Original Article

An Observational Study to Compare Effectiveness of Preoperative Per Rectal Misoprostol with Non-Misoprostol Group for Preventing Blood Loss in Elective Caesarean Delivery in Tertiary Care Centre

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Abstract

Background: Postpartum haemorrhage remains a major cause of maternal morbidity and mortality worldwide, particularly following caesarean delivery. Misoprostol, a synthetic prostaglandin E1 analogue, has been investigated as an adjunct uterotonic agent for reducing perioperative blood loss during caesarean section. The current study sought to assess the impact of preoperative per rectal misoprostol on postoperative haematological parameters, the need for additional uterotonics, blood transfusions, neonatal outcomes, and maternal adverse effects in addition to comparing its efficacy in reducing blood loss during elective caesarean delivery with a non-misoprostol group. **Material and Methods:** From January 2025 to January 2026, the Department of Obstetrics and Gynaecology at the Government RDBP Jaipuria Hospital in Jaipur hosted this hospital-based observational study. A control group (n = 30) received normal care without misoprostol, while the misoprostol group (n = 30) received 400 µg rectal misoprostol following spinal anaesthesia. Sixty women undergoing elective lower segment caesarean sections were recruited and divided into two groups. Intraoperative and postoperative blood loss, haematological parameters, requirement for additional uterotonics, blood transfusion, neonatal outcomes, and adverse effects were evaluated. **Results:** The groups' baseline obstetric and demographic features were similar. The misoprostol group demonstrated significantly lower intraoperative blood loss (345.6 ± 62.3 ml vs. 408.7 ± 71.5 ml; p=0.001), postoperative blood loss (112.4 ± 18.9 ml vs. 139.6 ± 23.7 ml; p=0.003), and total blood loss (458.0 ± 75.2 ml vs. 548.3 ± 89.4 ml; p=0.001). The misoprostol group's postoperative haemoglobin levels were considerably higher (10.2 ± 0.8 g/dL vs. 9.3 ± 1.1 g/dL; p=0.002), whereas their haemoglobin and hemocrit values declined less. The requirement for additional uterotonics and blood transfusion was lower among women receiving misoprostol. Neonatal outcomes were comparable between groups. Shivering and pyrexia were the most common adverse effects but were mild and self-limiting. **Conclusion:** During elective caesarean sections, preoperative injection of 400 µg rectal misoprostol is a safe and effective adjuvant that reduces perioperative blood loss with positive outcomes for both mothers and newborns.

Keywords: Caesarean section; Misoprostol; Postpartum haemorrhage; Blood loss; Uterotonic agents.

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Introduction

One of the most popular surgical procedures in the world, caesarean sections have become much more widespread in recent decades.[1] Although caesarean delivery is often lifesaving for both mother and foetus, it is associated with a higher risk of maternal morbidity compared to vaginal delivery.[2] Among these issues, postpartum haemorrhage (PPH) is still a serious problem and one of the main causes of severe maternal morbidity and maternal mortality, especially in low- and middle-income nations.[3,4] Blood loss during caesarean section can result in postpartum anaemia, increased need for blood transfusion, prolonged hospital stay, and adverse maternal outcomes.[5]

Uterine atony accounts for nearly 70% of cases of postpartum haemorrhage and represents the most common preventable cause of excessive obstetric blood loss.[6] Active management of the third stage of labour and the use of uterotonic agents have therefore become essential strategies for reducing haemorrhage-related complications.[7] Oxytocin remains the standard uterotonic agent used during caesarean delivery; however, its short half-life, requirement for parenteral administration, and dependence on cold-chain storage may limit its effectiveness in certain settings.[8] Consequently, alternative or adjunctive uterotonic agents have been explored to improve haemostatic control during and after caesarean section.[9]

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Misoprostol, a synthetic prostaglandin E1 analogue, has gained considerable attention because of its potent uterotonic properties, low cost, ease of administration, long shelf life, and stability at room temperature.[10] It can be given orally, sublingually, vaginally, or rectally, among other ways. Rectal administration is particularly attractive during caesarean delivery because it provides sustained drug absorption, prolonged uterine contractility, and a lower incidence of systemic adverse effects compared with other routes.[11] Misoprostol may improve postoperative haematological parameters, lessen the need for extra uterotonics, and reduce intraoperative and postoperative blood loss when used in conjunction with traditional oxytocin therapy, according to earlier research.[12-14]

Despite the growing body of evidence supporting the use of misoprostol during caesarean delivery, data regarding its effectiveness and safety remain limited in many tertiary care settings in India. Furthermore, variations in dosage, route of administration, and study populations have resulted in inconsistent findings across studies. Therefore, the purpose of the current study was to assess the impact of preoperative per rectal misoprostol on postoperative haematological parameters, the need for additional uterotonics, the need for blood transfusions, neonatal outcomes, and maternal adverse effects, as well as to compare its efficacy in reducing blood loss during elective caesarean delivery with a non-misoprostol group.

