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Original Research Article

Retrospective descriptive study of postpartum hemorrhage: a hospital-based study

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ABSTRACT

Background: Post-partum hemorrhage (PPH) remains one of the leading causes of maternal morbidity and mortality worldwide. Despite improvements in obstetric care, it continues to be a major contributor to preventable maternal deaths. This study aimed to determine the prevalence, etiological factors, risk determinants, management patterns, and maternal outcomes of post-partum hemorrhage in a tertiary care hospital.

Methods: This retrospective descriptive study was conducted in the department of obstetrics and gynecology, Sri Venkateshwaraa Medical College Hospital and Research Centre, from June 2022 to May 2025. A total of 2,510 deliveries were recorded during the study period. Cases of primary PPH were identified according to the World Health Organization definition (blood loss ≥500 ml after vaginal delivery or ≥1000 ml after caesarean section within 24 hours). Data were analysed using descriptive and inferential statistics.

Results: Among 2,510 deliveries, 70 women developed PPH, giving a prevalence of 2.8%. The majority of affected women were aged 20-34 years (82.9%) and multigravidas (52.9%). Uterine atony was the most common cause (78.6%), followed by traumatic causes (17.1%) and retained placental tissue (4.3%). Induced labour (17.1%) and prolonged labour (11.4%) were the leading associated risk factors. Medical management was successful in 90% of cases, while 10% required surgical intervention, including uterine artery ligation, compression sutures, and obstetric hysterectomy. Blood transfusion was required in 45.7% of patients. One maternal death (1.4%) occurred due to disseminated intravascular coagulation and hypovolemic shock.

Conclusions: The prevalence of PPH in this hospital-based study was 2.8%. Uterine atony remained the predominant cause. Early recognition, prompt medical management, and timely intervention to surgical procedures were effective in reducing maternal morbidity and mortality.

Keywords: Maternal outcome, Obstetric hysterectomy, Post-partum hemorrhage, Surgical management, Uterine atony

INTRODUCTION

Postpartum hemorrhage (PPH) remains one of the leading causes of maternal morbidity and mortality worldwide, accounting for nearly one-quarter of all maternal deaths globally.[1] It is defined by the WHO as blood loss of ≥500 ml within 24 hours after vaginal delivery or ≥1000 ml after cesarean section, with severe PPH referring to blood loss exceeding 2000 ml. Clinically, it is classified using the "four T's" model tone (uterine atony), tissue (retained placental products), trauma (genital tract injury), and thrombin (coagulation disorders) which aids in systematic diagnosis and management.[1]

Despite advances in obstetric care, PPH continues to be a major obstetric emergency, especially in low- and middle-income countries where resource limitations impede early recognition and intervention.[2] The global prevalence of PPH varies between 1% and 5% of deliveries, with uterine atony being the predominant cause in 70-90% of cases.[3,6]

Risk factors commonly associated with PPH include prolonged or induced labor, multiple gestations, macrosomia, high parity, operative deliveries, and hypertensive disorders such as preeclampsia.[4,5] Additionally, cesarean deliveries, especially among women with placenta previa or those conceived via assisted reproductive technologies, are linked to significantly higher blood loss.[5]

A hospital record-based study in Tamil Nadu by Ramani and Vijaya reported a PPH prevalence of 0.73%, with uterine atony accounting for 79.1% of cases.[6] Induced labor and prolonged labor were identified as the most frequent risk factors. Similar findings were reported in multicenter studies across Asia and Africa, emphasizing the critical role of timely diagnosis, uterotonic therapy, and stepwise management to prevent fatal outcomes.[7,8]

Given the variability in prevalence and risk profiles across different healthcare settings, localized institutional studies are essential to identify context-specific trends and inform evidence-based protocols. Understanding the etiological distribution, management strategies, and outcomes of PPH in a tertiary care setting can help refine preventive measures, optimize resource allocation, and reduce maternal mortality.

