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Original Research Article

A study of management and outcomes of postpartum haemorrhage in singleton pregnancy at a tertiary care hospital: an observational study

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ABSTRACT

Background: Postpartum haemorrhage (PPH) remains a leading cause of maternal morbidity and mortality worldwide, particularly in low- and middle-income countries. Early recognition and prompt management are crucial for improving outcomes.
Methods: This prospective observational study included 60 women with singleton pregnancies who developed PPH at Cama and Albless Hospital, Mumbai from August 2024 to May 2025. Data on demographics, risk factors, etiology, management modalities, and maternal outcomes were collected and analyzed.
Results: Uterine atony was the most common cause (91.7%), followed by genital tract trauma. Anemia was the predominant risk factor (71.7%). Medical management with uterotonics was first-line therapy; oxytocin was used in all cases (100%), carboprost in 91.7%, and misoprostol in 70.0%. Surgical interventions were required in refractory cases. Blood transfusion was needed in 50% of patients. Most patients (96.6%) recovered; maternal death occurred in 2 cases (3.4%).
Conclusions: PPH remains a significant obstetric emergency with substantial morbidity. Early risk factor identification, standardized management protocols, and prompt interventions are essential. Addressing antenatal anemia and ensuring blood product availability are critical for improving outcomes.

Keywords: Blood transfusion. Maternal outcome, Postpartum haemorrhage, Singleton pregnancy, Uterine atony, Uterotonics

INTRODUCTION

The International Federation of Gynecology and Obstetrics (FIGO) recognizes that postpartum hemorrhage (PPH) remains the leading cause of maternal morbidity and mortality worldwide. In 2022, the FIGO guidelines reaffirmed that PPH contributes significantly to the global burden of maternal deaths, with a disproportionate impact on low- and middle-income countries.[1]

PPH accounts for approximately 70,000 maternal deaths annually, with the majority occurring in Africa and South Asia.[2] It remains a leading cause of maternal mortality across all income settings. Maternal mortality due to PPH is largely preventable through timely and effective interventions. The high incidence of PPH-related deaths reflects deficiencies in healthcare infrastructure and access to emergency obstetric care in resource-limited settings.[3]

According to FIGO, uterine atony is the most common cause of PPH, and the use of uterotonics should be an integral part of comprehensive management. However, given the complexity of PPH, uterotonics alone are insufficient, and management requires a multidisciplinary approach involving timely administration of medical therapy, surgical interventions, blood transfusion services, and intensive care support.[1]

The American College of Obstetricians and Gynecologists (ACOG), through its reVITALize program, redefined PPH

as cumulative blood loss ≥1,000 ml or any blood loss accompanied by signs or symptoms of hypovolemia within 24 hours of delivery.[4] This definition emphasizes that clinical signs must guide diagnosis, as quantitative thresholds alone can be misleading.

Importantly, in postpartum women, clinical signs such as tachycardia and hypotension may be absent until substantial blood loss has occurred.[6] Typically, these signs emerge only after a loss of 25% of circulating blood volume (approximately 1,500 mL). Thus, a high index of suspicion and early recognition of risk factors are critical for preventing adverse outcomes.[7]

Effective PPH management demands a rapid and coordinated response. Initial steps involve prompt identification of excessive bleeding, accurate quantification of blood loss, and immediate resuscitation with intravenous fluids and blood products. Pharmacological interventions, including uterotonics (oxytocin, ergometrine, carboprost, misoprostol) and tranexamic acid, constitute the first line of management. Surgical interventions such as uterine compression sutures, vessel ligation, and hysterectomy are reserved for refractory cases.[8]

METHODS

Study design

This was a single-centric, prospective, observational study.

Study place and period

The study was conducted in the Department of Obstetrics and Gynaecology at Cama and Albless Hospital, Government Medical College, Mumbai, over a period of ten months from August 2024 to May 2025.

Inclusion criteria

All women with singleton pregnancies who developed postpartum haemorrhage (PPH) following delivery and were admitted to the Department of Obstetrics and Gynaecology during the study period were included.

Exclusion criteria

Women with multiple gestations and those with pre-existing coagulation disorders were excluded.

Procedure

All patients were managed according to the departmental PPH protocol. Assessment of blood loss was performed through visual estimation. Clinical diagnosis of PPH was based on changes in vital signs (pulse >90/min, blood pressure <90/60 mmHg) and signs of shock. Each patient underwent a systematic examination to identify the underlying cause, including assessment for tears, hematoma formation, and uterine atony. Management included medical therapy (oxytocin, ergometrine, carboprost, misoprostol) and surgical interventions (vaginal repair, compression sutures, selective devascularization) as indicated. Blood transfusion was administered as per requirement. A pre-designed Case Record Form (CRF) was used for data collection.

Ethical consideration

The study was conducted in accordance with the Declaration of Helsinki. Informed consent was obtained from all participants.

