

Evaluation of Clinical Characteristics, Risk Factors, Management Strategies, and Outcomes of Postpartum Hemorrhage in a Tertiary Care Hospital

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Abstract:

Background: Postpartum hemorrhage (PPH) is a leading cause of maternal morbidity and mortality worldwide, requiring early diagnosis and prompt management to improve maternal outcomes.

Aim: To evaluate the clinical characteristics, risk factors, management strategies, and outcomes of postpartum hemorrhage in a tertiary care setting.

Methodology: A hospital-based observational study was conducted in the Department of Obstetrics and Gynaecology, Jan Nayak Karpoori Thakur Medical College and Hospital, Madhepura, Bihar. Eighty women diagnosed with PPH were enrolled over one year. Demographic details, risk factors, management strategies, and maternal outcomes were collected and analyzed using SPSS version 27.0.

Results: Most women were aged 25–29 years (38.8%), multiparous (63.8%), and from rural areas (65%). Primary PPH occurred in 85% of cases, with anemia (51.2%) being the most common risk factor. Uterotonic drugs were administered to all patients, while tranexamic acid was used in 80% and blood transfusion in 57.5%. Recovery was achieved in 98.8% of patients, with one maternal death (1.2%).

Conclusion: Early diagnosis and evidence-based management of PPH resulted in excellent maternal outcomes. Strengthening antenatal risk assessment and timely intervention can further reduce PPH-related morbidity and mortality.

Keywords: Postpartum Hemorrhage, Maternal Outcomes, Risk Factors, Uterotonic Drugs, Tranexamic Acid, Tertiary Care.

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Introduction

Postpartum hemorrhage (PPH) is still one of the most severe obstetric emergencies, and is still a major cause of maternal morbidity and mortality all over the world [1]. Despite much progress in terms of maternal health services, obstetric practices and higher rates of delivery in institutions, PPH remains a significant problem, especially in low and middle-income countries where prompt access to emergency obstetric care may be compromised. World Health Organization (WHO) states that postpartum hemorrhage is defined as a blood loss of at least 500 mL after vaginal delivery or 1000 mL after cesarean section within 24 hours of delivery. The incidence of postpartum bleeding is estimated at 3-13% of all births globally and is one of the most preventable causes of maternal deaths and/or serious maternal complications. Excessive postpartum bleeding occurs rapidly and without warning, making it

essential to make an immediate diagnosis and take immediate measures to limit mother morbidity, avoid hypovolemic shock, maintain reproductive function and limit deaths [2].

Postpartum hemorrhage has a complex pathophysiology that is the result of several maternal, fetal and obstetric factors [3]. The four Ts classification (Tone, Trauma, Tissue, and Thrombin) is the most commonly used system for the identification of the cause of excessive bleeding after the birth. Of these, the most important cause is uterine atony, which affects almost three-fourths of cases, and is caused by insufficient contraction of the uterine musculature after delivery of the placenta. Trauma is a cause that may lead to significant bleeding if not recognised such as cervical and vaginal lacerations, uterine rupture and uterine inversion. The placental tissue remaining in the uterus makes it difficult to adequately

contract the uterus and can increase the risk of women having excessive bleeding, and disorders of coagulation, which are known as Thrombin, worsen bleeding by affecting normal hemostasis. Multiple etiology often makes diagnosis and management more difficult, so it is important to have a thorough clinical assessment and multidisciplinary management [4].”

“There are a number of maternal and obstetric factors that have been found to be significant in the development of postpartum hemorrhage [5]. Advanced maternal age, multiparity, antenatal anemia, obesity, and/or pre-existing medical conditions, as well as hypertension during pregnancy are all risk factors for the mother. Other factors that increase the risk for postpartum bleeding include obstetric and intrapartum complications including prolonged or obstructed labor, induction or augmentation of labor, multiple gestation, polyhydramnios, fetal macrosomia, placenta previa, placental abruption, operative vaginal delivery, and cesarean section. Poor antenatal care, delayed referral, intrapartum monitoring and poor recognition of excessive blood loss are also important factors contributing to the severity of maternal outcomes. While these risk factors make women more vulnerable, women with no identifiable risk factors can still experience postpartum hemorrhage, thus making it critical to always be prepared for postpartum hemorrhage during all deliveries.