METHODS

This retrospective descriptive study was conducted in the department of obstetrics and gynecology at Sri Venkateshwaraa Medical College Hospital and Research Centre. The study included all women who delivered in the institution between June 2022 and May 2025. Medical records were retrieved from the hospital's medical records department (MRD) after obtaining approval from the institutional ethics committee (IEC No: 202/25).

All women who developed primary postpartum hemorrhage (PPH), defined as a blood loss of ≥500 ml following vaginal delivery or ≥1000 ml following caesarean section within 24 hours of childbirth as per the World Health Organization criteria, were included in the study.[1] Records with incomplete obstetric or postpartum data and those of women referred after delivery elsewhere were excluded.

The sample size was estimated using the prevalence reported by Ramani and Vijaya, which found a 0.73% incidence of PPH in a tertiary hospital.[6]

Using the formula $n = [Z^2 \times p \times (1 - p)]/d^2$ with Z =1.96 (95 % CI), p=0.0073, and d=0.02, the minimum required sample size was approximately 70. However, all available eligible cases during the study period were analyzed.

Data were collected retrospectively using a structured proforma that captured demographic variables (age, parity, socioeconomic status, gestational age), obstetric details (mode and type of delivery, induction and duration of labour, multiple gestation), and maternal comorbidities such as anaemia, pre-eclampsia, polyhydramnios, placenta praevia, or previous PPH. Each case was categorized according to the "four T's" classification- tone (uterine atony), tissue (retained placental products), trauma (genital tract injury), and thrombin (coagulation disorders). Details of management, including medical therapy with uterotonics such as oxytocin, carboprost, methergine, misoprostol, and tranexamic acid, as well as uterine suction tamponade, surgical interventions such as uterine compression sutures, devascular procedures or hysterectomy, were recorded. Outcomes including blood transfusion requirements, length of hospital stay, and maternal morbidity or mortality were also noted.

The data were entered in Microsoft Excel and analyzed using SPSS version 25.0. Descriptive statistics such as mean and percentage were used to summarize the findings. Associations between categorical variables were tested using the Chi-square test or Fisher's exact test where appropriate, and non-parametric data were analyzed using the Mann-Whitney U test. Logistic regression was applied to identify independent predictors of PPH, and a p value <0.05 was considered statistically significant.

Because the study relied exclusively on anonymized hospital records, the ethical risk was minimal, and informed consent was waived by the institutional ethics committee. Patient confidentiality was maintained throughout data handling and analysis.

RESULTS

During the study period from June 2022 to May 2025, a total of 2,510 deliveries were conducted at Sri Venkateshwaraa Medical College Hospital and Research Centre. Among these, 70 women developed post-partum hemorrhage (PPH), yielding a prevalence of 2.8%.

Table 1: Demographic and clinical characteristics of study population (n=70).

Variables	Frequency	Percentage
Age (years)		
<20	10	14.3
20-34	58	82.9
≥35	2	2.8
Gravidity		
Primigravida	33	47.1
Multigravida	37	52.9
Mode of delivery		
Vaginal	65	92.9
Caesarean section	5	7.1
Gestational age (weeks)	38.0±1.6	-
Socioeconomic status (lower/middle)	46/24	65.7/34.3

The majority of affected women (82.9 %) were aged 20-34 years, with a mean±SD age of 26.8±4.1 years.

Adolescents (<20 years) accounted for 14.3%, whereas only 2.8% were older than 35 years. Multigravidas represented 52.9% of cases, and primigravidas comprised 47.1%.

Regarding mode of delivery, vaginal births predominated (92.9%, n=65), while caesarean sections contributed 7.1% (n=5). The average gestational age at delivery was 38±1.6 weeks.

Etiological distribution

Uterine atony was the leading cause, observed in 79 % of cases (n=55). Traumatic causes (cervical, vaginal, or perineal lacerations) accounted for 17% (n=12), and tissue causes such as retained placental fragments for 4% (n=3). No isolated thrombin-related coagulation disorder was documented.