Sample size

A total of 60 cases were included. The minimum sample size calculated using the formula $n = Z^2P(1-P)/d^2$ was 42, assuming an expected PPH proportion of 2.8% and an absolute allowable error of 5% at 95% confidence level.

Statistical analysis

Data were compiled using Microsoft Excel and analyzed using appropriate statistical tools. Results are presented in tabular format.

RESULTS

Table 1 presents the baseline demographic and obstetric characteristics of the study subjects. The mean age of participants was 28.3 years, with the majority (38.3%) belonging to the 26-30-year age group. Multiparous women constituted 70.0% of the study population, while 75.0% resided in rural areas. Normal BMI was observed in 50.0% of subjects, followed by underweight (20.0%), overweight (18.3%), and obese (11.7%). Deliveries were predominantly at term (75.0%), with preterm and post-term deliveries accounting for 15.0% and 10.0%, respectively.

Table 2 summarizes the delivery and PPH characteristics. Caesarean section was the most common mode of delivery (50.0%), followed by vaginal (33.3%) and instrumental (16.7%) deliveries. Among caesarean sections, 83.3% were performed as emergency procedures. Primary PPH was noted in 83.3% of cases, with uterine atony being the predominant etiology (91.7%). Traumatic causes were present in 71.7% of cases, and combined atonic and traumatic PPH was observed in 63.3%. Blood loss was less than 1 liter in 51.7% of patients, between 1-2 liters in 41.6%, and more than 2 liters in 6.7%.

Table 3 depicts the distribution of risk factors associated with atonic PPH. Among the study population, anemia affected 71.7% of subjects, preeclampsia was noted in 31.7%, and grand multiparity (parity >2) was present in 30.0% of cases. Prolonged labour was documented in 11.7% of patients. Additional risk factors included

previous history of PPH (20.0%), polyhydramnios (8.3%), and multiple gestation (6.7%), consistent with the multifactorial etiology of atonic PPH.

Table 1: Baseline demographic and obstetric characteristics of study subjects (n=60).

Parameter	Category	Number	Percent
Age (years)	<20	2	3.3
	21-25	16	26.7
	26-30	23	38.3
	31-35	15	25.0
	36-40	4	6.7
Parity	Primigravida	18	30.0
	Multiparous	42	70.0
Residence	Rural	45	75.0
	Urban	15	25.0
BMI	Underweight (<18.5)	12	20.0
	Normal (18.5-24.9)	30	50.0
	Overweight (25-29.9)	11	18.3
	Obese (≥30)	7	11.7
Gestational age in weeks	Preterm (<37)	9	15.0
	Term (37-40)	45	75.0
	Post-term (>40)	6	10.0

Table 2: Delivery and PPH characteristics (n=60).

Parameter	Category	Number	Percent
Mode of delivery	Vaginal	20	33.3
	Instrumental	10	16.7
	Caesarean	30	50.0
Type of caesarean (n=30)	Emergency	25	83.3
	Elective	5	16.7
Oxytocin prophylaxis	Used	18	30.0
	Not used	42	70.0
Blood pressure status	Normotensive	36	60.0
	Hypertensive (excluding preeclampsia)	5	8.3
	Preeclampsia	19	31.7
Previous history of PPH	Yes	12	20.0
	No	48	80.0
Type of PPH	Primary	50	83.3
	Secondary	10	16.7
Etiology of PPH*	Atonic	55	91.7
	Traumatic	43	71.7
	Combined (atonic + traumatic)	38	63.3
Blood loss	<1 L	31	51.7
	1-2 L	25	41.6
	>2 L	4	6.7

*:combined atonic and traumatic PPH

Table 3: Risk factors associated with atonic PPH.

Risk Factor	Number (n=60)	Percentage (%)
Anemia	43	71.7
Preeclampsia	19	31.7
Multiparity (>2)	18	30.0
Abruptio placentae	7	11.7
Obesity	7	11.7
Prolonged labour	7	11.7
Polyhydramnios	6	10.0
Placenta previa	3	5.0
Precipitate labour	4	6.7
Big baby	4	6.7

Table 4: Management of PPH and maternal outcomes (n=60).

