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To study implementation of PPH bundle approach for the management of postpartum haemorrhage at a tertiary care centre

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Abstract

Background & Methods: The aim of the study is to study implementation of PPH bundle approach for the management of Postpartum Haemorrhage. PPH bundle includes first and response to refractory PPH bundles. The First response bundle includes uterine massage, IV fluids, uterotonics and tranexamic acid[13]. In between the first and second bundle, there is a supportive and symptomatic approach which includes checking for tears and if present repairing tears and evacuation of the bladder and emptying the uterus if any tissues are present. Response to Refractory PPH bundle includes aortic and bimanual compression, intrauterine balloon tamponade and use of non-pneumatic anti shock garments supported by blood transfusions, surgical interventions and referral.

Results: Before the implementation of the PPH bundle approach, 183 patients (94.81%) who developed PPH were alive and discharged and 10(5.18%) died. After the implementation of the bundle approach,164(98.79%) patients were alive and discharged and patients died due to PPH reduced to 02(1.20%) ($p = 0.037$). The data indicates a significant improvement in patient outcomes and a significant reduction in maternal mortality following the implementation of the PPH bundle approach.

Conclusion: Postpartum Haemorrhage (PPH) bundle at our tertiary care centre have significantly improved the management and outcomes of PPH cases. This study, through a rigorous combination of prospective and retrospective analysis, has highlighted several critical areas of success. The consistent demographic profile and delivery modes suggest that the PPH bundle is broadly applicable and effective across diverse patient groups. Better stabilization of patients upon admission, as indicated by the improved shock index, underscores the effectiveness of the PPH bundle in managing PPH more efficiently. The increased use of tranexamic acid, intrauterine balloon tamponade, and non-pneumatic anti-shock garments, along with the reduced need for additional uterotonics and invasive procedures,

demonstrates the efficacy of the PPH bundle approach in clinical practice.

Keywords: bundle, management & Postpartum Haemorrhage

Study Design: Prospective and retrospective observational study.

Introduction

One critical aspect of maternal health that demands urgent attention is Postpartum Haemorrhage (PPH), a leading cause of maternal mortality worldwide[1]. Addressing PPH, directly contributes to achieving Target 3.1 of SDG 3, which aims to reduce the global maternal mortality ratio[2]. According to the World Health Organization (WHO), PPH is responsible for approximately 25% of all maternal deaths globally[3]. Despite significant progress in improving maternal health outcomes in recent years, PPH remains a persistent challenge, especially in low-resource settings where access to quality healthcare is limited. PPH is defined clinically by any amount of bleeding from or into the genital tract following delivery of the baby up to the end of the puerperium, (the period following childbirth during which mothers reproductive organs return to their original non pregnant state) which adversely affects the general condition of the patient, that can be seen by the rise in pulse rate and falling blood pressure[4] and it defined quantitatively by average blood loss more than 500ml following vaginal delivery, blood loss more than 1000ml following caesarean delivery and blood loss more than 1500 following caesarean hysterectomy[5]. It is also classified into primary and secondary PPH. Primary PPH occurs up to 24 hours of birth whereas secondary PPH occurs between 24 hours to 6 weeks postpartum[4]. Major causes contributing to PPH include uterine atony (70%), Trauma including cervical, vaginal, perineal lacerations, pelvic hematomas, uterine inversion, and rupture uterus (20%), due to retained product of conception and adherent placenta (10%), and coagulopathy (1%)[6]. By implementing effective interventions to prevent and manage PPH, we can save countless lives and make substantial progress towards ensuring maternal well-being. Postpartum Haemorrhage Emergency Care Using a Bundle Approach as per the guidelines established by the World Health Organization for the management of Postpartum haemorrhage and implemented in July 2021[10]. It is a new, systematic, and evidence-based strategy that consolidates a set of interventions into a cohesive package for the prevention and management of PPH. It includes the first response bundle and response to the refractory PPH bundle approach. The First Response bundle to be done on every patient with PPH every time. That is why it is called a bundle[12]. There is no specific order and multiple steps /actions can and should be done at the same time. There should be multiple providers on the team. Most PPH can be managed by the first response bundle alone if it is initiated early in PPH. The First response bundle includes uterine massage, IV fluids, uterotonics and tranexamic acid[13]. In between the first and second bundle, there is a supportive and symptomatic approach which includes checking for tears and if present repairing tears and evacuation of the bladder and emptying the uterus if any tissues are present. Response to Refractory PPH bundle includes aortic and bimanual compression, intrauterine balloon tamponade and use of non-pneumatic anti shock garments supported by blood transfusions, surgical interventions and referral[14]. The trigger for the refractory intervention is bleeding that doesn't stop as part of the first response bundle. The trigger is not a change in vital signs of shock[12]. Ideally, refractory PPH interventions are initiated even before a woman is in shock[15]. If these procedures are ineffectual, surgical interventions such as compressive sutures,