Risk factors

Among identified risk factors, induced labour was most frequent (17%, n=12), followed by prolonged labour (11%, n=8), preeclampsia (7%, n=5), polyhydramnios (4%, n=3), macrosomia (4%, n=3), and multiple gestation (3%, n=2). Other less common contributors included anaemia (3%, n=2) and abruptio placentae (1 case). Nearly half the women (48%) had no clearly identifiable antenatal risk factor.

Table 2: Etiological distribution of postpartum hemorrhage.

Etiology	Frequency	Percentage
Tone (uterine atony)	55	78.6
Tissue (retained placenta or bits)	3	4.3
Trauma (genital tract injury)	12	17.1
Thrombin (coagulopathy)	0	0
Total	70	100

Management pattern

Most patients (90%, n=63) responded to medical management alone, which included sequential use of uterotonics (oxytocin, carboprost, methylergometrine, misoprostol) and tranexamic acid, combined with uterine massage and balloon tamponade where indicated. Surgical management was required in 10% (n=7) of cases, primarily for uncontrolled bleeding following uterine atony or extensive lacerations. Among surgically treated women, uterine compression sutures were performed in 5 cases.

Blood transfusion was required in 46% (n=32), and blood-product transfusion in 21% (n=15). The mean number of transfused packed-cell units per patient was 2.3±1.2.

Table 3: Identified risk factors among PPH cases.

Risk factors	Frequency	Percentage
Induced labour	12	17.1
Prolonged labour	8	11.4
Preeclampsia	5	7.1
Polyhydramnios	3	4.3
Macrosomia	3	4.3
Multiple gestation	2	2.9
Anemia	2	2.9
Abruptio placentae	1	1.4
No identifiable risk factor	34	48.6

Table 4: Management and blood transfusion details.

Parameters	Frequency	Percentage
Type of management		
Medical management only	63	90.0
Surgical management	7	10.0
Hysterectomy	2	2.9
Uterine compression sutures ± vessel ligation	5	7.1
Blood transfusion		
Required	32	45.7
Not required	38	54.3

Table 5: Maternal outcomes and statistical associations.

Variables	Medical management (n=63)	Surgical management (n=7)	P value
Mean age (years)	26.5±4.0	28.2±3.8	0.221
Multigravida (%)	48.0	71.4	0.041*
Induction of labour (%)	15.9	42.8	0.031*
Blood transfusion required (%)	38.0	100.0	<0.001*
Mean hospital stays (days)	4.6±1.7	7.8±2.0	<0.001*
Mortality (%)	0	14.3 (1 case)	0.049*

*Statistically significant (p<0.05).

Maternal outcome

The mean duration of hospital stay was 4.8±1.9 days (range 3-10). 69 women (98.6%) had uneventful recovery, while one maternal death (1.4%) occurred due to disseminated intravascular coagulation (DIC) and hypovolemic shock. No secondary complications such as sepsis, fistula, or renal failure were reported during admission.

Statistical analysis revealed that multigravidity, induction of labour, and blood transfusion requirement were significantly associated with surgical management (p<0.05). Age, mode of delivery, and parity did not show statistically significant differences across treatment groups.

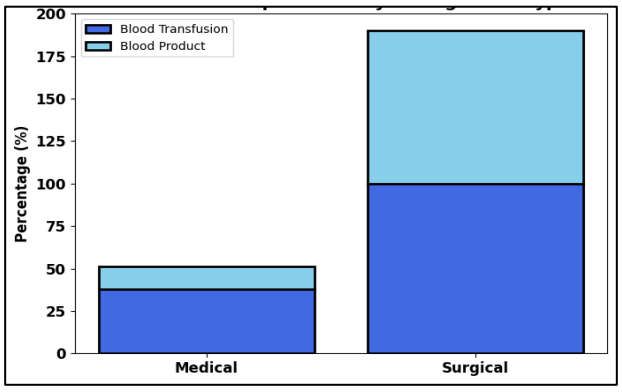

Figure 1: Transfusion requirement by management type.