Parameter	Category	Number (%)
Medical management	Oxytocin	60 (100.0)
	Carboprost	55 (91.7)
	Misoprostol	42 (70.0)
	Ergometrine	38 (63.3)
Surgical management	Vaginal repair	12 (20.0)
	Uterine compression suture	7 (11.7)
	Selective devascularisation	4 (6.7)
Blood transfusion	Required	30 (50.0)
Maternal morbidity	Severe anemia	43 (71.7)
	Need for blood transfusion	30 (50.0)
	Hypovolemic shock	6 (10.0)
	Wound sepsis	6 (10.0)
	RICU admission	3 (5.0)
	Lactation failure	3 (5.0)
	DIC	1 (1.7)
	Renal failure	1 (1.7)
	Puerperal sepsis	1 (1.7)
Maternal outcome	Recovered/discharged	58 (96.6)
	Death	2 (3.4)

Table 4 outlines the management strategies and maternal outcomes. Uterotonic administration was universal, with all patients receiving oxytocin as first-line therapy. Second-line agents included carboprost (used in 55 patients), misoprostol (42 patients), and ergometrine (38 patients). Surgical interventions were required in select cases: uterine curettage was performed in 21 patients (35.0%), uterine balloon tamponade in 5 (8.3%), and compression suture techniques in 3 (5.0%). Half of the study population (30 patients, 50.0%) required blood transfusion. Maternal morbidity included hypovolemic shock (6 cases, 10.0%), acute kidney injury (2 cases, 3.3%), and DIC (1 case, 1.7%). Overall, 58 patients

(96.6%) recovered and were discharged, while 2 patients (3.4%) succumbed to irreversible hemorrhagic shock with DIC.

Of the 60 patients, 58 (96.6%) recovered and were discharged following successful management, while 2 patients (3.4%) succumbed to severe hemorrhagic shock with disseminated intravascular coagulation.

DISCUSSION

The present study evaluated the management and outcomes of postpartum haemorrhage in 60 women with singleton pregnancies at a tertiary care hospital. Uterine atony was identified as the most common cause of PPH, accounting for 91.7% of cases, which is consistent with global literature where atony is reported in 70-80% of PPH cases.[1-4] This finding underscores the critical importance of effective uterotonic prophylaxis and prompt recognition of uterine atony in the immediate postpartum period. Traumatic causes were present in 71.7% of cases, often coexisting with atonic PPH (63.3%), highlighting the multifactorial nature of PPH.

Anemia was the most prevalent risk factor, present in 71.7% of subjects substantially higher than the global prevalence of 29.9% in women of reproductive age.[3] Similar findings have been reported by Dulewad et al and Patel et al, who documented anemia rates of 60-75% among PPH cases at Indian tertiary centres.[22,24] The predominantly rural population (75%) in our study likely contributed to this high prevalence, reflecting limited access to antenatal care and nutritional supplementation. Anemia reduces physiological reserve to tolerate blood loss and is a well-recognized contributor to adverse maternal outcomes.[3]

Other significant risk factors included preeclampsia (31.7%), multiparity (30.0%), and prolonged labour (11.7%), comparable to reports by Malla et al in a Nepalese tertiary care setting.[23] Caesarean section was the most common delivery mode (50%), with emergency caesarean accounting for 83.3% of these cases. The association between caesarean delivery and PPH is well-established, attributed to factors such as uterine atony, surgical trauma, and prolonged anesthesia.[5-9]

Medical management with uterotonics formed the backbone of treatment. Oxytocin was used universally (100%), consistent with FIGO and WHO guidelines.[1-9] Carboprost was administered in 91.7% and misoprostol in 70.0% of cases. These patterns align with Jahan et al and Arvindar et al in similar settings.[25,26] Surgical interventions were reserved for refractory cases: vaginal procedures (tear repair) in 20%, uterine compression sutures in 11.7%, and selective devascularization in 6.7%. Notably, no patient required emergency obstetric hysterectomy, comparing favorably with reported rates of 5-15%.[1-21] This likely reflects effective medical management and timely use of conservative surgical measures.

Blood transfusion was required in 50% of patients, with transfusion needs escalating with blood loss severity. This rate is comparable to Santoso et al and underscores the importance of blood product availability.[20] Packed cell volume was the most commonly used blood product. The majority of patients (96.6%) recovered and were discharged. The maternal mortality rate of 3.4% is consistent with reports of 2-5% from Indian tertiary care centres.[22,24]

This study has several limitations. First, the relatively small sample size of 60 patients may limit generalizability. Second, being a single-centre study at a tertiary care hospital, the results may not represent lower-level facilities where resources differ. Third, visual estimation of blood loss, though clinically practical, is subject to inaccuracy. Fourth, the study did not include long-term follow-up beyond the immediate postpartum period. Finally, the absence of a control group limits comparative analysis of management strategies. Larger multicentre studies with longer follow-up are needed to validate these findings.

CONCLUSION

The present study demonstrates that PPH remains a significant obstetric challenge with substantial maternal morbidity. Uterine atony was the predominant cause, and anemia was the most prevalent risk factor. Effective medical management with uterotonics, particularly oxytocin, carboprost, and misoprostol, proved successful in the majority of cases, with conservative surgical interventions reserved for refractory hemorrhage. The favorable maternal outcomes in 96.6% of patients highlight the importance of early recognition, adherence to standardized protocols, prompt medical and surgical intervention, and availability of blood products. Addressing antenatal anemia and strengthening tertiary care services remain critical priorities for reducing the burden of PPH.

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