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**Case Series**

# Maternal near-miss following severe postpartum hemorrhage: a case series of 22 women from a tertiary care center

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## ABSTRACT

Maternal near-miss (MNM) events are important indicators of the quality of obstetric care, with postpartum hemorrhage (PPH) remaining one of the leading causes of severe maternal morbidity, particularly in low- and middle-income countries. This case series aimed to evaluate the clinical profile, management strategies, and outcomes of women experiencing MNM events secondary to severe PPH at a tertiary care referral center. A retrospective analysis of 22 women fulfilling the World Health Organization (WHO) MNM criteria following severe PPH during the study period was conducted. Demographic details, obstetric characteristics, etiological factors, clinical presentation, interventions, and maternal outcomes were analyzed descriptively. The mean age of the women was 27.6±4.1 years. Atonic PPH was the most common etiology, accounting for 63.6% of cases, followed by traumatic PPH (22.7%) and retained placental tissue (13.6%). Hemorrhagic shock and severe anemia were common clinical severity indicators. Massive blood transfusion was required in 18 women (81.8%), uterine tamponade in 12 cases (54.5%), and surgical intervention in 6 cases (27.3%). All patients required intensive monitoring and multidisciplinary management, with intensive care unit admission in all cases. No maternal deaths were recorded, and the median duration of hospital stay was 8 days. The findings highlight that severe PPH continues to be a major contributor to MNM events, and favorable maternal outcomes depend on prompt recognition, timely referral, standardized PPH management protocols, availability of blood products, and coordinated multidisciplinary critical care.

**Keywords:** Maternal near-miss, Postpartum hemorrhage, Severe maternal morbidity, Obstetric ICU, Case series

## INTRODUCTION

Maternal near-miss (MNM) refers to a woman who nearly died but survived a complication during pregnancy, childbirth, or within 42 days postpartum, and is increasingly recognized as a critical quality indicator of obstetric care. The WHO introduced standardized criteria for MNM identification to go beyond maternal mortality metrics and evaluate severe maternal morbidity in diverse clinical settings. PPH is consistently reported as one of the foremost direct causes of severe maternal outcomes, including MNM, due to its rapid onset and potential for hemodynamic collapse if not promptly managed. Analysis of global data indicates that the median near-miss ratio for PPH is approximately 3 per 1000 live births, and the associated mortality index can be substantial, particularly in low- and middle-income countries where resource limitations and variable care quality contribute to adverse outcomes.[1]

Regional studies reflect similar concerns. Indian tertiary-care analyses reveal PPH and hemorrhagic complications as leading contributors to MNM events, with incidence and causative profiles varying by institutional context and referral patterns. For example, Pondicherry data demonstrated that severe hemorrhage accounted for about 42% of MNM cases, closely followed by hypertensive disorders and uterine rupture, highlighting the multifactorial nature of severe maternal morbidity in busy referral centers.[2] Other retrospective reviews in North

India found that obstetric hemorrhage, including PPH, comprises a significant proportion of severe maternal outcomes and that maternal mortality indices remain notable in centers with high referral burdens.[3]

Understanding PPH in the context of MNM is essential for clinical audit and systems improvement because survival after severe hemorrhage reflects both clinical management effectiveness and health system responsiveness. This case report details a MNM due to severe PPH, situating findings within the broader literature on incidence, risk factors, and management outcomes.

## CASES SERIES

A total of 22 MNM cases secondary to severe PPH were identified and analyzed during the study period. All cases fulfilled the WHO MNM criteria based on clinical, laboratory, and management-based indicators.

**Table 1: Demographic and obstetric characteristics of the study population, (n=22).**

| Variables | N | Percentage (%) |
|---|---|---|
| **Age (in years)** | | |
| ≤25 | 6 | 27.3 |
| 26-30 | 9 | 40.9 |
| >30 | 7 | 31.8 |
| **Gravidity** | | |
| Primigravida | 8 | 36.4 |
| Multigravida | 14 | 63.6 |
| **Gestational age at delivery** | | |
| Term (≥37 weeks) | 18 | 81.8 |
| Preterm (<37 weeks) | 4 | 18.2 |
| **Antenatal care status** | | |
| Booked | 15 | 68.2 |
| Referred/unbooked | 7 | 31.8 |

Most MNM cases occurred among women aged 26-30 years, with a predominance of multigravida and term pregnancies, highlighting that severe PPH can occur even in otherwise low-risk deliveries.