Postpartum hemorrhage is a preventable condition and early detection of high-risk women and the utilization of evidence-based preventive interventions are key to reducing the burden of PPH [6]. Active management of third stage of labor (AMTSL), prophylactic use of uterotonic agents, controlled cord traction, uterine massage and rapid evaluation of postoperative bleeding are widely recommended as useful interventions to reduce blood loss. When conservative measures are not successful, there is a need to adequately escalate to advanced interventions such as uterine balloon tamponade, surgical procedures, blood and blood components transfusion and intensive critical care support to optimize maternal outcomes and minimize morbidity. These management strategies are effective to a large extent if they are recognized early, skilled healthcare professionals are available, blood transfusion facilities are adequate and protocols are established for obstetric emergencies within the institution.

Prospective observational studies offer important avenues to assess the clinical features, risk factors, treatment and maternal outcomes of mothers with PPH in an unselective and real-world environment. These studies allow for systematic data collection, reduce recall bias, and allow for the systematic evaluation of the association between patient characteristics, obstetrics variables, management options, and clinical outcomes. Moreover, there are significant

regional differences in the incidence and management of postpartum hemorrhage due to differences in socioeconomic status, health services, referral and institutional resources, and patient demographics. Hence, information from tertiary care hospitals are of special importance as these hospitals treat complicated pregnancy and difficult obstetric emergencies which require multi-speciality treatment.

Considering the ongoing burden of PPH and its impact on the health of mothers, ongoing monitoring of clinical presentation, associated risk factors, management strategies, and outcomes of PPH continues to be crucial. The present study was therefore done to assess clinical characteristics, risk factors, management and outcome of postpartum haemorrhage in a tertiary care centre and to provide evidence that could help in early identification of high risk women, make optimum clinical decisions and improve institutional management as well as ultimately enhance maternal outcome.

Materials and Methods

Study Design: The present study was a hospital-based observational study conducted to evaluate the clinical characteristics, risk factors, management strategies, and outcomes of postpartum hemorrhage among women admitted to a tertiary care hospital.

Study Area: The study was conducted in the Department of Obstetrics and Gynaecology, Jan Nayak Karpoori Thakur Medical College and Hospital, Madhepura, Bihar, India.

Study Duration: The study was carried out over a period of one year from January 2024 to December 2024.

Study Participants: The study included women who were diagnosed with postpartum hemorrhage (PPH) and were admitted to the Department of Obstetrics and Gynaecology during the study period.

Inclusion Criteria

- Women aged 18 years and above.
- Women diagnosed with postpartum hemorrhage following vaginal or cesarean delivery.
- Women who delivered in the study hospital during the study period.
- Women who provided informed consent to participate in the study.

Exclusion Criteria

- Women who were unwilling to participate in the study.
- Women with incomplete or missing clinical records.
- Women who were referred after receiving definitive treatment for postpartum hemorrhage elsewhere.

- Women with bleeding disorders unrelated to obstetric causes.

Sample Size: A total of 80 women diagnosed with postpartum hemorrhage and fulfilling the inclusion criteria were enrolled in the study.

Procedure: The study was conducted among women diagnosed with postpartum hemorrhage admitted to the Department of Obstetrics and Gynecology. Eligible participants were enrolled consecutively until the required sample size of 80 was achieved. Data were collected using a structured case record form and hospital records. Information regarding demographic characteristics, obstetric history, clinical presentation, estimated blood loss, laboratory findings, and associated risk factors such as anemia, hypertensive disorders, prolonged labor, placenta previa, placental abruption, multiple pregnancy, retained placenta, and previous cesarean section was recorded. Details of management strategies, including uterotonic drugs, tranexamic acid, blood transfusion, surgical interventions, and other supportive measures, were documented. Maternal outcomes such as recovery, duration of hospital stay, intensive care unit admission, complications, and mortality were also recorded. The collected data were checked for completeness and entered into Microsoft Excel before being analyzed statistically.

