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Implementation of Postpartum Hemorrage Emergency Care Using Bundle Approach at a Tertiary Care Hospital in Bangladesh

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Abstract **Original Research Article**

***Background*:** Postpartum hemorrhage (PPH) is a leading cause of maternal mortality and morbidity globally, especially in low- and middle-income countries like Bangladesh. Despite advancements in maternal healthcare, PPH management remains challenging due to inadequate resources and infrastructure. The bundle approach, which involves implementing a set of evidence-based interventions simultaneously, has emerged as a promising strategy to enhance PPH management and reduce maternal mortality. ***Objective*:** This study aims to evaluate the implementation process of a PPH care bundle at a tertiary care hospital in Bangladesh, focusing on its effectiveness, challenges, and outcomes. ***Method*:** Implementation of PPH EmC care using bundle approach was done over a period of about 24 months from December 2021 to December 2023. To observe the efficacy of Bundle Approach, we compared the outcome of initial 6 months (December 2021 to may 2022) with last 6 months of implementation period (July 2023 to December 2023). ***Results*:** Post-implementation, there was a significant reduction in blood transfusion rates (decreased by 60%, p=0.0319) and the need for radical surgical interventions, such as hysterectomies (reduced from 27.27% to 11.5%, p=0.032). The use of tranexamic acid increased significantly (from 12.72% to 32.69%, p=0.041). ***Conclusion*:** The implementation of the PPH EmC care using Bundle Approach at the tertiary care hospital in Bangladesh resulted in significant improvements in the management of PPH, particularly in reducing blood transfusions and radical surgeries. Despite these improvements, challenges such as increased severity of PPH cases suggest the need for ongoing refinement of the bundle approach. Further research is needed to fully assess its impact and address remaining challenges.

Keywords: Postpartum hemorrhage, care bundles, maternal mortality.

INTRODUCTION

Postpartum hemorrhage (PPH) remains a leading cause of maternal mortality and morbidity worldwide, particularly in low- and middle-income countries like Bangladesh. Despite advances in maternal healthcare, PPH continues to pose significant challenges in resource-limited settings, where timely and effective interventions are often hampered by inadequate infrastructure, limited access to trained healthcare providers, and insufficient supplies [1-3]. In response to these challenges, the implementation of a bundle approach for managing PPH in tertiary care hospitals represents a promising strategy to enhance the quality of care and reduce maternal mortality.

The bundle approach to emergency care is a systematic strategy that involves the simultaneous implementation of a set of evidence-based interventions. These interventions are designed to be applied consistently and in a coordinated manner to improve patient outcomes. In the context of PPH, the PPH EmC care using Bundle Approach typically includes timely administration of uterotonics, immediate and accurate assessment of blood loss, early initiation of resuscitation measures, and the prompt identification and management of the underlying causes of hemorrhage [4-7]. By standardizing care processes and ensuring that all critical steps are taken promptly, the bundle approach can

significantly improve the management of PPH and reduce the associated risks.

Implementing the bundle approach in a tertiary care hospital in Bangladesh presents both opportunities and challenges. Tertiary care hospitals in the country are often the last resort for high-risk pregnancies and complicated deliveries, making them crucial settings for the effective management of PPH. However, these hospitals often face challenges such as overcrowding, limited resources, and varying levels of staff training, all of which can impact the successful implementation of the bundle approach. Understanding the specific context of the healthcare system in Bangladesh is essential to tailoring the bundle approach to the local needs and ensuring its effectiveness.

OBJECTIVE

This initiative aims to document and analyze the implementation process of the PPH EmC care using Bundle Approach in a tertiary care hospital in Bangladesh, highlighting both the successes and the obstacles encountered.

METHODOLOGY

Study Duration

Implementation of PPH EmC care using bundle approach was done over a period of about 24 months from December 2021 to December 2023. To observe the efficacy of Bundle Approach, we compared the outcome of initial 6 months (December 2021 to May 2022) with last 6 months of implementation period (July 2023 to December 2023). The extended duration allowed for comprehensive data collection and analysis before and after the implementation of the Postpartum Hemorrhage Emergency Care (PPH EmC) Bundle Approach.

Study Participants

Inclusion Criteria

- All women who developed postpartum hemorrhage (PPH) within the first 24 hours following delivery were included in the study.

