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Original Research Article

Mode of delivery and fetomaternal outcomes in patients with postpartum haemorrhage: a retrospective study at a tertiary care centre in India

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ABSTRACT

Background: Postpartum haemorrhage (PPH) remains an important cause of maternal mortality, particularly in low and middle-income countries including India. Although several obstetric risk factors contribute to PPH, the association between mode of delivery and fetomaternal outcomes remains an area of ongoing research. This study aimed to compare fetomaternal outcomes among women with PPH following vaginal, caesarean and instrumental deliveries and also to identify factors associated with severe maternal morbidity.

Methods: A retrospective study was conducted in the Department of Obstetrics and Gynaecology at a tertiary care hospital in India. Medical records of women diagnosed with PPH between January 2023 to January 2025 were reviewed. Data on demographic characteristics, obstetric variables, mode of delivery, causes of PPH, type of management, maternal complications and neonatal outcomes were collected and analysed.

Results: Among 225 women with PPH, 110 (48.8%) had vaginal deliveries, 73 (32.4%) caesarean deliveries and 42 (18.6%) instrumental deliveries. Uterine atony was the commonest cause of PPH, particularly among vaginal deliveries. Blood transfusion was required in 29% of vaginal, 16% of caesarean and 9% of instrumental deliveries. ICU admission, obstetric hysterectomy, disseminated intravascular coagulation and prolonged hospital stay were more frequent following vaginal delivery. Low Apgar score, NICU admission and neonatal mortality were also more frequent among vaginal deliveries.

Conclusions: Among women with PPH, vaginal mode of delivery was associated with higher maternal morbidity and adverse neonatal outcomes. Early recognition and prompt multidisciplinary management are essential to improve fetomaternal outcomes.

Keywords: Maternal outcome, Mode of delivery, Neonatal outcome, Postpartum haemorrhage

INTRODUCTION

Postpartum haemorrhage is important cause of maternal mortality in developing as well as developed countries, accounting for approximately one-quarter of maternal deaths.^{1,2} It is defined as either a blood loss ≥ 500 mL or blood loss ≥ 300 ml accompanied by abnormal clinical parameters: Pulse rate >100 bpm, Systolic blood pressure

<100 mmHg, Diastolic blood pressure <60 mmHg and Shock index >1 .³

Despite improvements in antenatal care, institutional deliveries, blood banking services, and emergency obstetric care, PPH continues to contribute significantly to maternal mortality in India.^{1,4} Besides mortality, PPH results in severe anemia, blood transfusion, intensive care admission, emergency hysterectomy, prolonged

hospitalization, and psychological trauma.⁵ According to recent statistics, in developing countries the estimated mortality rate is 140,000 per year or one maternal death every 4-min due to PPH.⁶ In India, the incidence of PPH is 2-4% following vaginal delivery and 6% following cesarean section.⁷ On the other hand, studies have shown PPH accounts for 26.5% of maternal deaths in India.⁸

WHO also indicates that most maternal deaths resulting from PPH occur within the first 24 hours of postpartum and are preventable and manageable if appropriate and effective resources are readily available.¹ The World Health Organization works to contribute to the reduction of maternal mortality by increasing research evidence, providing evidence-based clinical and programmatic guidance.⁹

Also, mode of delivery is an important determinant of postpartum haemorrhage. Vaginal and instrumental delivery are commonly associated with uterine atony and genital tract trauma, whereas caesarean delivery carries additional risks related to surgical blood loss, placenta previa, placenta accreta spectrum, prolonged operative time and postoperative complications.^{10,11}

Several international studies have demonstrated increased maternal morbidity following caesarean delivery complicated by PPH. However, evidence from Indian tertiary care centres remains limited. Retrospective analysis of hospital records provides valuable information regarding disease burden, management practices and maternal as well as neonatal outcomes in routine clinical practice. Therefore, the present study was undertaken to evaluate the association between mode of delivery and fetomaternal outcomes among women with postpartum haemorrhage. This study aimed to identify cause of postpartum haemorrhage, to compare maternal complications following vaginal delivery, instrumental and caesarean sections in women with PPH. Also, to compare maternal and neonatal outcomes according to mode of delivery.

