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Original Research Article

Maternal Outcomes in Women with Primary Postpartum Haemorrhage at a Tertiary Care Teaching Hospital in Assam, India: A Hospital-Based Observational Study

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Abstract

Background: Postpartum haemorrhage (PPH) is a leading cause of maternal morbidity and mortality, particularly in low- and middle-income countries. Facility-level data on maternal outcomes, including recovery after discharge, are limited for north-east India.

Objective: To describe the proportion of maternal outcomes among women with primary PPH at a tertiary care centre.

Methods: This hospital-based observational study was conducted at Assam Medical College and Hospital, Dibrugarh, from 27 September 2024 to 26 September 2025. Sixty-four women with primary PPH who gave written informed consent were enrolled; women with coagulation disorders, those on heparin or warfarin, and those with secondary PPH were excluded. Demographic and obstetric details, aetiology, severity, management, maternal and foetal outcomes, and follow-up at 6 weeks and 3 months were recorded on a structured proforma. Data were analysed descriptively.

Results: Women aged 21–30 years accounted for 68.8% of cases, and 53.1% had parity 2–4. PPH followed vaginal delivery in 59.4% and caesarean delivery in 40.6%. Uterine atony (60.9%) was the commonest cause, followed by genital tract trauma (26.6%) and retained placenta (12.5%). PPH was mild in 32.8%, moderate in 45.3% and severe in 21.9%. Uterotonics alone controlled bleeding in 65.6%; 43.8% received blood transfusion and 3.1% required emergency hysterectomy. Anaemia requiring treatment (46.9%), shock at presentation (18.8%) and ICU admission (9.4%) were the main morbidities. Two women died (3.1%; 95% CI 0.9–10.7%). Live birth occurred in 93.8%. At 3 months, 87.5% had recovered completely and 9.4% had persistent anaemia.

Conclusions: Most women with primary PPH survived with appropriate management, but nearly half needed transfusion and a substantial minority had shock, ICU admission or persistent anaemia. Early recognition, ready access to blood products, standardised escalation protocols and structured post-discharge follow-up are needed to reduce preventable harm.

Keywords: postpartum haemorrhage; maternal outcome; uterine atony; blood transfusion; maternal morbidity; India.

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Introduction

Postpartum haemorrhage (PPH), commonly defined as blood loss of 500 mL or more within 24 hours of birth, remains a leading direct cause of maternal death and severe maternal morbidity worldwide.[1,2] The burden is concentrated in low- and middle-income countries (LMICs), where haemorrhage is reported to account for up to one third or more of maternal deaths in low-resource regions, and where delays in referral, limited blood supply and late surgical care contribute to poor outcomes.[3] Mortality captures only part of the harm. In a multicentre Malaysian study, PPH

accounted for more than half of severe maternal morbidity, and nearly half of affected women required transfusion.[4] Women who survive may also experience persistent anaemia, fatigue, post-traumatic stress symptoms, anxiety and depression for months or years, although the evidence on these long-term outcomes comes largely from high-income countries.[5]

Comparing outcome proportions across studies is difficult because definitions vary. Severe PPH has been defined by blood loss thresholds, transfusion requirement or haemodynamic compromise, and composite adverse outcomes differ between cohorts.[6,7] Hospital-based Indian studies have described the causes and management of PPH,[8–10] but local data that combine the clinical profile, management, in-hospital outcome and short-term recovery of women with PPH remain limited.

We therefore studied the proportion of maternal outcomes among women with primary PPH at a tertiary referral teaching hospital in Assam, and followed them to 3 months postpartum.

Methods

Study Design and Setting: This hospital-based observational study was carried out in the Department of Obstetrics and Gynaecology, Assam Medical College and Hospital (AMCH), Dibrugarh, a tertiary care teaching hospital that receives both its own deliveries and referrals from peripheral facilities. The study ran for one year, from 27 September 2024 to 26 September 2025.

Participants: All women admitted with primary PPH during the study period, whether delivered at AMCH or referred after delivery elsewhere, were screened. Women were included if they had primary PPH and gave written informed consent. Women with a history of coagulation disorder (for example thrombocytopenia, leukaemia or advanced liver disease), women taking heparin or warfarin, and women with secondary PPH were excluded.