Exclusion Criteria

- Women who experienced late or secondary PPH beyond the first 24 hours postpartum.
- Women presenting with first-trimester bleeding episodes.
- Patients who declined to participate in the study.

Study Size

A non-probability convenience sampling technique was employed to enroll participants. Eligible subjects were selected based on the predefined inclusion and exclusion criteria until the desired sample size was achieved. This approach facilitated the efficient collection of relevant data within the study period.

Variables

Independent Variables

The study considered several independent variables to assess their impact on PPH outcomes:

- **Demographic Parameters:** Age, parity, and gestational age at delivery.
- **Clinical Factors:** Cause of PPH (e.g., uterine atony, retained placenta), severity of hemorrhage, and mode of delivery (spontaneous vaginal delivery or cesarean section).
- **Referral Status:** Whether the patient was directly admitted to the hospital or referred from another healthcare facility.
- **Cesarean Delivery Details:** Classification of cesarean sections as primary or repeat procedures.

Outcome Variables

The outcomes were evaluated using the following dependent variables:

- **Shock Index at Admission:** Calculated as heart rate divided by systolic blood pressure to assess hemodynamic stability.
- **Management Interventions:** Type and effectiveness of medical and surgical interventions utilized.
- **Use of Medications:** Administration of additional uterotonics and tranexamic acid.
- **Blood Transfusions:** Requirement for blood and blood component transfusions.
- **Surgical Procedures:** Necessity for radical surgical interventions such as hysterectomy.
- **Maternal Morbidity and Mortality:** Incidence rates before and after implementing the PPH EmC care using Bundle Approach.

Data Collection and Follow-Up

The study compared maternal morbidity and mortality related to PPH six months before and after the implementation of the PPH EmC care using Bundle Approach, which was introduced in July 2022.

- **Pre-Implementation Data:** Collected retrospectively from hospital records between January 2022 and June 2022.
- **Post-Implementation Data:** Gathered prospectively from August 2022 to January 2023 following the training and implementation of the PPH EmC care using Bundle Approach.

Blood loss was quantified using both objective measures (e.g., calibrated collection devices) and subjective assessments (e.g., estimation based on soaked materials and visual inspection). PPH severity was categorized as follows:

- **Mild PPH:** Blood loss between 500 mL and 700 mL.
- **Moderate PPH:** Blood loss between 700 mL and 1000 mL.

- **Severe PPH:** Blood loss exceeding 1000 mL.

For patients referred from other facilities, detailed delivery information was often unavailable; however, their critical condition upon arrival warranted immediate inclusion and management according to study protocols.

All participating women were monitored for a minimum follow-up period of two months postpartum to assess recovery and identify any delayed complications related to PPH.

Implementation of the PPH EmC care using Bundle Approach

The PPH EmC care using Bundle Approach was introduced through a structured, multi-phase training program tailored to the Bangladeshi healthcare context:

Phase 1: Training of Trainers (TOT)

- Collaborations were established between the Bangladesh Society of Obstetricians and Gynaecologists (BSOG), the Ministry of Health and Family Welfare (MoHFW), and international partners such as the World Health Organization (WHO).
- Senior obstetricians, gynecologists, and nurse educators from the tertiary care hospital underwent intensive TOT sessions focusing on evidence-based PPH management protocols.

Phase 2: Hospital Staff Training

- The trained professionals from Phase 1 conducted comprehensive training sessions for resident doctors, staff nurses, midwives, and support staff within the hospital.
- Training modules included theoretical knowledge, practical skills workshops, and simulation exercises to enhance readiness and response to PPH emergencies.

Phase 3: Regional Healthcare Provider Training

- Extending beyond the tertiary care setting, healthcare providers from district hospitals, Upazila health complexes, and community clinics were trained.
- Emphasis was placed on standardizing PPH management practices across various levels of the healthcare system to ensure consistency and improve referral processes.

Statistical Analysis

Data were analyzed using IBM SPSS Statistics for Windows, Version 26.0 (IBM Corp., Armonk, NY, USA). The analysis included:

- **Descriptive Statistics:** To summarize demographic and clinical characteristics of the study population.
- **Normality Testing:** Employed to assess data distribution using tests such as the Shapiro-Wilk test.
- **Inferential Statistics:**
  - **Chi-Square Test:** Applied to compare categorical variables between pre- and post-implementation groups.
  - **Fisher's Exact Test:** Used when sample sizes were small or expected frequencies were low.
  - **Independent t-tests or Mann-Whitney U tests:** Utilized for comparing continuous variables based on data distribution.
- **Significance Level:** A p-value of ≤ 0.05 was considered statistically significant for all tests performed.