METHODS

Study design and setting

This was a record based retrospective study conducted in Department of Obstetrics and Gynaecology at Dr RPGMC, Tanda, Himachal Pradesh, India. The study duration was 2 years from January 2023 to January 2025. This study included all women who developed PPH following either vaginal, instrumental or caesarean delivery.

Inclusion criteria

Women aged 18-45 years who were diagnosed with postpartum haemorrhage (PPH), including those with singleton or multiple pregnancies and whose delivery was conducted at the study hospital were included.

Exclusion criteria

Women referred to the study hospital after receiving management elsewhere, those with antepartum haemorrhage without postpartum haemorrhage and those with known inherited coagulation disorders were excluded from the study.

Data collection

Information extracted from the labour room records and files retrieved from the medical record section. It includes patient's demographic details, parity, antenatal booking status, gestational age, etiology of PPH, medical disorders/obstetric complications, mode of delivery, type of management i.e. medical, surgical or combined management, maternal complications were analysed. Also, the maternal and perinatal outcome (Apgar score, NICU admission, neonatal deaths) were studied in details from the patient's files.

Statistical analysis

Data was entered into Microsoft Excel sheet and analysed using Epi Info. Categorical variables were expressed as frequencies and percentages. A p-value less than 0.05 was considered statistically significant. The study received approval from the Institutional Ethics Committee.

RESULTS

Present study observed the total number of PPH were 225 out of total 15,362 deliveries. Table 1 shows 18%, 45%, 37% cases belonged to age <25, 25-34 and ≥35 years respectively. Majority were between 25-34 yrs, out of which 51 cases were among vaginal, 14 among instrumental and 37 cases among caesarean deliveries were. Almost 52% cases were unbooked, predominantly seen among vaginal mode of delivery. 57% cases of PPH having '0' parity. Majority (56%) of women belonged to rural background with maximum number of cases (53%) were between 37-40 weeks gestational age belonging to underweight BMI (35%), all three categories showing maximum number of cases among vaginal mode of delivery.

Table 2 showing uterine atony as the major cause of PPH with 20% cases among vaginal, 5% among instrumental and 8% cases among caesarean mode of delivery. Second commonest cause was genital trauma contributing to 16% cases of PPH among vaginal and 8% among instrumental deliveries which is statistically significant. Retained placental tissues accounted for 9% cases in vaginal, 3% in instrumental and 5% cases in caesarean deliveries. Majority (5%) cases of PPH among caesarean mode of delivery were due to deranged coagulation excluding inherited coagulopathies whereas 14% cases due to placenta previa/accreta were seen only among caesarean mode of delivery showing significant association.

Table 1: Baseline characteristics with mode of delivery.

Variables	Category	Mode of delivery			Number (%)
		Vaginal	Instrumental	Caesarean section	
Age (years)	<25	20	8	12	40 (18%)
	25-34	51	14	37	102 (45%)
	≥35	39	20	24	83 (37%)
Booking status	Unbooked	63	23	30	116 (52%)
	Booked	47	19	17	109 (48%)
Parity	Primigravida	62	30	36	128 (57%)
	Multigravida	48	12	37	97 (43%)
Gestational age	<37 weeks	13	5	8	25 (11%)
	37-40 weeks	62	17	28	119 (53%)
	>40 weeks	35	20	37	81 (36%)
Residence	Rural	76	19	30	125 (56%)
	Urban	34	23	43	100 (44%)
BMI	<18.5	46	8	24	78 (35%)
	18.5-24.9	31	14	20	65 (29%)
	25-29.9	28	13	11	52 (23%)
	>30	5	7	18	30 (13%)

Table 2: Etiology of postpartum haemorrhage.

Cause	Vaginal delivery, N (%)	Instrumental delivery, N (%)	Caesarean section, N (%)	P value
Uterine atony	44 (20)	12 (5)	18 (8)	0.84
Genital tract trauma	35 (16)	20 (8)	-	<0.001
Retained placenta/tissues	21 (9)	6 (3)	12 (5)	0.94
Placenta previa/accreta	-	-	32 (14)	<0.001
Deranged coagulation (excluding inherited coagulopathies)	10 (4)	4 (2)	11 (5)	0.45

Table 3: Maternal outcomes.

