

Outcome after Implementation of Postpartum Hemorrhage Bundle Project in a Tertiary Center in North India

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ABSTRACT

Aim: To study the outcome of implementing Postpartum Haemorrhage Emergency care using a bundle approach (PPH EmC) in the management of patients with PPH in a tertiary referral center in North India.

Materials and methods: The study was conducted in a tertiary referral hospital in the department of Obstetrics and Gynaecology of Sir Sunderlal hospital, Banaras Hindu University, Uttar Pradesh state, India for a period of 12 months from June 2021 to June 2022. It is a prospective observational study. Prior to the study, training of health care providers including medical and paramedical staff was done using World Health Organization guidelines on Postpartum Hemorrhage Emergency Care (PPH EmC) using bundle approach. The data was collected by chart review and the outcome was observed in percentages.

Results: The prevalence of PPH was 4.25%. PPH was the cause of maternal mortality in 8.7% cases. Atonic PPH was most common (76%). A significant correlation was found between amount of blood loss and requirement of refractory intervention ($p=0.004$) and 3.7% of the patients died due to intractable PPH. Of the patients died with PPH, 75% patients died due to delay in referral from other facilities. There is significant increase in mortality in referred patients ($p=0.03$).

Conclusions: Mortality due to PPH reduced after the implementation of PPH care bundles.

Key words: Postpartum Haemorrhage, Emergency care training, Bundle approach, outcome

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Introduction

The global estimates indicate that there were 295 000 maternal deaths in the year 2017. India has 35,000 maternal deaths in 2017 accounting for 12% of the maternal deaths in the world.¹ Haemorrhage is the main cause of maternal mortality, resulting in 27% (one quarter) of deaths. More than two thirds of reported haemorrhage deaths were classified as postpartum haemorrhage.²

In India, maternal mortality ratio has declined from 130 in 2014-2016 to 103 in 2017-19. Despite the efforts, PPH remains as the main cause of maternal mortality in India. Incidence of PPH is reported as 2% - 4% after vaginal delivery and 6% after caesarean section as published by national health portal of India in 2017 with uterine atony being the reason in 50% of the cases among the four main causes.³

In developing countries, the main cause for maternal mortality is due to delay in seeking care, nonavailability or under-availability of the resources and lack of proper guidelines. To address this problem, The International Federation of Obstetrics and Gynaecology (FIGO) of London along with Massachusetts General Hospital Global Health Innovation Lab (MGH GHI) of USA has initiated a Bundle approach to deliver Postpartum Emergency care (PPH EmC) using World Health Organisation (WHO) PPH management guidelines.

The bundle approach refers to the usage of a set of evidence-based interventions in the management of a defined patient population. Based on many studies, with good adherence, bundle approach has favourable outcomes in the management of PPH.⁴

FIGO and Massachusetts General Hospital (MGH) has collaborated with the senior obstetric providers worldwide for the implementation of PPH EmC using bundle approach to reduce the PPH related mortality and morbidity by training the obstetrician and nursing providers involved in maternal health care. The training is provided for health care providers of all health care levels from primary care centre to tertiary referral centres for the prevention of PPH, prompt identification, management and timely referral of the patient with PPH.

PPH Emergency care includes both clinical and non-clinical approaches. The clinical interventions

include evidence backed, cost effective, resource saving methods that are easy to learn and perform. The non-clinical part includes system strengthening strategies which increase the adherence to evidence-based approaches and addresses the delays.

Who recommendations for management of PPH recommends the two care bundles for facility implementation. It integrates clinical and non-clinical approaches. Clinical approach includes two care bundles, 'first response bundle' comprises uterine massage, giving intravenous fluids, uterotonics and tranexamic acid to the patient, with emptying urinary bladder, emptying uterus and treating tears were supportive measures to first response bundle. The second bundle, 'refractory PPH interventions' include uterine compression or external aortic compression, the use of and intrauterine balloon tamponade (IBT) and non-pneumatic antishock garment (NASG) and surgical interventions. Teamwork and Communication, Facility readiness, Network Integration, Data, Monitoring and Quality Improvement, Leadership and use of best clinical practices were defined as PPH bundle supporting elements.⁵

Methods and Methodology

FIGO and Massachusetts General Hospital along with Uttar Pradesh state technical support unit (UPTSU) and Federation of Obstetric and Gynaecological Societies of India (FOGSI) started PPH Emergency care using bundle approach in Department of Obstetrics and Gynaecology, Banaras Hindu University with the support of Bill and Melinda Gates foundation. The PPH EmC bundle approach training started in Banaras Hindu University in 2021. The initial phase involved the training of the trainers observed online by members of FIGO, FOGSI and MGH in March 2021. During the next phase resident doctors, nurses and other paramedical staff were trained July-September 2021.

