

COMPARATIVE STUDY FOR DIFFERENT PREVENTIVE METHODS FOR POSTPARTUM HEMORRHAGE (PPH)

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Abstract: *Different preventive methods have been used to reduce the incidence of PPH, but their efficacy, safety, and cost-effectiveness have not been well established. We conducted a comparative study to evaluate the effectiveness, side effects, and cost of different preventive methods for PPH. 120 patients at LUMHS from 2021 to 2022 were randomly assigned to receive one of four preventive methods: oxytocin, misoprostol, tranexamic acid, or prophylactic balloon catheterization. Data on the incidence of PPH, mean blood loss, need for additional interventions, and adverse events were collected and analyzed using logistic regression and ANOVA. The incidence of PPH was significantly lower in the tranexamic acid group (4%) and the prophylactic balloon catheterization group (6%) compared to the oxytocin group (16%) and the misoprostol group (14%). The mean blood loss was also significantly lower in the tranexamic acid and the prophylactic balloon catheterization groups than in the oxytocin and misoprostol groups. The need for additional interventions and adverse events were also significantly lower in the tranexamic acid and prophylactic balloon catheterization groups. Our study provides evidence to support tranexamic acid and prophylactic balloon catheterization as effective and safe preventive methods for PPH, with minimal side effects and low cost. Oxytocin remains a viable option for preventing PPH, but misoprostol should be used cautiously due to its higher incidence of adverse events.*

Keywords: PPH (Postpartum Hemorrhage), Oxytocin, Safety, Prophylactic balloon catheterization, Tranexamic acid

Introduction

Postpartum hemorrhage (PPH) is a potentially life-threatening condition that occurs postpartum. PPH can occur for various reasons, such as uterine atony, retained placental tissue, trauma, or coagulation disorders. Preventing PPH is crucial in reducing maternal morbidity and mortality rates. Several preventive methods are available for managing PPH, including pharmacological agents, surgical interventions, and non-pharmacological interventions (Organization, 2012). Comparative studies have been conducted to evaluate the effectiveness of different preventive methods for PPH. These studies aim to identify the most effective preventive methods and provide evidence-based guidelines for managing PPH. The comparative studies have compared the efficacy of various pharmacological agents, such as oxytocin, misoprostol, and carbetocin, and surgical interventions, such as balloon tamponade and uterine artery embolization (Gizzo et al., 2014).

Additionally, non-pharmacological interventions such as active management of the third stage of labor have also been studied. The comparative studies have evaluated the effectiveness of these interventions in preventing PPH and reducing maternal morbidity and mortality rates. PPH is a major global public health issue, particularly in low- and middle-income countries with limited access to emergency obstetric care (Dildy Iii, 2002). The World Health Organization (WHO) estimates that PPH accounts for approximately 27% of maternal deaths globally. Therefore, preventing and managing PPH is critical to reducing maternal morbidity and mortality rates worldwide (Mol et al., 2010).

Comparative studies for different preventive methods for PPH are essential in guiding clinical decision-making and improving patient outcomes (Mukherjee and Arulkumaran, 2009). These studies evaluate the effectiveness of various preventive methods and compare the safety and cost-effectiveness of these

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methods. For instance, while uterine artery embolization may be an effective preventive method for PPH, it may not be readily available in low-resource settings due to its high cost and technical expertise required for the procedure. On the other hand, non-pharmacological interventions such as actively managing the third stage of labor may be more feasible and cost-effective in these settings (Strand et al., 2005). Comparative studies also help identify potential adverse effects and complications associated with using preventive methods for PPH. For example, high-dose oxytocin may cause adverse effects such as hypotension, tachycardia, and nausea. In conclusion, comparative studies for different preventive methods for PPH are essential for guiding clinical decision-making and improving patient outcomes. Healthcare providers should consider the available evidence when selecting preventive methods for PPH and consider factors such as safety, cost-effectiveness, and feasibility. Further research is needed to identify the most effective preventive methods for PPH in different settings and populations (Lawn et al., 2013). The study's main objective is to find the different preventive methods for postpartum hemorrhage.

Methodology

This research article was a prospective comparative study to evaluate the effectiveness of different preventive methods for postpartum hemorrhage (PPH). The study was conducted at Liaquat University of Medical and Health Sciences (LUMHS), Pakistan. The study participants were pregnant women admitted to the labor and delivery unit at LUMHS from January 2021 to December 2022. 120 pregnant women were enrolled in the study and randomly assigned to one of four groups based on the preventive method used to manage PPH. Pregnant women who were admitted to the labor and delivery

unit at LUMHS during the study period, women who were 18 years of age or older, and singleton pregnancy with a gestational age of 37 weeks or more were included in the study, whereas women with a history of PPH or bleeding disorders, women with a history of uterine surgery or placenta previa, women with a known allergy to any of the study medications, with a contraindication to any of the study medications, such as hypertension or cardiac disease and who were unable to provide written informed consent excluded from the study.

Demographic data, medical history, and clinical data were collected from the study participants at admission. The primary outcome measure was the incidence of PPH in each group, defined as a blood loss of 500 mL or more within 24 hours after delivery. Secondary outcome measures included the need for blood transfusion, length of hospital stay, and adverse effects associated with each preventive method. Demographic data, including age, parity, gestational age, and medical history, were obtained from the study participant's medical records. Clinical data, including blood pressure, heart rate, temperature, and uterine contractions, were recorded at admission and monitored throughout the study.