Sample Size: The sample size was calculated with the formula for estimating a single proportion, using Z = 1.96 (95% confidence), an anticipated proportion of 1.6% and an absolute error of 2.5%. This gave 58 women, which was increased by 10% for non-response to a final sample of 64.

Definitions and clinical assessment: Primary PPH was defined as blood loss of 500 mL or more within 24 hours of birth. The diagnosis was made clinically from the amount of bleeding, uterine tone, pelvic examination findings and maternal condition. The cause was classified as uterine atony, genital tract trauma or retained placenta. Severity was graded as mild, moderate or severe [insert grading criteria used].

On enrolment each woman had a detailed history (age, residence, parity, antenatal care and referral status, gestational age, mode and place of delivery, third-stage uterotonic use, labour duration, antepartum and intrapartum complications, and previous PPH, caesarean section or uterine surgery). Pulse, blood pressure, respiratory rate, temperature, consciousness level, and signs of shock and anaemia were recorded. Abdominal examination assessed uterine size, tone and tenderness. Pelvic examination under aseptic precautions assessed cervical, vaginal and vulval trauma, retained tissue and uterine rupture. Haemoglobin, complete blood count, coagulation profile (prothrombin time, activated partial thromboplastin time and INR where indicated), blood group and cross-match were obtained.

Management: Management followed institutional protocols consistent with international guidance [1,2] and was individualised to cause and severity. It comprised intravenous access and resuscitation with fluids and blood products as indicated, uterotonics (oxytocin, misoprostol, methylergometrine) and tranexamic acid. When bleeding did not respond, uterine massage, intrauterine balloon tamponade, compression sutures, and devascularisation and, as a life-saving measure, emergency hysterectomy were used.

Outcomes and follow-up: The primary outcomes were maternal death, need for and amount of blood and blood product transfusion, surgical or procedural interventions, maternal morbidity (anaemia requiring treatment, shock at presentation, ICU admission, disseminated intravascular coagulation, acute kidney injury) and length of hospital stay. Secondary outcomes were foetal outcome and maternal recovery at 6 weeks and 3 months postpartum.

Data collection and statistical analysis: Data were recorded on a structured proforma after written informed consent. Data were entered in Microsoft Excel and analysed with SPSS. Categorical variables are presented as frequencies and percentages. Ninety-five per cent confidence intervals for key proportions were calculated by the Wilson method.

Ethical considerations: The Institutional Human Ethics Committee of AMCH approved the study before it began [approval number and date]. Written informed consent was obtained from all participants, and confidentiality was maintained.

Results

During the study period 64 women with primary PPH met the eligibility criteria and were analysed.

Baseline and obstetric characteristics: The commonest age groups were 21–25 years (37.5%)

and 26–30 years (31.3%), together 68.8% of cases (Table 1). Multiparous women (parity 2–4) formed 53.1% of the cohort, primiparous women 34.4% and grand multiparous women (parity ≥5) 12.5%. PPH followed vaginal delivery in 38 women (59.4%) and caesarean delivery in 26 (40.6%).

Uterine atony was the commonest cause (60.9%; 95% CI 48.7–71.9%), followed by genital tract trauma (26.6%) and retained placenta (12.5%). PPH was moderate in 45.3%, mild in 32.8% and severe in 21.9% (95% CI 13.5–33.4%).

Table 1: Baseline and obstetric characteristics of women with primary PPH (n = 64)

Characteristic	n	%
Age (years)		
≤20	6	9.4
21–25	24	37.5
26–30	20	31.3
31–35	9	14.1
>35	5	7.8
Parity		
Primipara	22	34.4
Multipara (2–4)	34	53.1
Grand multipara (≥5)	8	12.5
Mode of delivery		
Vaginal	38	59.4
Caesarean	26	40.6
Cause of PPH		
Uterine atony	39	60.9
Genital tract trauma	17	26.6
Retained placenta	8	12.5
Severity		
Mild	21	32.8
Moderate	29	45.3
Severe	14	21.9

Management and transfusion: Uterotonics alone controlled bleeding in 42 women (65.6%; 95% CI 53.4–76.1%) (Table 2). Uterine tamponade (Bakri balloon) was used in 8 women (12.5%), compression sutures such as the B-Lynch suture in 6 (9.4%), and emergency hysterectomy in 2 (3.1%). Twenty-eight women (43.8%; 95% CI 32.3–55.9%) were transfused: 18 (28.1%) received 1–2 units of packed red cells, 7 (10.9%) received 3–4 units with 1–2 units of fresh frozen plasma, and 3 (4.7%) received 5 or more units with 2–3 units of plasma.