Study design: The study was a single tertiary referral centre based observational study conducted at Institute of Medical Sciences, Banaras Hindu University in Northern India to study the outcome of implementation of PPH Safety bundle for 12 months from June 2021 to June 2022.

Study population include those patients who delivered at our facility and experienced PPH and also those patients who were referred from other medical centres. The data was collected from the patient case records and PPH debrief forms. The data is presented as proportions and correlation between proportions was analysed using z-test and chi-square test with the *p* value set at 0.05. The data was analysed using IBM SPSS software version 24.0.

Ethical approval for the study was obtained from the Institute Ethics Committee need details Dean/2021/EC/2996.

Measurement of blood loss: PPH was identified in the patients with loss of more than 500ml following vaginal delivery and more than 1000ml following caesarean delivery or any amount of blood loss which caused the hemodynamic instability of the patient. PPH is classified into mild (blood loss is 500-1000ml) or major (>1000ml). Major is divided into moderate (1000-2000ml) and severe (>2000ml).⁶ Blood loss is mainly measured subjectively by visual estimation of blood loss (EBL) or pictorial blood assessment chart (PBAC).

Results

During the study period from June 2021 to June 2022, a total of 2765 patients were delivered at our institution of which 1167 were vaginal deliveries and 1887 were Caesarean deliveries. PPH was detected in 118 patients with a prevalence of 4.25%.

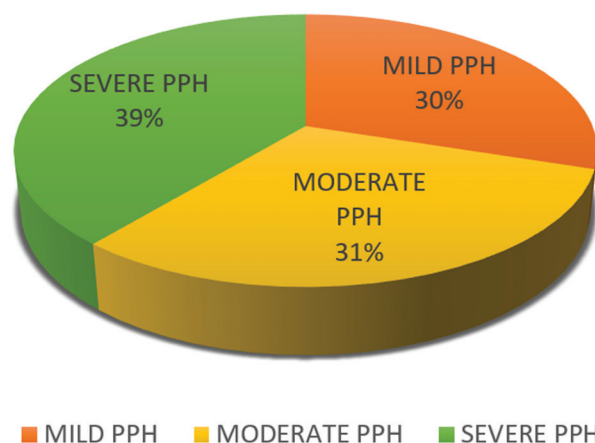
78% (N=92) of the women with PPH were delivered at this facility and 22% (N=26) patients were referred from other health care facilities where these women were delivered and were referred with PPH.

69.5% (N= 82) of the patients who had PPH were delivered by caesarean and 30.5% (N=36) were delivered vaginally. AMTSL was given for 100% of patients delivered at this facility.

Prevalence based on amount of blood loss

Severity of PPH	% (N=118)
Mild PPH	30% (N=36)
Moderate PPH	31% (N=37)
Severe PPH	39% (N=45)

Based on Amount of Blood Loss



Out of the 118 patients who had PPH, 29% had mild PPH, 32% had moderate PPH and 39% had severe PPH.

Prevalence of causes of PPH

Type of PPH	Number	Percentage
Atonic PPH	90	76%
Traumatic PPH	4	3.5
Mixed (atonic+ traumatic)	9	7.6%
Coagulopathy	4	3.5%
Retained placenta	1	0.9%
Morbidly adherent placenta	10	8.5%

Cause of PPH in our centre was mainly atonicity of the uterus (76%), followed by morbidly adherent placenta (8.5%), both atonic and traumatic PPH (7.6%) and coagulopathy in 3.5% patients. Traumatic PPH and retained placenta were the cause of PPH in very few patients.

Management of PPH	Number	Percentage
a. AMTSL	118	100%
b. Controlled by 1st response bundle-	71	60.1%
c. Required refractory measures		
1. Uterine compression	2	1.7%
2. Intrauterine balloon tamponade (IBT)	5	4.2%
3. NASG	1	0.8%
4. Surgical interventions	39	33%

100% of the patients who delivered received active management of third stage of labour (AMTSL) irrespective of the mode of delivery. 4.5% (N= 118) patients developed PPH. 100% of the patients who had PPH received first response bundle which comprised

uterine massage, intravenous fluids, uterotonics and tranexamic acid. Around 60.1%(N=71) cases were controlled by first response bundle alone and the remaining 39.9%(47) patients required refractory PPH interventions. NASG was used in 1 patient, Intra uterine Balloon Tamponade (ESM UBT) in 5 patients and bimanual uterine compression was done in 2 patients, aortic compression was not needed in any patient. Surgical interventions were done in 39 patients. 57.6% (N=68) patients required blood transfusions more than 2 units.