Efforts were made to minimize bias through standardized data collection procedures and consistent application of inclusion and exclusion criteria. However, retrospective data collection for the pre-implementation phase may have inherent limitations, which were acknowledged and considered during analysis and interpretation of results.

RESULTS

Gestational age distribution was similar, with the majority of patients in both groups delivering at more than 36 weeks (63.63% PRE vs. 65.38% POST, p=0.995). Parity showed a slight increase in primigravida cases post-implementation (41.81% PRE vs. 51.92% POST, p=0.356), but this difference was not statistically significant. Most patients had singleton pregnancies in both groups (98.18% PRE vs. 98.08% POST, p=1). The prevalence of underlying diagnoses such as severe anemia, hypertensive disorders, and maternal sepsis also remained largely unchanged across the two periods. The distribution of admitted versus referred patients was similar, with a slight increase in admitted patients post-implementation (72.72% PRE vs. 78.84% POST, p=0.46).

Table 1: Demographic variables of patients with PPH

Variable		Outcome of initial 6 months (December 2021 to May 2022) (n=55), n (%)	Outcome of last 6 months of implementation period (July 2023 to December 2023) (n=52), n (%)	p-Value
Gestational age	<28 weeks	3 (5.45%)	3(5.77%)	0.995
	28–32 weeks	6 (10.91%)	5 (9.62%)	
	32–36 weeks	11 (20%)	10 (19.23%)	
	>36 weeks	35 (63.63%)	34 (65.38%)	

Variable		Outcome of initial 6 months (December 2021 to May 2022) (n=55), n (%)	Outcome of last 6 months of implementation period (July 2023 to December 2023) (n=52), n (%)	p-Value
Parity	Primigravida	23 (41.81 %)	27 (51.92%)	0.356
	G 2	12 (21.81%)	11 (21.15%)	
	G 3	18 (32.72%)	10 (19.23%)	
	G 4	2 (3.63 %%)	4 (7.69%)	
Gestation	Singleton	54 (98.18%)	51 (98.08%)	1
	Twins	1 (1.82%)	1 (1.92%)	
Diagnosis	Severe anaemia	22 (40%)	18 (34.62%)	0.99
	Hypertensive disorders of pregnancy	8 (14.55%)	7 (13.46%)	
	Maternal sepsis	5 (9.09%)	4 (7.69%)	
	PROM	6 (10.90%)	7 (13.46%)	
	Thrombocytopenia	5 (9.09%)	6 (11.54%)	
	Antepartum hemorrhage	4 (7.27%)	5 (9.09%)	
	Preterm labor	3 (5.45%)	3 (5.77%)	
	Other	2 (3.6%)	2 (3.85%)	
Distribution of Admitted/Referral patients	Admitted patient	40 (72.72%)	41 (78.84%)	0.46
	Referred patient	15 (27.27%)	11 (21.15%)	
	Moderate	10 (18.18%)	1 (1.92%)	
	Severe	16 (29.09%)	19 (36.54%)	

The mode of delivery, whether spontaneous vaginal delivery (SVD) or cesarean delivery (CD), remained relatively consistent between the pre- and post-implementation groups, with SVD slightly decreasing from 58.2% to 53.8% and CD slightly increasing from 41.8% to 46.1% (p=0.65). Additionally, the proportion of primary cesarean deliveries compared to repeat cesarean deliveries did not significantly differ between the two periods, with primary cesareans accounting for 65.2% pre-implementation and 58.3% post-implementation (p=0.63).

