



## RESEARCH ARTICLE

## Uterine balloon tamponade in the management of refractory postpartum haemorrhage: A Prospective Observational Study

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### ABSTRACT

**Background:** Postpartum hemorrhage (PPH) remains a leading cause of maternal morbidity and mortality, particularly in low-resource settings. Uterine balloon tamponade (UBT) has emerged as a simple, cost-effective intervention for refractory PPH.

**Objective:** To evaluate the effectiveness and safety of uterine balloon tamponade in managing refractory postpartum hemorrhage.

**Methods:** This prospective observational study was conducted in the Department of Obstetrics & Gynaecology at PMCH, Patna, from March 2025 to February 2026. A total of 51 women with refractory PPH not responding to first-line medical management were included. Data regarding demographic profile, cause of PPH, mode of delivery, success rate of UBT, need for surgical intervention, and complications were recorded and analysed.

**Results:** The success rate of UBT in controlling hemorrhage was 82.4%. Uterine atony was the most common cause (64.7%). Surgical intervention was avoided in 76.5% of cases. Complications were minimal, with pain (11.8%) being the most common complication, followed by infection (7.8%) and balloon displacement (5.9%). Statistically significant association was found between early UBT insertion and successful outcome ( $p < 0.05$ ).

**Conclusion:** UBT is an effective, safe, and minimally invasive method for managing refractory PPH and can significantly reduce the need for surgical interventions.

**Keywords:** Postpartum hemorrhage (PPH), Uterine balloon tamponade (UBT), refractory PPH, surgical interventions

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### INTRODUCTION

Postpartum haemorrhage (PPH) is a significant obstetric emergency and one of the top causes of maternal mortality worldwide especially in underdeveloped countries such as India. It is described as a blood loss of more than 500 mL after vaginal delivery or 1000 mL after caesarean section. Despite improvements in obstetric care, PPH remains a significant clinical problem since it develops rapidly and can be life threatening. Uterine atony accounts for over 60–70% of causes of PPH, the most prevalent being retained placental tissue, damage to the genital tract and coagulation problems. PPH is usually treated in a stepwise manner, commencing with uterotonics such as oxytocin, methergin and prostaglandins. However, some people will not react to medical therapy and are classified as having refractory PPH[1].

Management of refractory PPH has traditionally been surgical, with procedures such as uterine artery ligation, compression sutures, or hysterectomy being employed. Although effective, these procedures require surgical competence, are associated with higher morbidity, and may result in loss of future fertility. In such situations,

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uterine balloon tamponade (UBT) has emerged as a useful alternative. It works by applying direct pressure within the uterine cavity to reduce bleeding. In our setting, the Haemolock Postpartum Balloon Catheter is routinely

used as the uterine balloon tamponade device for the management of refractory PPH. Various devices such as the Bakri balloon, condom catheter balloon, and modified Foley catheter are employed worldwide, particularly in low-resource settings[2].

UBT has many advantages such as ease of usage, less invasive, cost effective and preservation of fertility. In addition, it may be immediately deployed in emergency situations and does not require sophisticated surgical expertise[3]. The objective of the study is to examine the efficacy, safety and results of uterine balloon tamponade in the management of refractory postpartum haemorrhage in the tertiary care setup.

## METHODS

- **Study Design:** Prospective observational study
- **Setting:** Department of Obstetrics & Gynaecology, PMCH, Patna
- **Duration:** March 2025 – February 2026 (1 year)
- **Sample Size:** 51 patients

## Inclusion Criteria

- Women with postpartum haemorrhage not responding to uterotonics
- Age 18–40 years

## Exclusion Criteria

- Suspected uterine rupture
- Traumatic PPH
- Uterine Sepsis
- Uterine Anomaly

## Procedure

- UBT inserted using Haemolock balloon catheter under

aseptic precautions after failure of uterotonic therapy.

- Balloon inflated gradually with 250–500 mL sterile saline according to uterine response. Continuous monitoring of pulse, blood pressure, urine output, and vaginal bleeding was performed.
- Balloon retained for 12–24 hours and removed gradually after stabilization.

## Data Collected

- Age, parity
- Mode of delivery
- Cause of PPH
- Time to UBT insertion
- Outcome (success/failure)
- Need for surgery
- Complications