A significant correlation was found between amount of blood loss and use of refractory interventions for management of PPH ($p= 0.004$). As the amount of blood loss increased, there is increased use of refractory measures.

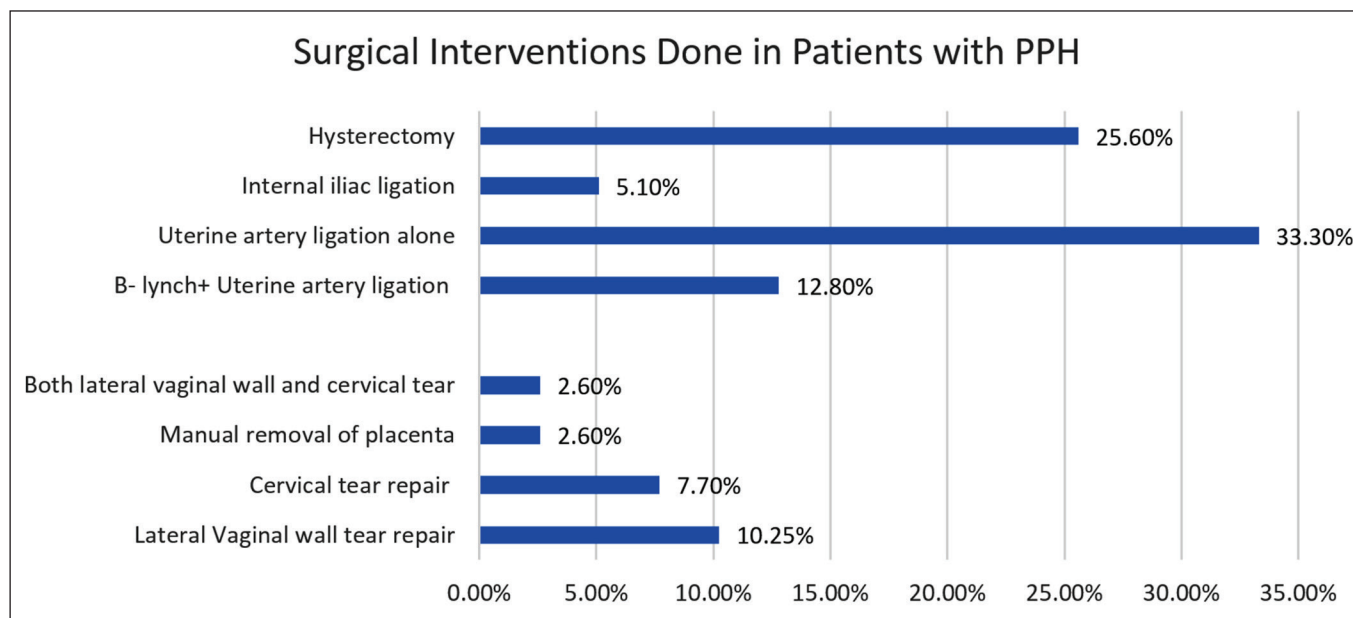
Surgical interventions done in patients with PPH

Surgical interventions	Patients who required them (N=39)	Percentage (%)
Lateral Vaginal wall tear repair	4	10.25%
Cervical tear repair	3	7.7%
Manual removal of placenta	1	2.6%
Both lateral vaginal wall and cervical tear	1	2.6%
B-lynch+ Uterine artery ligation	5	12.8%
Uterine artery ligation alone	13	33.3%
Internal iliac ligation	2	5.1%
Hysterectomy	10	25.6%

Uterine artery ligation was the most common surgical intervention done at our centre to manage the patients with refractory intervention followed by hysterectomy and B-Lynch uterine compression sutures. Vaginal wall tear repair was done in 10.25% patients, cervical tear repair in 7.7% patients, Manual removal of retained placenta was done in 1 (2.6%) patient.