Table 2: Delivery of patients with PPH

Outcome of initial 6 months, n (%)			Outcome of last 6 months of implementation period (n=52), n (%)	p-Value
Mode of delivery	SVD	32 (58.2%)	28 (53.8%)	0.65
	CD	23 (41.8%)	24 (46.1%)	
Order of Cesarean delivery	Primary	15 (65.2%)	14 (58.3%)	0.63
	Repeat	8 (34.8%)	10 (41.7%)	

Atonicity remained the leading cause of PPH in both the pre- and post-implementation groups, though slightly decreased in the post-group (90.91% to 82.69%). The use of tranexamic acid significantly increased from 12.72% to 32.69% (p=0.041), reflecting a shift in medical management practices. Additionally, the need for radical operations, such as hysterectomies, decreased significantly from 14.54% to 1.92% (p=0.032). Blood transfusion patterns also changed, with a reduction in the combined use of PRBC and FFP (49.09% to 7.69%, p=0.032), although the use of PRBC alone and the need for transfusions exceeding four units did not differ significantly between the two periods. While these findings suggest improvements in certain aspects of PPH management, other factors, such as shock index at admission, did not show significant differences, indicating the need for further research to assess the full impact of the care bundle.

Table 3: Interventions done in the management of PPH

		Outcome of initial 6 months, n (%)	Outcome of last 6 months of implementation period (n=52), n (%)	P value
PPH etiology	Atonicity	50 (90.91%)	43 (82.69%)	0.47
	Trauma	3 (5.45%)	4 (7.69%)	
	Tissue	1(1.82%)	4 (7.69%)	
	Coagulation disorders	1 (1.82%)	1 (1.92%)	
Management	Medical alone	28 (50.91%)	34 (68.38%)	0.186

		Outcome of initial 6 months, n (%)	Outcome of last 6 months of implementation period (n=52), n (%)	P value
	Medical and surgical both	27 (49.09%)	18 (34.62%)	
Use of additional uterotonics		5 (9.1%)	5 (9.6%)	1
Use of tranexamic acid		7 (12.72%)	17 (32.69%)	0.041
Blood transfusion and components	PRBC	22 (40%)	15 (28.85%)	0.032
	FFP	5 (9.09%)	1 (1.92%)	
	PRBC + FFP	27 (49.09%)	4 (7.69%)	
Blood transfusion >4 units of PRBC		3 (5.45%)	4 (7.69%)	0.71
Radical operation (hysterectomies)		8 (14.54%)	1 (1.92%)	0.032
	0.7-0.9	28 (50.90%)	32 (61.53 %)	
Shock Index at admission	1.0-2.0	26 (47.27%)	15 (28.84%)	0.06
	>2	1 (1.81%)	5 (9.61%)	

DISCUSSION

Care bundles are designed to deliver high-quality clinical care by ensuring adherence to specific guidelines and procedural enhancements. In 2017, the World Health Organization (WHO) introduced two key care bundles for the management of postpartum hemorrhage (PPH): the "initial response to PPH bundle" and the "response to refractory PPH bundle." The initial PPH first response bundle includes interventions such as uterotonics, intravenous fluids, tranexamic acid (TXA), and uterine massage. These are intended to be implemented alongside supportive measures like advocacy, training, teamwork, communication, respectful care, and the application of best clinical practices, similar to other clinical bundles [8, 9].

One of the most significant studies evaluating the effectiveness of an obstetric hemorrhage care bundle was conducted by the California Maternal Quality Care Collaborative. This study introduced a comprehensive maternal hemorrhage protocol across a health care system encompassing 29 delivery units with over 60,000 births annually [10]. The facilities involved ranged from small rural centers with around 200 deliveries per year to large urban hospitals with over 6,000 births annually. The primary outcomes measured were the total number of blood transfusions and peripartum hysterectomies. Notably, there was a reduction in these outcomes from 35.9 per 1,000 deliveries at baseline to 26.6 per 1,000 deliveries within 10 months post-implementation.

There is limited evidence regarding the challenges of implementing care bundles in low- and middle-income countries. To address this gap, we conducted a comparative study of PPH cases initial 6 months & last 6 months of implementation of the care bundle approach at our institution.

Following the implementation of the PPH care bundle, there was a significant reduction in the number of patients requiring blood transfusions, with blood product usage decreasing by 60% (p=0.0319). This reduction is particularly critical in low-income countries where the availability and utilization of blood products are key factors in PPH mortality. Some patients, especially those with severe baseline anemia, receive transfusions primarily for symptomatic relief [11]. Additionally, the number of women requiring radical surgical interventions, such as hysterectomies, was significantly reduced by more than half, from 27.27% in the pre-implementation group to 11.5% in the post-implementation group (p=0.032). Blood transfusions and radical surgeries are commonly used as markers of maternal morbidity associated with PPH.