uterine artery ligation or hysterectomy are required[16]. Non-clinical components of the PPH bundle approach are quality improvement, teamwork and communication, facility readiness and network integration[17].

Material and Methods

All women who developed PPH in the department of Obstetrics and Gynaecology, Gandhi Medical College, Bhopal and who are referred as a case of PPH. All women who developed PPH in the department of Obstetrics and Gynaecology, Gandhi Medical College, Bhopal and who are referred as a case of PPH during the period of data collection. The patients were provided with a study information sheet and consent form and were explained the relevant details about the study in a language best understood by them.

Inclusion criteria

- All women who developed PPH in the department of Obstetrics and Gynaecology, Gandhi Medical College, Bhopal and who are referred as a case of PPH.

Exclusion criteria

- Women who do not develop PPH or those who are not willing to participate in the study.

Result

Table 1: Total no of Deliveries and Total no of PPH

	Before applying the PPH bundle approach (n = 193)		After applying the PPH bundle approach (n =166)	
	n	%	n	%
Total no of Deliveries	15258		12588	
Total no vaginal deliveries	9772	64.04	7349	58.38
Total no LSCS	5486	35.95	5239	41.61
Total no of PPH	193	1.26	166	1.31
In our institute	85	44.0	64	38.6
Referred as a case of PPH	108	56.0	102	61.4

There was a total of 15258 deliveries occurred in the PRE period (2018) and 12588 deliveries in the POST period (2023). In the PRE period total number of vaginal deliveries was 9772 (64.04%) and the total number of LSCS was 5486 (35.95%). The total number of PPH cases was 193 (1.26%) including PPH developed in our institute and referred as a case of PPH in which 85 (44%) patients developed PPH in our institute, that is 0.55% of all deliveries and referred patients as a case of PPH were 108(56%).

In the POST period total number of vaginal deliveries was 7349(58.38%) and the total number of LSCS was 5239(41.61%). The total number of PPH was 166 (1.31%) in the POST period in which patients who developed PPH in our institute were 64(38.6%) which is 0.50% of all deliveries in our institute and referred cases were 102(61.4%).

Table 2: Causes of PPH

Cause of PPH	Before applying the PPH bundle approach (n = 193)		After applying the PPH bundle approach (n =166)		P value
	n	%	n	%	
Atonic	91	47.15	86	51.80	0.676
Traumatic	81	41.97	64	38.55	
Retained Placenta	21	10.88	16	9.63	

Among the total number of PPH, 91(47.15%) cases were due to atonic PPH in the PRE period and 86(51.80%) cases in the POST period. Number of PPH due to traumatic PPH were 81(41.97%) in the PRE period and 64(38.55%) in the POST period. PPH due to retained placenta was 21(10.88%) in the PRE period and 16 (9.63%) in the post period. In both the PRE and POST periods, Atonic PPH was the most common cause of PPH followed by traumatic PPH and then retained placenta.

Table 3: Type of Bundle

Type of Bundle	After applying the PPH bundle approach	
	n	%
First response bundle	112	67.5
Response to refractory PPH bundle	54	32.5

Out of the 166 PPH cases after implementing the PPH bundle approach, 112 cases (67.5%) were managed by the first response bundle (i.e., with intravenous fluids, uterine massage, tranexamic acids and oxytocin). The remaining 54 cases (32.5%) received the response to the refractory PPH bundle.