Outcome	Vaginal delivery, N (%)	Instrumental delivery, N (%)	Caesarean section, N (%)	P value
Blood transfusion	65 (29)	21 (9)	36 (16)	0.35
ICU admission	19 (8)	10 (4)	12 (5)	0.57
Obstetric hysterectomy	6 (3)	-	5 (2)	0.24
DIC	8 (4)	3 (1)	9 (4)	0.45
Prolonged hospital stays (≥7 days)	12 (5)	8 (4)	11 (5)	0.39

Table 4: Neonatal outcomes.

Outcome	Vaginal delivery, N (%)	Instrumental delivery, N (%)	Caesarean section, N (%)	P value
Apgar <7 at birth	53 (24)	18 (8)	35 (16)	0.82
NICU admission	42 (19)	16 (7)	33 (15)	0.60
Neonatal mortality	15 (7)	8 (4)	5 (2)	0.14

Table 3 shows that maternal outcome like blood transfusion (29% in vaginal delivery, 9% in instrumental and 16% in caesarean deliveries), ICU admission (8% in vaginal, 4% in instrumental and 5% in caesarean), obstetric hysterectomy (3% in vaginal and 2% in caesarean deliveries), DIC (4% in vaginal, 1% in instrumental and

4% in caesarean), prolonged hospital stay (5% in vaginal, 4% in instrumental and 5% in caesarean deliveries).

The most commonly observed neonatal outcome was Apgar score <7 at birth with 24% cases seen among vaginal mode of delivery followed by 16% in C-sections and 8% in instrumental deliveries; second commonest was NICU

admission with 19% in vaginal, 15% in caesareans and 7% among instrumental deliveries. Neonatal mortality was 7% among vaginal mode of delivery.

DISCUSSION

As stated above the maternal haemorrhage is a leading cause of maternal morbidity and mortality. The present study showed maximum number of cases of postpartum haemorrhage seen among vaginal mode of delivery compared with instrumental and caesarean delivery. Most women with PPH in the present study were aged between 25-34 years (45%), unbooked (52%), primigravida (57%) aligning with the findings of Gora et al.¹² The predominance of women from rural areas (56%) and unbooked pregnancies (52%), similar results have been documented by Kamal et al highlighting gaps in antenatal care where risk factors remain undetected.¹³

Uterine atony was the leading cause of PPH majorly seen among vaginal mode of delivery, followed by genital tract trauma and retained placental tissue. These findings consistent with global estimates indicating atony contributes to 60-80% of PPH cases. Genital tract trauma was more frequently associated with vaginal and instrumental deliveries, whereas placenta previa/accreta was observed exclusively in caesarean deliveries, highlighting the increased risk of abnormal placentation with operative births.¹⁴⁻¹⁶

Blood transfusion was the most common maternal intervention required, followed by ICU admission, while obstetric hysterectomy and DIC were observed in a smaller proportion. This favourable outcome indicates effective multidisciplinary care, early recognition and prompt intervention, consistent with global data indicating improved survival rates, where standardized PPH bundles and rapid-response systems are implemented.¹⁷

Among neonatal outcomes, low Apgar score and NICU admission were significantly higher in women who had PPH which was noted among all modes of delivery, indicating the impact of maternal hemodynamic instability and intrapartum complications on neonatal well-being. Although neonatal mortality was higher among vaginal deliveries, the difference was not statistically significant, suggesting that timely neonatal resuscitation and intensive care may improve survival despite increased morbidity.^{18,19}

Overall, present study reinforces that PPH continues to be a major obstetric emergency. Despite decreasing incidence, PPH remains a major contributor to maternal and neonatal morbidity and mortality. Strengthening antenatal care, early detection of high-risk pregnancies and ensuring immediate access to trained personnel and emergency interventions are important to further decrease PPH-associated complications.

CONCLUSION

Among women with postpartum haemorrhage, vaginal delivery was associated with significantly higher maternal morbidity, including greater blood loss, increased transfusion requirements, higher ICU admission rates and greater need for obstetric hysterectomy. Neonatal morbidity, particularly low Apgar score and NICU admission, was also more frequent among vaginal mode of delivery. Strengthening antenatal risk assessment, ensuring availability of blood products, adhering to standardized PPH management protocols and timely multidisciplinary intervention may improve fetomaternal outcomes.

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Ethical approval: The study was approved by the Institutional Ethics Committee

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