Successfully implementing the care bundle approach requires behavioral motivation and educational support among healthcare workers, as well as clinical collaboration across multiple disciplines. The supportive elements, including sustainable guidelines, positive leadership, resource availability, proper resource utilization, training of medical staff, teamwork, communication, record-keeping, and a focus on quality care, are crucial to the success of care bundles. Hospitals often face challenges in adopting these recommendations due to constraints in time, resources, multidisciplinary teamwork, and the need for cultural shifts in work practices.

CONCLUSION

This study aimed to assess whether implementing a PPH EmC care using Bundle Approach could reduce maternal morbidity and mortality in our institution. The ultimate objective of establishing a bleeding management bundle was to decrease the overall incidence of PPH and/or the total volume of blood lost per patient. While we observed some improvements in PPH management following the bundle care training, the differences in outcomes were not always statistically significant due to various confounding factors. Nonetheless, PPH EmC care using Bundle Approach hold promise for improving PPH-related morbidity by

utilizing fewer resources and requiring fewer interventions. Further research with a larger patient population, designed to minimize confounding variables, is necessary to more accurately determine the effectiveness of PPH EmC care using Bundle Approach.

REFERENCE

1. AbouZahr, C. (2003). Global burden of maternal death and disability. *Br Med Bull*, *67*, 1–11. [PubMed] [Google Scholar]
2. Trends in maternal mortality 2000 to 2017: estimates by WHO, UNICEF, UNFPA, World Bank Group and the United Nations Population Division. [Apr; 2022]; https://apps.who.int/iris/handle/10665/327596 2022
3. Weeks, A. (2015). The prevention and treatment of postpartum haemorrhage: what do we know, and where do we go to next? *BJOG*, *122*, 202–210. [PubMed] [Google Scholar]
4. Habitamu, D., Goshu, Y. A., & Zeleke, L. B. (2019). The magnitude and associated factors of postpartum hemorrhage among mothers who delivered at Debre Tabor general hospital 2018. *BMC Res Notes*, *12*, 618. [PMC free article] [PubMed] [Google Scholar]
5. Ngwenya, S. (2016). Postpartum hemorrhage: incidence, risk factors, and outcomes in a low-resource setting. https://doi.org/10.2147/IJWH.S119232. *Int J Womens Health*, *8*, 647–650. [PMC free article] [PubMed] [Google Scholar]
6. Amanuel, T., Dache, A., & Dona, A. (2021). Postpartum hemorrhage and its associated factors among women who gave birth at Yirgalem General Hospital, Sidama Regional State, Ethiopia. *Health Serv Res Manag Epidemiol*, *8*, 23333928211062777. https://doi.org/10.1177/23333928211062777. [PMC free article] [PubMed] [Google Scholar]
7. Sheldon, W. R., Blum, J., Vogel, J. P., Souza, J. P., Gülmezoglu, A. M., & Winikoff, B. (2014). Postpartum haemorrhage management, risks, and maternal outcomes: findings from the World Health Organization Multicountry Survey on Maternal and Newborn Health. *BJOG*, *121*(Suppl 1), 5–13. [PubMed] [Google Scholar]
8. Guidance Note on Prevention and Management of Postpartum Haemorrhage. [Apr; 2022]; https://www.nhm.gov.in/images/pdf/programmes/maternal-health/guidelines/Guidance_Note_on_Prevention_2022
9. Save Mothers. [Apr; 2022]; https://savemothers.org/resources/ 2022
10. Bohren, M. A., Lorencatto, F., Coomarasamy, A., Althabe, F., Devall, A. J., Evans, C., ... & Miller, S. (2021). Formative research to design an implementation strategy for a postpartum hemorrhage initial response treatment bundle (E-MOTIVE): study protocol. *Reproductive health*, *18*, 1-16. [PMC free article] [PubMed] [Google Scholar]
11. Althabe, F., Therrien, M. N., Pingray, V., Hermida, J., Gülmezoglu, A. M., Armbruster, D., ... & Miller, S. (2020). Postpartum hemorrhage care bundles to improve adherence to guidelines: a WHO technical consultation. *International Journal of Gynecology & Obstetrics*, *148*(3), 290-299. [PMC free article] [PubMed] [Google Scholar]