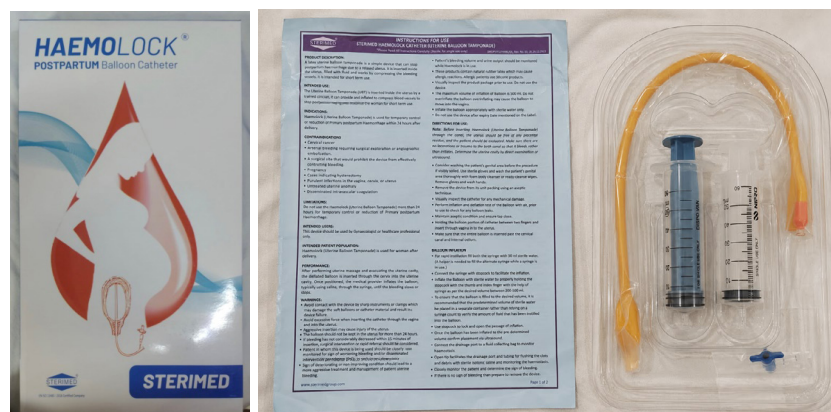
## Statistical Analysis

The connection of categorical variables of study groups was assessed by Chi-square test. The data were reported as frequencies and percentages and comparisons were made appropriately. All analyses were judged statistically significant for a p-value < 0.05.

## RESULTS

**Table 1:** Demographic Characteristics

| Variable  | Frequency (n=51) | Percentage (%) | p-value |
|-----------|------------------|----------------|---------|
| Age <25   | 18               | 35.3           | 0.12    |
| Age 25–30 | 22               | 43.1           |         |
| Age >30   | 11               | 21.6           |         |
| Primipara | 21               | 41.2           | 0.08    |
| Multipara | 30               | 58.8           |         |



**Figure 1:** Components of Haemolock UBT. The kit contents: UBT catheter, stopcock, syringe, and instruction sheet

**Table 2:** Causes of PPH

| Cause                     | Frequency | Percentage | p-value |
|---------------------------|-----------|------------|---------|
| Uterine atony             | 33        | 64.7       | 0.01    |
| Coagulopathy              | 7         | 13.7       |         |
| Retained placental tissue | 11        | 21.6       |         |

**Table 3:** Outcome of UBT

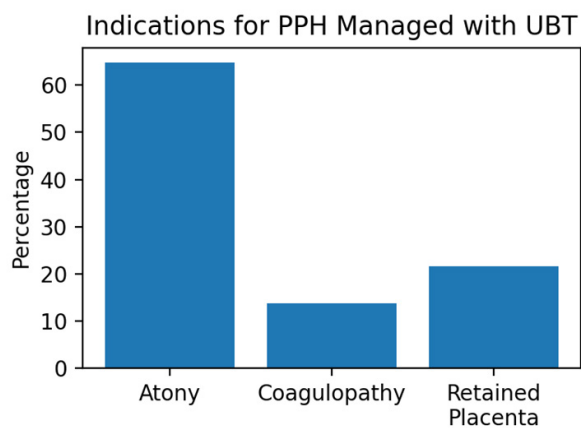
| Outcome | Frequency | Percentage | p-value |
|---------|-----------|------------|---------|
| Success | 42        | 82.4       | 0.002   |
| Failure | 9         | 17.6       |         |

**Table 4:** Complications

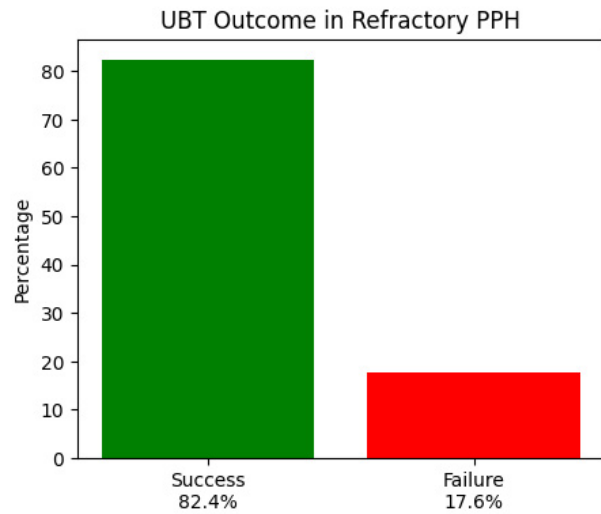
| Complication         | Frequency | Percentage | p-value |
|----------------------|-----------|------------|---------|
| Infection            | 4         | 7.8        | 0.09    |
| Pain                 | 6         | 11.8       |         |
| Balloon displacement | 3         | 5.9        |         |
| No complication      | 38        | 74.5       |         |

**Table 5:** Mode of delivery

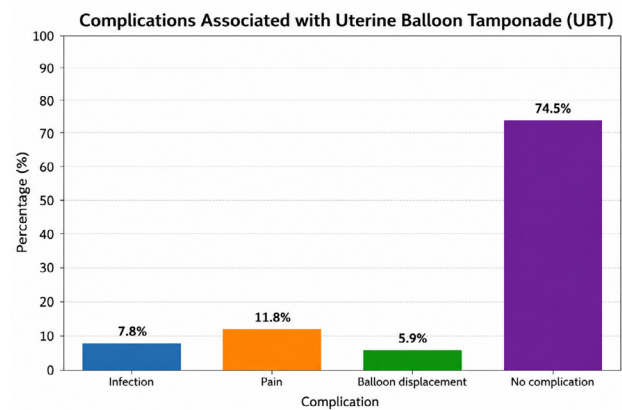
| Mode of delivery | Frequency | Percentage |
|------------------|-----------|------------|
| Vaginal          | 36        | 70.6       |
| Caesarean        | 15        | 29.4       |