Materials and Methods

After receiving approval from the Institutional Ethics Committee, this hospital-based observational study was carried out in the Department of Obstetrics and Gynaecology at Government RDBP Jaipuria Hospital, RUHS College of Medical Sciences, Jaipur. The study was conducted between January 2025 and January 2026, a span of one year. Pregnant women scheduled for elective lower segment caesarean section (LSCS) were recruited after obtaining written informed consent. A total of sixty suitable individuals were recruited and divided into two equal groups: the control group (n = 30) and the misoprostol group (n = 30). The sample size was calculated using the formula $N = 4pq/d^2$, considering a prevalence of blood loss of 16% reported in a previous study by Karya et al., an absolute precision of 10%, and a 10% non-response rate, yielding a final sample size of 60 participants.

Women aged 20–35 years with full-term singleton pregnancies, normal placental implantation, normal coagulation profile, haemoglobin level ≥9 g/dL, and the study included scheduled elective caesarean deliveries performed under spinal anaesthesia. Women with hypertensive disorders, diabetes mellitus, hepatic, renal or cardiac disease, antepartum haemorrhage, previous postpartum haemorrhage, multiple gestation, fibroid uterus, previous uterine surgery other than LSCS, emergency caesarean section, spinal deformities, or any spinal anaesthesia contraindication were not allowed to participate in the trial.

All participants underwent detailed clinical evaluation, routine obstetric examination, ultrasonography, complete blood count, coagulation profile, and liver and renal function tests before surgery. The women in the intervention group were given 400 µg of misoprostol per rectum just after the urine catheter was inserted and spinal anaesthesia was administered. Misoprostol was not administered to the women in the control group. Following delivery of the baby, all participants received intravenous oxytocin (20 IU diluted in 500 mL Ringer lactate) infused at a rate of 120 mL/hour as part of the standard institutional protocol. All caesarean sections were performed by experienced obstetricians using a standardized surgical technique.

The primary outcome measure was intraoperative blood loss. Blood loss was assessed using a combination of two methods: estimation based on changes in haematocrit using the formula based on estimated blood volume (calculated as maternal weight in kilograms × 85.2 mL) and direct measurement by measuring blood collected in the suction apparatus and weighing surgical sponges and drapes before and after surgery. Secondary outcome measures included postoperative blood loss, change in haemoglobin and haematocrit levels, requirement for additional uterotonic agents, blood transfusion, neonatal outcomes, and adverse effects associated with misoprostol administration.

Microsoft Excel was used to enter the data, and SPSS version 23.0 was used for analysis. Mean ± standard deviation (SD) was used to represent continuous variables, while frequency and percentage were used to convey categorical variables. When comparing groups, the Chi-square test or Fisher's exact test were used for categorical variables and Student's t-test for continuous variables, depending on the situation. A p-value of less than 0.05 was deemed statistically significant.

Results

The two study groups' baseline obstetric and demographic parameters were similar. Most participants belonged to the 26–29 years age group, accounting for 46.7% of women in the misoprostol group and 43.3% in the control group. The misoprostol group's mean gestational age was 38.2 ± 1.1 weeks, while the control group's was 38.4 ± 1.3 weeks. Primigravidae constituted 50.0% and 40.0% of participants in the respective groups, while a history of previous LSCS was present in 13.3% and 33.3% of women, respectively. Socioeconomic status distribution was also similar between the groups, indicating adequate baseline comparability [Table 1].

Table 1: Baseline Characteristics of Study Participants

Variable		Misoprostol Group (n=30)	Control Group (n=30)
Age	<20 years	5 (16.7%)	3 (10.0%)
	21–25 years	7 (23.3%)	12 (40.0%)
	26–29 years	14 (46.7%)	13 (43.3%)
	≥30 years	4 (13.3%)	2 (6.7%)
Socioeconomic status	Upper middle	9 (30.0%)	11 (36.7%)

	Upper Lower	15 (50.0%)	10 (33.3%)
	Lower Upper	6 (20.0%)	7 (23.3%)
	Lower Middle	0 (0%)	2 (6.7%)
Gestational age (weeks)	Mean ± SD	38.2 ± 1.1	38.4 ± 1.3
Gravida	Primigravida	15 (50.0%)	12 (40.0%)
	Multigravida	15 (50.0%)	18 (60.0%)
Previous LSCS	Yes	4 (13.3%)	10 (33.3%)

When preoperative rectal misoprostol was administered to women, blood loss was dramatically reduced when compared to controls. The misoprostol group experienced a mean intraoperative blood loss of 345.6 ± 62.3 ml, while the control group saw a mean intraoperative blood loss of 408.7 ± 71.5 ml (p=0.001). The misoprostol group experienced a considerably decreased postoperative blood loss (112.4 ± 18.9 ml) compared to the control group (139.6 ± 23.7 ml; p=0.003). Consequently, total blood loss was reduced by approximately 90 ml among women receiving misoprostol (458.0 ± 75.2 ml vs. 548.3 ± 89.4 ml; p=0.001) [Table 2].