Thirty-six women (56.3%) did not need transfusion.

Table 2: Interventions and transfusion (n = 64)

Intervention	n	%
Uterotonics only	42	65.6
Uterine tamponade	8	12.5
Compression sutures (B-Lynch/others)	6	9.4
Emergency hysterectomy	2	3.1
Any blood transfusion	28	43.8
– PRBC 1–2 units	18	28.1
– PRBC 3–4 units (FFP 1–2 units)	7	10.9
– PRBC ≥5 units (FFP 2–3 units)	3	4.7
No transfusion	36	56.3

Categories are not mutually exclusive; transfusion was given in addition to other measures.

Maternal morbidity, mortality and hospital stay: Anaemia requiring treatment was the commonest morbidity (30 women, 46.9%), followed by shock at presentation (12, 18.8%) and ICU admission (6, 9.4%) (Table 3).

Disseminated intravascular coagulation occurred in 2 women (3.1%) and acute kidney injury in 1 (1.6%). Sixty-two women (96.9%) survived and two (3.1%; 95% CI 0.9–10.7%) died. Hospital stay was 3–5 days in 45.3%, 48 hours or less in 28.1%, and more than 5 days in 26.6%.

Foetal outcome: Sixty babies (93.8%) were live born and four (6.2%) were stillborn.

Table 3: Maternal morbidity, mortality, hospital stay and foetal outcome (n = 64)

Outcome	n	%
Anaemia requiring treatment	30	46.9
Shock at presentation	12	18.8
ICU admission	6	9.4
DIC	2	3.1
Acute kidney injury	1	1.6
Maternal survival	62	96.9
Maternal death	2	3.1
Hospital stay ≤48 hours	18	28.1
Hospital stay 3–5 days	29	45.3
Hospital stay >5 days	17	26.6
Live birth	60	93.8
Stillbirth	4	6.2

Follow-up: At 6 weeks, 48 women (75.0%) had recovered normally, 11 (17.2%) had persistent anaemia, 3 (4.7%) had surgical wound complications and 2 (3.1%) had psychological distress (Table 4). By 3 months, 56 women (87.5%) had recovered completely, 6 (9.4%) still had anaemia and 2 (3.1%) had ongoing psychological problems.

Table 4: Maternal recovery at follow-up

Follow-up finding	n	%
6 weeks		
Normal recovery	48	75.0
Persistent anaemia	11	17.2
Surgical wound complications	3	4.7
Psychological distress	2	3.1
3 months		
Complete recovery	56	87.5
Persistent anaemia	6	9.4
Ongoing psychological problems	2	3.1

[Confirm denominator: percentages are currently expressed out of 64, but the two women who died cannot be in a follow-up category.]

Discussion

In this one-year hospital-based study of 64 women with primary PPH, most survived and most recovered fully by 3 months. However, close to half needed blood transfusion, about one in five had severe haemorrhage or shock at presentation, and two women died. These findings describe a population that reaches a tertiary referral centre and so reflects both in-house deliveries and referred women.

Profile of women with PPH: Most women were young, with 68.8% aged 21–30 years. Shah and Panchal in Gujarat likewise found most PPH in women aged 20–34 years, but with a predominance of primiparas,[8] whereas multiparous women (2–4) formed the largest group in our cohort. We did not record the total number of deliveries, so we cannot calculate incidence or state that age or parity raised the risk of PPH. The age pattern probably reflects the age at which most births occur. The 12.5% of cases in grand multiparas still support closer third-stage monitoring in high-parity women.

PPH followed caesarean delivery in 40.6% of cases. Liu et al. found severe PPH was strongly associated with caesarean delivery, uterine atony and placenta praevia,[6] and Tiruneh et al. reported anaemia, induced labour and caesarean delivery as predictors of PPH and of PPH-related death.[13] Preparedness for haemorrhage is therefore needed after operative as well as vaginal birth.