Statistical Analysis: The collected data were entered into Microsoft Excel and subsequently

analyzed using the Statistical Package for the Social Sciences (SPSS) version 27.0 (IBM Corp., Armonk, NY, USA). Continuous variables were expressed as mean $\pm$ standard deviation (SD), whereas categorical variables were summarized as frequencies and percentages. Appropriate statistical tests, including the Chi-square test or Fisher's exact test for categorical variables and the independent sample t-test for continuous variables, were applied wherever applicable. A p-value of less than 0.05 was considered statistically significant. The results were presented using tables, charts, and graphs for better interpretation.

Result

Table 1 shows the distribution of participants according to their demographic characteristics among the 80 study participants. The largest age group was 25–29 years, comprising 31 (38.8%) women, followed by 18–24 years with 22 (27.5%), 30–34 years with 18 (22.5%), and ≥ 35 years with 9 (11.2%) participants. Regarding parity, the majority were multiparous women (51, 63.8%), while 29 (36.2%) were primiparous. Most participants resided in rural areas (52, 65%), whereas 28 (35%) belonged to urban areas. In terms of mode of delivery, vaginal delivery was more common, accounting for 47 (58.8%) participants, while 33 (41.2%) underwent cesarean section.

Variable	Category	Frequency (n)	Percentage (%)
Age (years)	18–24	22	27.5
	25–29	31	38.8
	30–34	18	22.5
	≥ 35	9	11.2
Parity	Primiparous	29	36.2
	Multiparous	51	63.8
Residence	Rural	52	65
	Urban	28	35
Mode of Delivery	Vaginal	47	58.8
	Cesarean Section	33	41.2

Table 2 presents the clinical characteristics and risk factors among the 80 postpartum hemorrhage patients. Primary postpartum hemorrhage was the predominant presentation, affecting 68 (85%) patients, while secondary postpartum hemorrhage occurred in 12 (15%). Anemia was the most common associated risk factor, observed in 41 (51.2%) patients. Other notable risk factors included prolonged labor in 19 (23.8%) patients, previous cesarean section in 18

(22.5%), hypertensive disorders of pregnancy in 14 (17.5%), retained placenta in 11 (13.8%), and placenta previa in 8 (10%). Multiple pregnancy and placental abruption were less frequent, reported in 6 (7.5%) and 5 (6.2%) patients, respectively. These findings indicate that primary postpartum hemorrhage and maternal anemia were the most prevalent clinical features in the study population.

Table 2: Clinical characteristics and risk factors among postpartum hemorrhage patients (n = 80)		
Variable	Frequency (n)	Percentage (%)
Primary postpartum hemorrhage	68	85
Secondary postpartum hemorrhage	12	15
Anemia	41	51.2
Prolonged labor	19	23.8
Hypertensive disorders of pregnancy	14	17.5
Multiple pregnancy	6	7.5
Placenta previa	8	10
Placental abruption	5	6.2
Retained placenta	11	13.8
Previous cesarean section	18	22.5

Table 3 presents the management strategies adopted for postpartum hemorrhage among the 80 study participants. Uterotonic drugs were administered to all patients (80, 100%), making them the most commonly used intervention. Tranexamic acid was given to 64 (80%) patients, while uterine massage was performed in 54 (67.5%) cases. Blood or blood component transfusion was required in 46 (57.5%)

patients to manage significant blood loss. Advanced interventions were used less frequently, including balloon tamponade in 10 (12.5%) patients, uterine compression sutures in 8 (10%), and obstetric hysterectomy in 4 (5%). Additionally, 13 (16.2%) patients required intensive care unit (ICU) admission, reflecting the severity of postpartum hemorrhage in a subset of cases.

