area under ROC curve by extended trapezoidal rule = 0.674731. Wilcoxon estimate of area under ROC curve = 0.674731. DeLong standard error = 0.106825: 95% CI = 0.465359 to 0.884103. Optimum cut-off point selected = 2,000. Sensitivity (95% CI) = 0.444444 (0.136996 to 0.787991). Specificity (95% CI) = 0.83871 (0.72332 to 0.919847.

Figure 4: ROC Plot for Maternal Morbidity and EBL

DISCUSSION

PPH is a well-documented cause of significant maternal morbidity and mortality. The incidence of PPH in our study population was 0.85% which is comparatively lower than the incidence quoted in many studies[6]. This is mostly to do with implementing preventative measures such as employing active management of the third stage for all patients and identifying patients at risk of PPH at early stages of labor.

We found a strong correlation between the estimated blood loss and the need for blood transfusion. Our transfusion protocol is based on hemodynamic instability and hematological indices. Typically, cross-matched and compatible blood is transfused after valid consent except in critical situations[13]. The total blood volume in average pregnant at term is proximately 100ml/kg (i.e. average 7000ml)[1].

Many authors have reported the essential need for blood transfusion in resuscitating obstetric hemorrhage to reduce the maternal mortalities and morbidities[10,14]. Jadon et al supported the decision of blood transfusion based on clinical and hematological grounds[15,16]. A retrospective case-control study found lower usage of blood and blood components in PPH; it was unclear whether this practice is due to early recognition of PPH and effective active management or the prevalence of less severe cases in their study[17].

PPH is a serious complication which can lead to long hospital stay. Our findings showed a strong correlation between the estimated blood loss and the length of hospital stay. A study reported that women with PPH had significantly longer hospital stay compared to women without PPH[11].

Our study did not correlate EBL with hemoglobin drop. This could be due to technicality issues. Estimating the drop of hemoglobin implies measuring the hemoglobin level after blood loss and before any corrective measures, which is not practical. Furthermore, EBL could be inaccurate as well as the possibility of erroneous laboratory readings. Similar findings were reported in a retrospective study of 11,932 deliveries; the study revealed favorable hematological indices post-resuscitation[16]. However, Bergmann et al found a correlation between EBL and postpartum anemia[18]. The same findings were found in a systemic review by Liu et al; they found hemoglobin drop to be directly related to the severity of bleeding[9]. Other studies found that correlation could be found only if blood loss exceeded 1500 ml[19].

ROC curve analysis for EBL and occurrence of morbidity in our study population was 67% and revealed a cutoff point of estimated blood loss of 2000 ml with a sensitivity of 44% and specificity of 84%. Ten of our patients required ICU admissions; similarly, Gutierrez et al found a high rate of ICU admission following hemorrhage[16].

Five women in our study had hysterectomy; all of these women had either major or severe PPH. The procedure was performed as a life-saving, to manage massive postpartum hemorrhage. A retrospective study emphasized the timely emergency hysterectomy to reduce morbidity[20]. Mclintock et al also discussed the need for hysterectomy in massive PPH[7].

In a study a correlation between primary PPH and subtotal hysterectomy, DIC, acute renal failure, shock and anemia was found[4]. In addition, in several studies, PPH was found to be a significant cause of maternal morbidity[20,21].

One limitation of our study is the subjective method of EBL assessmen. Clinical experience could play an important role in the accurate estimation. Our study population contained un-booked patients and patients who fail to attend antenatal care regularly. We tend to go for blood transfusion based on a reading of low HB at the admission. Furthermore, the estimation of Hb drop would not be technically possible before giving blood products and most Hb readings are actually taken after performing full resuscitation. One particular limitation relevant to our study was addressing the long-term psychological morbidity of having a postpartum hysterectomy.

CONCLUSION

Primary postpartum hemorrhage is significantly related to the maternal need for blood transfusion and hospital stay. Morbidity occurs once EBL reaches 2000 ml.

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Competing Interest: None.

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