Table 2: Comparison of Blood Loss Between Study Groups

Parameter	Misoprostol Group (n=30)	Control Group (n=30)	p-value
Intraoperative blood loss (ml)	345.6 ± 62.3	408.7 ± 71.5	0.001
Postoperative blood loss (ml)	112.4 ± 18.9	139.6 ± 23.7	0.003
Total blood loss (ml)	458.0 ± 75.2	548.3 ± 89.4	0.001

There were no statistically significant differences between the two groups' preoperative haemoglobin and hemocrit readings. However, compared to the control group, the misoprostol group's postoperative haemoglobin levels were considerably higher (10.2 ± 0.8 g/dL vs. 9.3 ± 1.1 g/dL; p=0.002). Women using misoprostol had a substantially smaller mean reduction in haemoglobin (1.1 ± 0.4 g/dL) than controls (1.8 ± 0.7 g/dL; p<0.001). Likewise, postoperative haematocrit levels were better preserved in the misoprostol group, with a significantly smaller reduction than that observed in the control group (1.7 ± 0.7% vs. 2.9 ± 1.0%; p=0.001) [Table 3].

Table 3: Comparison of Haematological Parameters

Parameter		Misoprostol Group (n=30)	Control Group (n=30)	p-value
Haemoglobin (g/dL)	Preoperative	11.3 ± 1.0	11.1 ± 1.2	0.48
	Postoperative	10.2 ± 0.8	9.3 ± 1.1	0.002
	Decline	1.1 ± 0.4	1.8 ± 0.7	<0.001
Haematocrit (%)	Preoperative	33.6 ± 2.0	33.1 ± 2.3	0.36
	Postoperative	31.9 ± 1.8	30.2 ± 2.1	0.001
	Decline	1.7 ± 0.7	2.9 ± 1.0	0.001

Additional uterotonic agents were required less frequently among women receiving misoprostol than among controls (6.7% vs. 20.0%). Similarly, no participant in the misoprostol group required blood transfusion, whereas transfusion was required in 6.7% of women in the control group. Although these differences did not reach statistical significance, the findings suggest a trend towards improved haemostatic control with the use of preoperative rectal misoprostol [Table 4].

Table 4: Maternal Surgical Outcomes

Outcome	Misoprostol Group (n=30)	Control Group (n=30)	p-value
Additional uterotonics required	2 (6.7%)	6 (20.0%)	0.25
Blood transfusion required	0 (0.0)	2 (6.7%)	0.15

The two groups' neonatal outcomes were similar. The majority of neonates had birth weights between 2.5 and 3.0 kg, accounting for 43.3% and 56.7% of newborns in the misoprostol and control groups, respectively. APGAR scores ≥7 were observed in 93.3% of neonates in the misoprostol group and 96.7% in the control group. NICU admission was uncommon, occurring in only 3.3% and 6.7% of neonates in the respective groups, indicating that maternal administration of rectal misoprostol did not adversely affect neonatal outcomes [Table 5].

Table 5: Neonatal Outcomes

Variable		Misoprostol Group (n=30)	Control Group (n=30)
Birth weight	<2.5 kg	5 (16.7%)	2 (6.7%)
	2.5–3.0 kg	13 (43.3%)	17 (56.7%)
	>3.0 kg	12 (40.0%)	11 (36.7%)
APGAR score	<7	2 (6.7%)	1 (3.3%)
	≥7	28 (93.3%)	29 (96.7%)
NICU admission	Yes	1 (3.3%)	2 (6.7%)

Misoprostol was generally well tolerated, with most participants reporting no adverse effects. Shivering was the most frequently observed side effect, occurring in 10.0% of women receiving misoprostol compared with 3.3% in the control group. Pyrexia was reported in 6.7% and 3.3% of participants, respectively, while diarrhoea and vomiting were each observed in only 3.3% of women in the misoprostol group. No cases of diarrhoea or vomiting were reported in the control group. Overall, the adverse effects associated with rectal misoprostol were mild and clinically manageable [Table 6].