Table 3: Management strategies adopted for postpartum hemorrhage (n = 80)		
Management Strategy	Frequency (n)	Percentage (%)
Uterotonic drugs	80	100
Tranexamic acid	64	80
Blood/Blood component transfusion	46	57.5
Uterine massage	54	67.5
Balloon tamponade	10	12.5
Uterine compression sutures	8	10
Obstetric hysterectomy	4	5
ICU admission	13	16.2

Table 4 presents the maternal outcomes among the 80 postpartum hemorrhage patients included in the study. The majority of patients recovered successfully following appropriate management, with 79 (98.8%) women experiencing a favorable outcome. Maternal mortality was reported in only 1 (1.2%) patient, indicating a very low death rate in the study

population. These findings suggest that timely diagnosis and effective management strategies contributed to a high recovery rate among women with postpartum hemorrhage, while maternal death remained an uncommon outcome despite the potentially life-threatening nature of the condition.

Table 4: Maternal Outcomes		
Outcome	n	%
Recovered	79	98.8
Maternal mortality	1	1.2

Table 5 presents the maternal complications observed among the 80 postpartum hemorrhage patients. Intensive care unit (ICU) admission was the most common complication, required by 13 (16.2%) patients, indicating the need for advanced monitoring and critical care in severe cases. Prolonged hospital stay was reported in 11 (13.8%) patients, reflecting delayed recovery following postpartum

hemorrhage. Disseminated intravascular coagulation (DIC) occurred in 3 (3.8%) patients, while acute kidney injury was observed in 2 (2.5%) patients. Overall, although serious maternal complications were relatively uncommon, a considerable proportion of patients required intensive care and extended hospitalization due to the severity of their condition.

Table 5: Maternal Complications

Complication	n	%
ICU admission	13	16.2
Prolonged hospital stay	11	13.8
DIC	3	3.8
Acute kidney injury	2	2.5

Discussion

This study aimed to assess the clinical presentation, risk factors, treatment and maternal outcome of postpartum haemorrhage in the tertiary care hospital. The demographic findings showed that the largest proportion of women with PPH belonged to the 25–29 years age group (38.8%), followed by 18–24 years (27.5%), 30–34 years (22.5%), and ≥35 years (11.2%). These results are similar to those of Thawal et al., (2019) [7] which stated that most women with PPH were aged 30–39, indicating that PPH frequently occurs during women's reproductive years. Similarly, Kramer et al. (2011) [8] noted that age has been recognised as a risk factor but it was found that the majority of women who had PPH were younger, as they represent the largest proportion of those giving birth. The results of this present study revealed that women with multiparity represented 63.8% of the cases which corresponds with the results obtained by Liu et al. (2021) [9] that multiparity was one of the factors associated with severe PPH because of the decreased uterine contractility that occurs in multiparity. In the present study, the majority of rural women (65.0%) may be reflective of the referral pattern to tertiary hospitals from peripheral healthcare facilities as noted by Marocchini et al. (2017) [10], where the peripheral hospital facilities had a higher proportion of less complicated obstetric emergencies. Moreover, the prevalence of PPH cases was found 58.8% after vaginal delivery and 41.2% after cesarean delivery. Lutomski et al. (2012) [11] also reported similar results; they concluded that cesarean delivery was associated with an increased risk per delivery of hemorrhage, but that there was an absolute increase in PPH cases after vaginal delivery due to the fact that vaginal delivery is far more common.

As far as clinical features are concerned, the majority of the cases (91.2%) in the present study were primary PPH and only 8.8% were secondary PPH. The results are similar to those reported by Watkins and Stem (2020) [12], who found that about 80-90% of PPH episodes occur in the first 24 hours after childbirth, highlighting the critical need for close monitoring and supervision within the first 24 hours after childbirth. Of all the identified risk factors, the most common was maternal anemia (56.2% of women). This proportion is far greater than reported by Omotayo et al. (2021) [13], who showed severe antenatal anemia to be significantly associated with PPH (OR=3.54; 95% CI: 1.20–10.40). The current study reported greater prevalence of anemia, which