Despite all the efforts, 4 patients died due to intractable during study period. Total number of 46 patients died in the maternity ward during this study time, out of which 4 were due to PPH accounting for 8.7% of cause of maternal deaths in the facility. Of the patients expired, 1 patient delivered at this facility (n=92) and 3 patients were referred (n=26) from other hospitals. There is significant increase in mortality in referred patients ($p=0.03$). There is no significant decrease in mortality rate after the implementation of PPH bundle ($p=0.125$)

A debrief was done after managing every case of PPH. The debrief rate was 100%. Debrief included the evaluation of management done by medical and paramedical staff, leadership, teamwork, communication, clinical skill, the things which went well and things which could be improved. In our centre things that were well included prior identification of a high-risk patient for PPH, availability of all the drugs required for the management of PPH. Skilled medical and Paramedical staff. Things that could be improved included increased team members, timely referral of the patients referred from nearby health centre before the “golden hour” is completed and prior information



of the patients being referred. Information to blood bank through an alarm activating system to reduce the delay in arrangement and release of blood products required.

Discussion

The objective of FIGO PPH EmC using bundle approach is to improve quality of care in management of PPH patients at the hospitals where deliveries are performed and it aims to reduce the maternal mortality and morbidity. The training sessions incorporates simulations, group activities, didactic sessions. The practical tool kit was provided during the training sessions.

It integrates clinical and non-clinical approaches. Clinical approach has 'first response bundle' which includes uterine massage, giving intravenous fluids, uterotonics and tranexamic acid to the patient, with emptying urinary bladder, emptying uterus and treating tears were supportive measures to first response bundle. The 'refractory PPH interventions' include uterine compression or external aortic compression, use of IBT, NASG and surgical interventions. Non clinical approach includes teamwork and Communication, Facility readiness, Network Integration, Data, Monitoring and Quality Improvement, Leadership and use of best clinical practices were defined as PPH bundle supporting elements.

The prevalence of PPH in our centre was 4.25%, which is slightly higher than reported by other studies done in India which reported a prevalence of 3.3%.⁷ The prevalence of PPH in our centre before PPH EmC training was implemented was 9.5%, there is a reduction in the rate of PPH post PPH EmC training by 50%. Majority of the mothers (39%) experienced severe PPH and moderate PPH was seen in 31% cases, mild PPH in 30% cases.

The major cause of PPH was atonic (76% cases) followed by morbidly adherent placenta in 8.5% cases, disorders of coagulation were cause for 3.5% cases which is higher than the other study done in India where bleeding diathesis was cause in only 0.07% cases.⁷

Other observations made during the implementation of the bundle care program was preventive strategies at our institute were well established with risk

stratification of pregnant women based on their obstetric, medical and surgical history and women with high risk for PPH are identified early and staff, medicine, blood products are arranged beforehand if PPH were to occur in such patients. AMTSL was done in 100% of the mothers who delivered.

The mothers who developed PPH, all received first response bundle. Only in 60.1% mothers, PPH was controlled by first response bundle and the remaining 39.9% required refractory interventions. Uterine compression was done in 1.7% patients, Intrauterine balloon tamponade (IBT) was used in only 4.2% cases and NASG was used in only 0.8% cases. Surgical intervention was done in 33% cases. This low implementation of refractory PPH interventions IBT, NASG and compression manouvers is due to the refusal by patient and their anxious family members for these methods and requesting for an early surgical method of management, many of the patients were having PPH during caesarean section and are already in the operating room where surgeon is tempted to manage the patient surgically.

The surgical procedures which helped in majority of the cases with refractory PPH was uterine artery ligation in 33.3% followed by hysterectomy in 25.6% cases and B-Lynch uterine compression sutures along with uterine artery ligation in 12.8% cases. Vaginal wall tear repair, cervical tear repair, internal iliac artery ligation was done in 10.25% and 7.7% and 5.1% respectively. The rise in hysterectomy in our centre is due to more number of patients with morbidly adherent placenta being referred to our centre from other facilities.

57.6% patients who experienced PPH required more than 2 units of blood transfusion. PPH was the cause of death in 8.7% (4 out of 46). cases of maternal mortality during study period. This was less compared to the pre PPH EmC training period during which mortality due to PPH was 17.7% (6 out of 34). Majority (75%) of patients who died due to PPH in the study period were referred from other facilities.

During the debrief it was found that prior identification of a high-risk patient for PPH (n=72), availability of all the drugs required for the management of PPH (n=27), Skilled medical and Paramedical staff (n=19) were the advantages and requirement of more team members, timely referral from other centres, prior

information regarding referral and reducing delay in making blood products available needs to be improved at his facility.

Conclusion

This study was conducted to assess the outcome of implementation of PPH EmC using bundle

approach. To identify the cause, management approaches, teamwork, strengths and limitations in the implementation of this bundle study. Further long-term comparative studies are needed to evaluate the efficacy of this bundle approach in India.

The study shows that once PPH bundle is applied the mortality reduces.

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