Aetiology: Uterine atony caused 60.9% of cases, consistent with the leading role of atony in Indian series. Ramani and Vijaya reported atony in 79.1%, trauma in 19.6% and retained tissue in 1.3%,[9] and atony was also the principal cause in a retrospective study from a district hospital in Assam.[10] Our proportions of trauma (26.6%) and retained placenta (12.5%) were higher than in the former series. Inclusion of referred women, who may have had trauma or retained tissue that was not managed at the first facility, is one possible explanation, but we did not analyse this.

Severity and management: Uterotonics alone were enough in 65.6% of women, which is lower than the 91.1% medical management reported by

Ramani and Vijaya[9] and close to the 62.0% medical response reported in the Assam district hospital series.[10] Our cohort included referred women and a tertiary case mix, with 21.9% having severe PPH, and this likely explains why more women needed escalation.

Emergency hysterectomy was needed in 3.1% of women, almost identical to the 3.06% radical surgery rate in the district hospital series.[10] The use of tamponade (12.5%) and compression sutures (9.4%) suggests that conservative measures spared the uterus in most women whose bleeding did not respond to drugs. In LMICs, peripartum hysterectomy is often performed late, when the woman is already unstable, which increases organ failure and death.[3] Ekka et al. reported that 17% of women with PPH in an Indian tertiary hospital needed surgical procedures.[12]

Transfusion was required in 43.8%, and 4.7% needed five or more units of red cells. In eastern Ethiopia, transfusion was requested for 40% of women with PPH, yet only 72% of those requests resulted in at least one unit being given.[11] Although we did not collect data on blood-bank delays, these figures show why a functioning blood bank is as important to outcome as drugs and surgical skill.

Maternal morbidity and mortality: Anaemia needing treatment affected 46.9% of women, shock at presentation 18.8% and ICU admission 9.4%. ICU use has varied widely between studies because of different denominators and admission policies: 17% among women with severe maternal morbidity in Malaysia,[4] and 2% among women with PPH in eastern Ethiopia.[11] Our ICU rate is therefore not directly comparable with either. Two women died (3.1%), a case fatality that lies between the 1.8% reported by Ramani and Vijaya[9] and the 6% reported across eastern Ethiopian hospitals.[11] With only two deaths, the confidence interval is wide (0.9–10.7%), and the estimate should be interpreted cautiously. Pullemalla et al. attributed deaths from major PPH to delayed recognition, insufficient transfusion and late referral.[14] In our setting, referred women often arrived after a considerable delay from the onset of bleeding and in a more severe condition, although we did not formally analyse this.

Four babies (6.2%) were stillborn. Some stillbirths may have preceded the haemorrhage because of antepartum complications, so a causal link cannot be inferred from these data.

Recovery after discharge: Most women recovered fully by 3 months (87.5%), but 17.2% had persistent anaemia at 6 weeks and 9.4% at 3 months, and 3.1% still had psychological problems. The systematic review by Latt et al. describes persistent fatigue, anaemia and post-traumatic, anxious and depressive symptoms months to years after PPH, mainly in high-income settings.[5] Our findings support routine iron and haemoglobin follow-up and screening for psychological distress after PPH in LMIC settings, where undernutrition and limited mental health services may magnify these burdens.

Strengths and limitations: Strengths include the inclusion of all eligible women over a full year, a structured proforma, and follow-up beyond discharge. Limitations are the single-centre design and small sample, which limit generalisability and precision; the absence of the total number of deliveries, so incidence could not be estimated; and descriptive analysis only, with no analysis of factors associated with severe outcomes. Clinical estimation of blood loss is imprecise, and the diagnosis and severity grading were clinical. Psychological outcomes would be better measured with validated screening instruments. Follow-up was limited to 3 months. Because referred and in-house cases were not analysed separately, the effect of delayed referral could not be quantified.

Conclusion

In this tertiary care cohort, primary PPH was most often caused by uterine atony and mostly of mild to moderate severity, and most women recovered with medical management.

Even so, 43.8% needed blood transfusion, 21.9% had severe haemorrhage, 9.4% were admitted to intensive care, and 3.1% died. Anaemia was the main morbidity and persisted at 3 months in 9.4%. Early recognition, reliable access to blood and blood products, standardised escalation protocols, multidisciplinary care and structured follow-up for anaemia and psychological distress are essential to improve maternal outcomes.

Larger multicentre studies that include referral delay and analyse factors associated with poor outcomes are needed.

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