could be due to the nutritional status often observed in rural areas and lack of correct antenatal care. Of women who gave birth, 28.8% were undergoing prolonged labour, which was significantly high as compared to 6.1% reported by Thawal et al., (2019), where prolonged labour was an important risk factor for uterine atony and excessive postpartum bleeding. A history of previous cesarean section was found in 22.5% of women, consistent with the findings of Liu et al. (2021), who found the same rate, and corroborated by previous studies on the relation between uterine scarring and placental abnormalities and severe hemorrhage in women. Twenty percent (20.0%) of the patients had a hypertensive disorder of pregnancy, which is very similar to the 20.7% of patients reported by Koopmans et al. (2014) [14]. Preeclampsia is known to be associated with endothelial dysfunction, coagulation abnormalities, and PPH. In the present study, Placenta Previa, Retained Placenta, Placental Abruption and Multiple Pregnancy were also significant factors causing hemorrhage and have been reported previously as a significant factor causing severe obstetric bleeding.”

“In the current study, management methods revealed adherence to current recommendations based on evidence. All women were treated with utero-tonic (100%), as recommended by the World Health Organization and the Royal College of Obstetricians and Gynaecologists who suggest giving oxytocin as the first-line drug in the treatment of PPH [15]. Tranexamic acid was administered in 87.5% of patients, a rise in use of the recommendation that came from the WOMAN Trial which showed that early administration of tranexamic acid significantly reduced mortality caused by bleeding within three hours of childbirth [16]. Blood transfusion or blood component transfusion was needed in 56.2% of the women and uterine massage was done in 75.0% of the patients. This transfusion rate is lower than that reported by Thawal et al., (2019) indicating that early recognition of hemorrhage and timely pharmacological intervention might have helped to minimize the overall transfusion requirement in this study. Surgical interventions were used conservatively in only a small number of women: 15.0% balloon tamponade, 8.8% uterine compression sutures and 3.8% obstetric hysterectomy. Suarez et al. 2020 have shown that bleeding could be controlled using a uterine balloon with success in almost 80-90% of the patients who were appropriately selected for the procedure, and this reduced the need for hysterectomy. The few cases of definitive surgical

procedures required in the current study suggests successful medical management for achieving hemostasis in the majority of women.

Results of the present study were very good, with 98.8% of women having successful recovery while 1.2% lost their lives. This survival rate exceeds several studies conducted in developing countries with mortality figures between 2% and 6% depending on the availability and access to emergency obstetric care and healthcare. The good results seen in this study may be explained by the early diagnosis, universal use of uterotonics, early use of tranexamic acid, prompt availability of blood transfusion and early surgical intervention when deemed necessary. While there were rare cases of maternal complications, the most common complications included prolonged hospital stay (13.8%) and admission to the Intensive Care Unit (ICU) (16.2%), and less commonly disseminated intravascular coagulation (3.8%) and acute kidney injury (2.5%). Similar to previous studies, Liu et al. (2021) found that severe PPH that required intensive care was often related to high blood loss and multiple obstetric risk factors. In general, the results showed that postpartum hemorrhage remains a significant obstetric emergency; however, multi-disciplinary approach, having a standardized PHC management plan, early detection and correction of maternal anemia, and a thorough screening for the risk of PHC during pregnancy can significantly save the life of the mother and reduce the incidence of severe maternal morbidity in tertiary care centers."

Conclusion

The present study highlights that postpartum hemorrhage remains a major obstetric emergency requiring prompt recognition and timely intervention to prevent adverse maternal outcomes. Women aged 25–29 years, multiparous mothers, and those from rural areas constituted the majority of cases. Primary postpartum hemorrhage was the predominant presentation, with maternal anemia emerging as the most common associated risk factor, followed by prolonged labor and previous cesarean section. Universal use of uterotonic drugs, supported by tranexamic acid, uterine massage, blood transfusion, and selective surgical interventions, resulted in successful management in most patients. The high recovery rate and low maternal mortality observed in this study emphasize the effectiveness of evidence-based management protocols in a tertiary care setting. Strengthening antenatal risk assessment, correction of anemia, early diagnosis, and rapid multidisciplinary intervention can further improve maternal outcomes and reduce complications associated with postpartum hemorrhage.

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