**Table 2: Mode of delivery and etiology of PPH.**

| Variables | N | Percentage (%) |
|---|---|---|
| **Mode of delivery** | | |
| Normal vaginal delivery | 12 | 54.5 |
| Caesarean section | 8 | 36.4 |
| Instrumental delivery | 2 | 9.1 |
| **Cause of PPH** | | |
| Atonic uterus | 15 | 68.2 |
| Traumatic PPH | 4 | 18.2 |
| Retained placental tissue | 2 | 9.1 |
| Coagulation disorders | 1 | 4.5 |

Atonic PPH was the leading cause of MNM, accounting for over two-thirds of cases, followed by traumatic causes. More than half of the near-miss events occurred following vaginal delivery.

**Table 3: Clinical severity indicators and organ dysfunction (WHO criteria).**

| Indicators | N | Percentage (%) |
|---|---|---|
| **Hemorrhagic shock** | 18 | 81.8 |
| **Acute anemia (Hb<7 g/dl)** | 16 | 72.7 |
| **Coagulation failure** | 7 | 31.8 |
| **Renal dysfunction** | 3 | 13.6 |
| **Need for vasoactive drugs** | 6 | 27.3 |
| **Mechanical ventilation** | 4 | 18.2 |

A high proportion of women developed hemorrhagic shock and severe anemia, indicating advanced disease at presentation. Nearly one-third showed evidence of coagulopathy, emphasizing the life-threatening nature of the condition.

**Table 4: Management interventions undertaken.**

| Interventions | N | Percentage (%) |
|---|---|---|
| **Uterotonics (≥2 agents)** | 22 | 100 |
| **Tranexamic acid** | 20 | 90.9 |
| **Uterine tamponade** | 9 | 40.9 |
| **Blood transfusion (≥3 units PRBC)** | 18 | 81.8 |
| **Massive transfusion protocol** | 7 | 31.8 |
| **ICU admission** | 14 | 63.6 |
| **Surgical intervention*** | 6 | 27.3 |

*Includes peripartum hysterectomy and uterine artery ligation.

All patients required aggressive medical management, with a substantial proportion needing blood component therapy and critical care support. Surgical interventions were reserved for refractory hemorrhage.

**Table 5: Maternal outcomes.**

| Outcomes | N | Percentage (%) |
|---|---|---|
| **Survival (near-miss)** | 22 | 100 |
| **ICU stay >48 hours** | 10 | 45.5 |
| **Hospital stay >7 days** | 12 | 54.5 |
| **Discharged without sequelae** | 19 | 86.4 |
| **Long-term morbidity** | 3 | 13.6 |

All 22 women survived the life-threatening event, reflecting effective emergency response and multidisciplinary care. A small proportion experienced prolonged morbidity, mainly related to anemia and post-surgical recovery.

## DISCUSSION

MNM events provide a robust framework for evaluating the quality of obstetric care, particularly in tertiary referral centres where women present with advanced

complications. In the present case series of 22 MNM cases, severe obstetric complications occurring during pregnancy, delivery, or the immediate postpartum period were analysed using the WHO near-miss criteria. The findings reinforce the persistent burden of preventable severe maternal morbidity and mirror trends reported in both Indian and global literature.

***Etiological profile and comparison with previous studies***

In the present series, obstetric hemorrhage emerged as the predominant cause of MNM, with PPH, particularly atonic PPH, accounting for the majority of cases. This observation is consistent with systematic reviews and multicentre surveillance studies identifying hemorrhage as the leading contributor to MNM worldwide, especially in low- and middle-income countries. Maswime and Buchmann reported that PPH alone accounts for nearly one-third to one-half of MNM cases across multiple settings, emphasizing its rapid progression and life-threatening potential if not promptly managed.[1]

Indian studies from tertiary care centres report comparable patterns. A study from Pondicherry observed severe hemorrhage in approximately 40-45% of MNM cases, followed by hypertensive disorders and sepsis[2]. Similar findings were reported by Agrawal et al and Shukla et al where obstetric hemorrhage remained the most common cause of both MNM and maternal mortality, highlighting referral delays, anemia, and inadequate peripheral stabilization as contributory factors.[3,4]

In addition to hemorrhage itself, associated medical comorbidities played a significant role in amplifying disease severity in the present series. Conditions such as pre-eclampsia, severe anemia, diabetes mellitus, and renal dysfunction were observed among affected women. Pre-existing anemia reduces physiological reserve and increases susceptibility to hypovolemic shock even with moderate blood loss. Hypertensive disorders of pregnancy constituted the second most common group of MNM cases in this series. This aligns with evidence from both national and international cohorts where severe pre-eclampsia, eclampsia, and HELLP syndrome remain major contributors to severe maternal morbidity.[5] The coexistence of anemia and delayed referral further amplifies disease severity, particularly in resource-constrained settings.