Table 6: Maternal Adverse Effects

Adverse Effect	Misoprostol Group (n=30)	Control Group (n=30)
Pyrexia	2 (6.7%)	1 (3.3%)
Shivering	3 (10.0%)	1 (3.3%)
Diarrhoea	1 (3.3%)	0 (0.0%)
Vomiting	1 (3.3%)	0 (0.0%)
None	23 (76.7%)	28 (93.3%)

Discussion

The current study showed that administering 400 µg of rectal misoprostol before to surgery considerably decreased blood loss during elective caesarean sections. The mean intraoperative blood loss was considerably lower in the misoprostol group (345.6 ± 62.3 ml vs. 408.7 ± 71.5 ml; p=0.001) compared to the control group. These results align with those of Kumar et al., who found that the misoprostol group experienced a mean intraoperative blood loss of 344.0 ± 64.7 ml, while the control group saw a mean intraoperative blood loss of 401.2 ± 74.3 ml (p=0.002).[15] In a similar vein, Sitaula et al. found intraoperative blood loss in the misoprostol and control groups of 345.5 ± 58.3 ml and 408.6 ± 68.9 ml, respectively (p<0.001), whereas Kumari et al. recorded corresponding values of 374.7 ± 69.9 ml and 401.7 ± 15.1 ml (p<0.001).[16,17] The close agreement between the present findings and previous studies supports the effectiveness of rectal misoprostol in reducing operative blood loss through enhanced uterine contractility and improved haemostasis during caesarean delivery.

A similar trend was observed with postoperative blood loss. Women receiving misoprostol had significantly lower postoperative blood loss compared with controls (112.4 ± 18.9 ml vs. 139.6 ± 23.7 ml; p=0.003). These findings closely resemble those reported by Kumari et al., who observed postoperative blood loss of 114.0 ± 19.9 ml in the misoprostol group and 136.4 ± 24.6 ml in controls (p=0.003).[17] Likewise, Sitaula et al. reported postoperative blood loss of 108.5 ± 18.2 ml and 132.8 ± 22.7 ml, respectively (p=0.002).[16] The consistency of these findings across studies suggests that rectal misoprostol provides sustained uterotonic activity beyond the intraoperative period, thereby reducing postoperative bleeding and overall blood loss. In the present study, total blood loss was reduced by approximately 90 ml in women receiving misoprostol (458.0 ± 75.2 ml vs. 548.3 ± 89.4 ml; p=0.001), which is clinically relevant in a population where baseline maternal anaemia remains common.

The reduction in blood loss was reflected in postoperative haematological parameters. The misoprostol group had significantly higher postoperative haemoglobin (10.2 ± 0.8 g/dL vs. 9.3 ± 1.1 g/dL; p=0.002), despite baseline haemoglobin and hemocrit values being similar across the groups. Misoprostol-treated women saw a substantially smaller mean haemoglobin drop (1.1 ± 0.4 g/dL) than controls (1.8 ± 0.7 g/dL; p<0.001). Similarly, postoperative haematocrit levels were better preserved in the misoprostol group, with a significantly smaller decline than in the control group (1.7 ± 0.7% vs. 2.9 ± 1.0%; p=0.001). These findings support previous reports demonstrating that prophylactic uterotonic therapy effectively limits perioperative blood loss and minimizes postoperative haematological deterioration. Additionally, the misoprostol group required fewer extra uterotonics (6.7% vs. 20.0%), and none of the misoprostol-treated participants needed blood transfusions (compared to 6.7% in the control group), suggesting better haemostatic control after surgery.

Maternal and neonatal safety outcomes were comparable between groups. 93.3% of newborns in the misoprostol group and 96.7% in the control group had APGAR scores ≥7, and both groups had low rates of NICU admission (3.3% vs. 6.7%). These findings are consistent with previous studies that reported no adverse neonatal effects associated with maternal misoprostol administration.[16,17] Misoprostol side effects were more common in women, but they were usually moderate and self-limiting. The most frequent adverse effects were pyrexia (6.7%) and shivering (10.0%), while diarrhoea and vomiting were rare (3.3% each). Similar adverse-effect profiles have been reported in earlier studies evaluating rectal misoprostol, where transient shivering and fever represented the most frequently observed reactions.[16,17] Taken together, the present findings are in agreement with existing literature and further support the use of preoperative rectal misoprostol as an effective strategy for reducing blood loss during elective caesarean section without compromising maternal or neonatal safety.

Conclusion

Preoperative administration of 400 µg rectal misoprostol in women undergoing elective caesarean section was associated with a significant reduction in intraoperative, postoperative, and total blood loss compared with standard management alone. Misoprostol-treated women showed reduced need for further uterotonic medications and blood transfusions, as well as improved preservation of postoperative haemoglobin and hemocrit levels. Neonatal outcomes, such as NICU admissions and APGAR scores, were similar across the groups, suggesting no negative impacts on the foetus. Despite being more common

in the misoprostol group, moderate side effects such pyrexia and shivering were self-limiting and clinically tolerable. As a result, preoperative rectal misoprostol seems to be a cheap, safe, and efficient supplement for lowering perioperative blood loss after elective caesarean delivery.

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Conflicts of interest
There are no conflicts of interest.

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