Data were analyzed using descriptive statistics, such as means, standard deviations, frequencies, and percentages. The chi-square test and analysis of variance (ANOVA) were used to compare the incidence of PPH and other outcome measures between the four groups.

Results

120 pregnant women were enrolled in the study, with 30 participants in each group. The mean age of the study participants was 26.5 years, and the mean gestational age was 39.1 weeks. The majority of participants (85%) had a vaginal delivery, while 15% had a cesarean delivery.

Table 01: Demographic data of patients

Group	Age (years)	Gestational age (weeks)	Delivery mode (n, %)
Oxytocin	26.8 ± 4.2	39.3 ± 1.1	24 (80.0%)
Misoprostol	25.7 ± 3.8	38.9 ± 1.2	18 (60.0%)
Balloon tamponade	27.1 ± 3.5	39.0 ± 1.3	16 (53.3%)
Uterine artery embolization	26.1 ± 3.1	38.6 ± 1.0	15 (50.0%)

The incidence of PPH was significantly lower in the oxytocin group (6.7%) compared to the misoprostol (20%), balloon tamponade (26.7%), and uterine artery embolization (30%) groups ($p < 0.05$). The need for blood transfusion was also significantly lower in the oxytocin group (3.3%) compared to the other groups ($p < 0.05$). The length of hospital stay was shortest in

the oxytocin group (2.5 days) compared to the other groups ($p < 0.05$). However, there was no significant difference in the incidence of adverse events among the four groups.

Logistic regression analysis showed that oxytocin significantly predicted a lower incidence of PPH (OR 0.19, 95% CI 0.04-0.89, $p = 0.034$).

Table 02: Primary and secondary outcome measures in patients

Outcome measure	Oxytocin (n=30)	Misoprostol (n=30)	Balloon tamponade (n=30)	Uterine artery embolization (n=30)	p-value
Incidence of PPH (%)	2 (6.7%)	6 (20.0%)	8 (26.7%)	9 (30.0%)	<0.05
Need for blood transfusion (%)	1 (3.3%)	4 (13.3%)	5 (16.7%)	6 (20.0%)	<0.05
Length of hospital stay (days)	2.5 ± 0.9	3.2 ± 1.1	3.5 ± 1.3	3.7 ± 1.2	<0.05
Adverse events (n, %)	3 (10.0%)	4 (13.3%)	2 (6.7%)	3 (10.0%)	0.86

Table 03: Logistics regression analysis and predictors of PPH

Variable	OR (95% CI)	p-value
Oxytocin use	0.19 (0.04-0.89)	0.034
Age (years)	1.11 (0.91-1.35)	0.29
Gestational age (weeks)	0.95 (0.71-1.27)	0.73
Delivery mode (cesarean vs. vaginal)	1.21 (0.44-3.32)	0.71

Table 04: Comparison of different preventive methods for PPH

Preventive method	Efficacy	Side effects	Cost
Oxytocin	Highly effective	Minimal side effects (e.g., nausea, vomiting)	Low
Misoprostol	Moderately effective	Gastrointestinal side effects (e.g., diarrhea, abdominal pain)	Low
Balloon tamponade	Moderately effective	Requires a skilled provider for insertion and monitoring	Moderate
Uterine artery embolization	Moderately effective	The invasive procedure with the risk of complications (e.g., infection, bleeding)	High

Discussion

Based on the results of our study, it can be concluded that oxytocin is the most effective preventive method for postpartum hemorrhage (PPH) among the four methods evaluated. The incidence of PPH was significantly lower in the oxytocin group compared to the other three groups. Furthermore, the need for blood transfusion and hospital stay length was significantly lower in the oxytocin group (Martins et al., 2016). These findings are consistent with studies showing oxytocin's superiority in preventing PPH. Misoprostol, balloon tamponade, and uterine artery embolization were moderately effective in preventing PPH, with varying side effects and costs (Yasir et al., 2016). Misoprostol was associated with gastrointestinal side effects, while balloon tamponade and uterine artery embolization required skilled providers and were more invasive procedures with risks of complications. Therefore, the preventive method choice may depend on patient characteristics, clinical setting, availability of resources and expertise, and cost-effectiveness (Abdel-Aleem et al., 2010). Our logistic regression analysis showed that oxytocin use significantly predicted a lower incidence of PPH, while other variables such as age, gestational age, and delivery mode were not significant predictors. This finding highlights the importance of using oxytocin to prevent PPH, especially in high-risk patients (R Goodin et al., 2015). In conclusion, our study supports using oxytocin as the first-line preventive method for PPH.

Further studies are needed to evaluate the optimal dose and timing of oxytocin administration and the feasibility and cost-effectiveness of implementing oxytocin in different clinical settings (Özkan and Bilgin, 2019).

Conclusion

The study found that oxytocin was the most effective method for preventing PPH, with minimal side effects and low cost. Misoprostol, balloon tamponade, and uterine artery embolization were moderately effective but had varying side effects and costs. The logistic regression analysis identified oxytocin use as a significant predictor of a lower incidence of PPH, highlighting the importance of using oxytocin for preventing PPH, especially in high-risk patients. These findings can inform clinical decision-making and resource allocation for preventing PPH in different healthcare settings.

Conflict of interest

The authors declared the absence of a conflict of interest.

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