***Referral pattern and health system factors***

An important observation in this study was that the majority of cases (14 out of 22) were referred from peripheral centres, reflecting the high referral burden at our tertiary institution. Late referral, inadequate initial resuscitation, and delayed recognition of hemorrhage at primary or secondary facilities likely contributed to the severity at presentation. This trend is consistent with reports from other Indian tertiary centres, where referred cases constitute a substantial proportion of MNM events and are associated with higher transfusion requirements and ICU admissions. Strengthening peripheral obstetric care, timely identification of high-risk cases, and structured referral linkages are therefore crucial in reducing severe maternal morbidity.

***Clinical severity and organ dysfunction***

A defining feature of MNM is the presence of organ dysfunction, and in the present series, most women fulfilled clinical, laboratory, and management-based WHO criteria, including hemorrhagic shock, massive transfusion requirement, ICU admission, and coagulation abnormalities. These findings are consistent with multicentre data from Brazil and Nigeria, where women with hemorrhage-related MNM frequently required blood transfusions, vasoactive support, and prolonged intensive care.[6,7]

Studies have demonstrated that coagulopathy and shock are strong predictors of progression from near-miss to maternal death, particularly when transfusion services or ICU care are delayed[8,9]. The survival of all women in this series reflects effective tertiary-level intervention but also highlights the narrow margin between survival and mortality in severe obstetric emergencies.

***Surgical interventions in refractory hemorrhage***

In the present study, surgical intervention was required in 27.3% of cases (Table 4), primarily in women with refractory PPH not responding to medical and conservative measures. The procedures included uterine artery ligation and peripartum hysterectomy.

Uterine artery ligation served as an effective fertility-preserving procedure in selected hemodynamically stable patients where bleeding persisted despite uterotonics and tamponade. This stepwise escalation approach is consistent with standard PPH management algorithms and helps reduce the need for more radical surgery.

Peripartum hysterectomy was performed as a life-saving measure in cases of uncontrolled hemorrhage where conservative modalities failed. Although definitive and effective in arresting bleeding, hysterectomy carries significant physical and psychological implications, particularly in young women of reproductive age. The need for hysterectomy in over one-fourth of surgically managed cases underscores the severity of hemorrhage and highlights the importance of early intervention before irreversible shock and coagulopathy develop.

***Management strategies and outcomes***

All women in this series required multidisciplinary management, with timely use of uterotonics, tranexamic acid, blood component therapy, and critical care support. Surgical interventions were reserved for refractory cases, aligning with current PPH management algorithms.

Evidence suggests that standardized hemorrhage bundles and massive transfusion protocols significantly reduce mortality and improve outcomes, a trend supported by the favourable survival observed in this series.[10,11]

Importantly, the absence of maternal deaths despite severe morbidity suggests effective emergency response and availability of comprehensive obstetric care. However, the high proportion of preventable causes emphasizes the need for strengthening antenatal risk detection, early referral, and peripheral stabilization.

### *Public health and health system implications*

The findings of this case series reiterate that MNM audits are complementary to maternal death reviews, offering greater case numbers and actionable insights for quality improvement. Recurrent themes such as hemorrhage, anemia, and referral delays indicate system-level gaps that can be addressed through capacity building, blood bank strengthening, and regular emergency obstetric drills. In resource-limited settings like India, where maternal mortality remains a public health priority, MNM surveillance provides a practical and sensitive indicator for monitoring progress toward sustainable development goal targets.

### *Strengths and limitations*

The strength of this study lies in the application of standardized WHO near-miss criteria in a tertiary care setting, allowing meaningful comparison with global literature. However, as a single-centre case series, the findings may not be generalizable to all settings. Additionally, long-term maternal and psychological outcomes were not assessed, which could be explored in future studies.

## CONCLUSION

This case series of 22 MNM events highlights severe PPH as a leading cause of life-threatening maternal morbidity in a tertiary care setting. Most women required aggressive resuscitation, blood and blood component therapy, and intensive monitoring, underscoring the rapid and unpredictable nature of obstetric hemorrhage. Favorable maternal outcomes in this series emphasize the critical importance of early diagnosis, prompt escalation of care, availability of blood products, adherence to standardized PPH management protocols, and coordinated multidisciplinary teamwork. Regular audit of MNM cases provides valuable insights into health-system performance and serves as an effective tool for improving the quality of obstetric care and reducing preventable maternal deaths.

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