DISCUSSION

The present study assessed the prevalence, etiological factors, risk determinants, and management outcomes of postpartum hemorrhage (PPH) among women delivered at Sri Venkateshwaraa Medical College Hospital and Research Centre over a three-year period. The prevalence of post-partum hemorrhage in the present study was 2.8%. This is higher than the 0.73% prevalence reported by Ramani and Vijaya in a tertiary-care hospital setting.[6] The present study assessed the prevalence, etiological factors, risk determinants, and management outcomes of postpartum hemorrhage (PPH) among women delivered at Sri Venkateshwaraa Medical College Hospital and Research Centre over a three-year period. The prevalence of post-partum hemorrhage in the present study was 2.8%. This is higher than the 0.73% prevalence reported by Ramani and Vijaya in a tertiary-care hospital setting.6 The difference in prevalence may be attributed to variations in patient referral patterns.

In the present study, uterine atony was the leading cause of PPH (78.6%), followed by trauma (17.1%) and retained placental tissue (4.3%). These findings align with multiple studies that consistently identify uterine atony as the most common etiology, responsible for 70-90% of PPH cases.[3,6] Atony results from failure of the uterus to contract adequately after delivery, which can be aggravated by prolonged labour, induced labour, and multiple gestations.

Among the identifiable risk factors, induced labour (17.1%) and prolonged labour (11.4%) were predominant. These associations have been well-documented by Brinsden et al and Khireddine et al who found that induction of labour- especially with oxytocin or prostaglandins- was associated with a 20-30% increase in PPH risk due to uterine muscle fatigue.[9,10] Other contributing factors observed in this study, such as pre-eclampsia, polyhydramnios, macrosomia, and anaemia, have also been implicated in earlier studies.[4,5]

In this study, medical management alone was successful in 90% of cases, while 10% required surgical intervention. This distribution mirrors that reported by Nanani et al and Rajeshwari et al, who achieved medical control in approximately 80-85% of cases.[7,12] Uterotonic agents-including oxytocin, carboprost, methylergometrine, and misoprostol- remained the mainstay of therapy, complemented by tranexamic acid and mechanical measures such as uterine massage or balloon tamponade. Surgical options, including uterine compression sutures and hysterectomy, were reserved for refractory bleeding.

The need for blood transfusion (45.7%) and blood-product support (21.4%) in this study reflects the severity of blood loss in selected patients and is comparable to the 44% transfusion rate reported by Ramani and Vijaya.[6] The mean hospital stay was longer among surgically managed cases (7.8±2.0 days) than those medically managed (4.6±1.7 days), consistent with findings from Kramer et al and Kumar et al.[8,13]

The case fatality rate was 1.4%, with one maternal death due to disseminated intravascular coagulation (DIC) and hypovolemic shock. This mortality rate is markedly lower than earlier reports from India, such as Dayal et al (21.7%). The case fatality rate was 1.4%, with one maternal death due to disseminated intravascular coagulation (DIC) and hypovolemic shock. This mortality rate is markedly lower than earlier reports from India, such as Dayal et al (21.7%).[7]

The current findings reaffirm the global and national trends that PPH remains preventable in most cases when managed promptly. The observed association of PPH with labour induction, multigravidity, and blood transfusion requirement aligns with previous observational studies.[5,14] The low prevalence and mortality in this study demonstrate the effectiveness of active management of the third stage of labour (AMTSL), adequate staff training, and stepwise escalation protocols as recommended by the WHO.[1]

CONCLUSION

This study highlighted that uterine atony remains the principal cause of postpartum hemorrhage, with induced and prolonged labour as major risk factors. Early recognition, aggressive medical therapy, and timely surgical intervention are key to reducing morbidity and mortality. Institutional readiness and adherence to standardized management protocols can further minimize preventable maternal deaths due to PPH.

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