Table 4: Tranexamic acid

	Before applying the PPH bundle approach (n = 193)		After applying the PPH bundle approach (n =166)		P-value
Yes	91	47.15	166	100.0	< 0.0001
No	102	52.84	0	0.0	

Before the implementation of the PPH bundle approach, tranexamic acid was used in 91 cases (47.15%), while 102 cases (52.84%) did not receive tranexamic acid. After the implementation, tranexamic acid was administered in all 166 cases (100%) of PPH ($p < 0.0001$). The data indicates a significant increase in the use of tranexamic acid in PPH management following the implementation of the PPH bundle approach, with its administration becoming universal in all cases post-implementation.

Table 5: Intrauterine balloon tamponade

	Before applying the PPH bundle approach (n = 193)		After applying the PPH bundle approach (n =166)		P-value
	n	%	n	%	
Yes	34	17.61	48	28.91	
No	159	82.39	118	71.09	0.011

Before the implementation of the PPH bundle approach, intrauterine balloon tamponade was used in 34 cases (17.61%), while 152 cases (78.75%) did not require this intervention. After the implementation, the use of intrauterine balloon tamponade increased to 48 cases (28.91%), with 118 cases (71.08%) not requiring it (p = 0.093). The data indicates an increase in the use of intrauterine balloon tamponade after the implementation of the PPH bundle approach and the p-value suggests that this change is statistically significant showing it is one of the major elements of the PPH bundle approach and helps in reducing maternal morbidity and mortality to a very extent.

Table 6: Non-pneumatic Anti - Shock Garment

	Before applying the PPH bundle approach (n = 193)		After applying the PPH bundle approach (n =166)		P-value
	n	%	n	%	
Yes	0.0	0.0	20	12.04	
No	193	100	146	87.95	<0.001

Before the implementation of the PPH bundle approach, NASG was not used. After the implementation, the use of NASG increased to 20 (12.04%) cases with 146 cases (87.95%) not requiring it(p<0.001). The data indicates a significant increase in the use of non-pneumatic anti-shock garments after the implementation of the PPH bundle approach indicating a more aggressive approach in managing severe PPH especially while transferring patients from casualty to operation theatre.

Table 7: Obstetric hysterectomy

	Before applying the PPH bundle approach (n = 193)		After applying the PPH bundle approach (n =166)		P-value
	n	%	n	%	
Total no of Obstetrics Hysterectomy	38	19.68	08	4.81	
	Indication				
Complete rupture of uterus	19	9.84	5	3.01	< 0.0001
Atonic PPH	14	7.25	01	0.60	
Placenta accreta syndrome	05	2.59	02	1.20	

Before the implementation of the PPH bundle approach, a total of 38 obstetric hysterectomies (19.68%) were performed. As Gandhi Medical Collage Bhopal is situated in the heart of the city of Bhopal, referred cases from rural areas were significantly high, especially for ruptured uterus, that need obstetric hysterectomy inevitably. After the implementation, this number significantly decreased to 8 (4.81%) ($p < 0.0001$). Specifically, for cases of complete rupture of the uterus, the number of hysterectomies decreased from 19 (9.84%) to 5 (3.01%). For cases of atonic PPH, the number of hysterectomies decreased from 14 (7.25%) to 1 (0.60%). For cases of placenta accreta syndrome, the number of hysterectomies slightly decreased from 5 (2.59%) to 2 (1.20%). Overall, the data indicates a significant reduction in the number of obstetric hysterectomies performed after the implementation of the PPH bundle approach. The decrease in hysterectomies across all indications suggests an improvement in managing PPH, especially atonic PPH leading to a reduced need for this radical intervention.

Table 8: Outcome of PPH

	Before applying the PPH bundle approach (n = 193)		After applying the PPH bundle approach (n =166)		P-value
	n	%	n	%	
Alive and discharged	183	94.81	164	98.79	
Death	10	5.18	02	1.20	0.037

Before the implementation of the PPH bundle approach, 183 patients (94.81%) who developed PPH were alive and discharged and 10(5.18%) died. After the implementation of the bundle approach,164(98.79%) patients were alive and discharged and patients died due to PPH reduced to 02(1.20%) ($p = 0.037$). The data indicates a significant improvement in patient outcomes and a significant reduction in maternal mortality following the implementation of the PPH bundle approach.