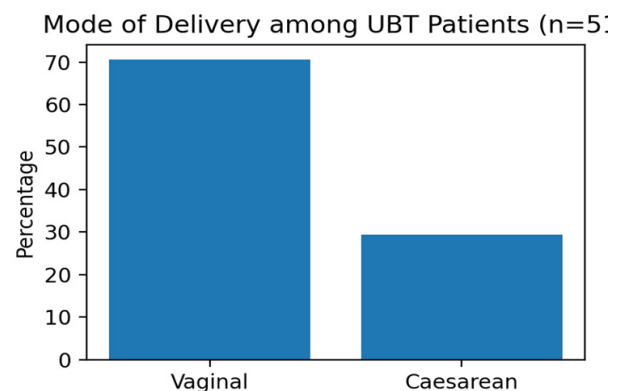
**Figure 2:** Indications for PPH managed with UBT



**Figure 3:** UBT outcome in refractory PPH



**Figure 4:** Complications associated with uterine balloon tamponade (UBT)



**Figure 5:** Mode of delivery among UBT patients

## DISCUSSION

Postpartum haemorrhage remains one of the leading causes of maternal morbidity and mortality, especially in low-resource settings. The present study demonstrated that uterine balloon tamponade using Haemolock balloon catheter is highly effective in controlling refractory postpartum haemorrhage with a success rate of 82.4%, which is comparable to previously published studies. Uterine atony was the most common cause of PPH, consistent with global evidence. Early insertion of the balloon catheter (mean time to UBT insertion:  $18.6 \pm 6.4$  minutes) significantly improved outcomes and reduced the need for surgical intervention. Nearly three-fourths of the women avoided major surgery, thereby preserving fertility and reducing postoperative complications. Complications associated with uterine balloon tamponade were minimal and manageable. Pain was the most common complication (11.8%), followed by infection (7.8%) and balloon displacement (5.9%). Most complications were minor and responded to conservative management without significant morbidity. Importantly, 74.5% of women experienced no complications following UBT insertion, supporting the safety profile of this intervention. The Haemolock balloon catheter was found to be economical, simple to use, and highly suitable for emergency use in tertiary and peripheral healthcare settings.

Approximately 76.5% of patients did not require surgical intervention, therefore avoiding the risks of anaesthesia, infection and potential long-term reproductive sequelae such as infertility. This is especially significant in women of reproductive age who want future fertility. The complication rate of UBT was minimal[4-6]. The most prevalent consequence was pain (11.8%) followed by infection (7.8%) and balloon displacement (5.9%). These problems were treatable and did not lead to severe morbidity. The minimal complication rate also confirms the safety profile of UBT. Comparison with other trials shows similar success rates between 75% and 90% and so reinforces the reliability of this intervention. Among the 51 women who underwent uterine balloon tamponade for refractory postpartum haemorrhage, 36 (70.6%) delivered vaginally, while 15 (29.4%) underwent caesarean section. Vaginal delivery was the more common mode of delivery among patients requiring UBT. However, the relatively high proportion of caesarean deliveries indicates that postpartum haemorrhage remains a significant complication across both delivery methods. Use of Haemolock balloon catheter proved highly useful in resource-limited settings because

of its affordability, easy availability, rapid insertion, and fertility-preserving advantage[7].

UBT is effective, but not without its restrictions. 17.6% of the cases failed and surgical intervention was needed including uterine artery ligation or compression sutures or hysterectomy. No maternal death was recorded in the present study. Failure may be due to delayed insertion, and considerable damage to the vaginal canal. Prompt training of healthcare providers on UBT can lead to substantially better maternal outcomes[8]. Integration of UBT into standard protocols for management of PPH and availability in peripheral healthcare centres will further reduce maternal mortality. This study supports the fact that uterine balloon tamponade is an invaluable therapy in the management of refractory postpartum haemorrhage especially in resource limited settings[9]

## CONCLUSION

Uterine balloon tamponade using Haemolock balloon catheter is an effective, safe, minimally invasive, and fertility-preserving intervention for refractory postpartum haemorrhage. The high success rate observed in this study highlights its ability to rapidly control bleeding and significantly reduce the need for major surgical procedures. Early diagnosis and timely insertion are associated with better maternal outcomes. The procedure is economical, technically simple, and suitable for use in both tertiary care hospitals and resource-limited healthcare centres. Incorporation of UBT into standard postpartum haemorrhage protocols and adequate training of healthcare workers can further reduce maternal morbidity.

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