Discussion

The Present study was a hospital-based prospective and retrospective observational study titled – To study implementation of PPH Bundle Approach for the Management of Postpartum Haemorrhage at a Tertiary Care Centre. The primary objective of this study was to determine the reduction in maternal morbidity and mortality using the PPH bundle approach and to compare the outcome of patients in the management of PPH before and after the use of the PPH bundle approach[8]. All the cases of PPH that occurred at Department of Obstetrics & Gynaecology, Gandhi Medical College, Bhopal and all the case who referred as a case of PPH to our institution during the period of data collection (2023) is included in the study. The obtained data is compared with data from 2018 retrospectively from records. After obtaining ethical clearance, records of the patients were assessed and included after applying inclusion criteria. Keeping in mind the research question, proposed hypothesis, aims and objectives, analysis was done. Descriptive analysis was done to show the in the form of frequency and percentage and inferential analysis was used to find out the association between variables.

Postpartum haemorrhage remains one of the leading causes of maternal morbidity and mortality worldwide, particularly in low-resource settings. By implementing a standardized PPH bundle, this study aimed to improve clinical outcomes, optimize the use of blood products,

and enhance the overall quality of maternal care. The significance of conducting this study lies in addressing the critical need for effective management strategies for PPH. Despite advancements in obstetric care, PPH continues to pose significant challenges due to its sudden onset and rapid progression. Implementing a structured and evidence-based approach such as the PPH bundle can potentially save lives and reduce the burden on healthcare systems. This study provides valuable insights into the practical application of the PPH bundle in a real-world clinical setting, contributing to the growing body of evidence supporting its efficacy[9]. The importance of the subject of research is underscored by the global efforts to reduce maternal mortality and improve maternal health outcomes. PPH is a preventable condition, yet it remains a significant cause of death and severe morbidity. By focusing on the implementation and outcomes of the PPH bundle, this study highlights the practical steps that can be taken to mitigate the risks associated with PPH. The findings emphasize the critical role of timely intervention, proper training, and adherence to standardized protocols in managing this obstetric emergency.

Comparatively, Skupski et al.[10], reported an even more dramatic reduction in maternal mortality, from 16.7% to 0.0%. This finding further reinforces the effectiveness of the PPH bundle in eliminating maternal deaths in their study population, showcasing the potential of such protocols to transform clinical outcomes drastically. Similarly, Chang et al.[11], observed a reduction in maternal mortality from 1.2% to 0.2%, and Seim et al.,(2023)[12] noted a significant decrease from 32.6% to 9.53%. These results align with our findings, demonstrating consistent improvements across various settings and populations.

Conclusion

Postpartum Haemorrhage (PPH) bundle at our tertiary care centre have significantly improved the management and outcomes of PPH cases. This study, through a rigorous combination of prospective and retrospective analysis, has highlighted several critical areas of success. The consistent demographic profile and delivery modes suggest that the PPH bundle is broadly applicable and effective across diverse patient groups. The increased use of tranexamic acid, intrauterine balloon tamponade, and non-pneumatic anti-shock garments, along with the reduced need for additional uterotonics and invasive procedures, demonstrates the efficacy of the PPH bundle approach in clinical practice. Most notably, the mortality rate among PPH patients has significantly decreased, with a higher percentage of patients being successfully discharged, showcasing the bundle's overall impact on patient health and recovery. The significant improvements in patient outcomes, reduced need for invasive procedures, and overall enhanced care management strongly advocate for the continued use and potential broader application of the PPH bundle approach in other healthcare settings. Continuous training for healthcare providers, regular evaluation of the bundle's effectiveness, and adaptations based on feedback and new evidence will further enhance its utility and effectiveness. The easily understandable flow charts for the management of PPH by the bundle approach method help everyone to do the correct method of practice without any confusion. The success observed at our tertiary care centre serves as a compelling model for other institutions aiming to improve their PPH management protocols. Future research should focus on longitudinal studies to assess the long-term benefits of the PPH bundle and explore its adaptability in different healthcare environments and populations.

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