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Original Article

Use of Misoprostol in the Prevention of Postpartum Haemorrhage Following Caesarean Section

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Abstract

Background: *Postpartum haemorrhage (PPH) remains a leading cause of maternal mortality, particularly in low-resource settings. Misoprostol, a synthetic prostaglandin E1 analogue, is inexpensive, thermo-stable, and easy to administer; it is increasingly used off-label in obstetrics for PPH prevention and treatment, but locally generated evidence on its rectal use during caesarean section in Bangladesh remains limited.*

Objective: *To ascertain the use of rectal misoprostol in the prevention of postpartum haemorrhage following caesarean section.*

Methods: *This was a cross-sectional comparative study conducted in the Department of Obstetrics and Gynaecology, Institute of Child and Mother Health (ICMH), Matuail, Dhaka, from November 2012 to April 2013. A total of 110 pregnant women at ≥37 weeks of gestation undergoing caesarean section were enrolled by consecutive sampling and assigned to two groups of 55 each: Group A (Trial group) received 400 mcg rectal misoprostol immediately after delivery of the baby in addition to standard oxytocin, while Group B (Control group) received standard oxytocin alone (10 IU IV/IM) as per WHO 2012 active management protocol. Outcomes included intra- and post-operative blood loss, incidence of PPH, and side effects. Data were analysed using SPSS version 16.0; chi-square and Fisher's exact tests were used for categorical variables and independent-samples t-test for continuous variables, with $p<0.05$ considered significant.*

Results: *The mean age was 21.90±3.73 years in Group A and 22.83±3.51 years in Group B. The majority were housewives (89.1% in Group A vs 96.4% in Group B) and primigravida (92.7% vs 96.4%). Blood loss <1000 ml was significantly more common in Group A than Group B (61.8% vs 29.1%), while blood loss >1000 ml was more frequent in Group B than Group A (70.9% vs 38.2%; $p=0.001$). Postpartum haemorrhage occurred in 3.6% of women in each group. Pyrexia was observed in 9.1% of Group A and 7.3% of Group B, and nausea in 1.8% and 3.6% respectively, with no significant difference ($p=0.676$).*

Conclusion: *Rectal misoprostol given as an adjunct to standard oxytocin was associated with significantly reduced intra- and post-operative blood loss following caesarean section, with a comparable side-effect profile. Given its low cost, thermal stability, and ease of administration, rectal misoprostol may have an important adjunctive role in PPH prevention in tertiary settings, and its use should continue to be explored in adequately powered randomized trials.*

Keywords: Postpartum haemorrhage, Rectal misoprostol, Caesarean section, Uterotonic, PPH prevention.

Introduction

To give birth to a healthy child is one of the most awaited events in a woman's life, but childbirth can also impose the greatest risks to maternal life. Maternal mortality from postpartum haemorrhage (PPH) remains a major global public health concern, especially in low- and middle-income countries[1]. Worldwide, obstetric haemorrhage is responsible for more than a quarter of all maternal deaths, and within Bangladesh approximately 26% of maternal deaths are attributable to haemorrhage[2]. PPH is conventionally defined as any amount of bleeding from or into the genital tract following birth of the baby, occurring up to the end of the puerperium, that adversely affects the general condition of the patient as evidenced by a rise in pulse rate and a fall in blood pressure[3]. It is sub-classified as primary, when bleeding occurs within 24 hours of delivery, or secondary, when bleeding occurs thereafter[4]. Pritchard et al. reported that the average blood loss following vaginal delivery and caesarean section was approximately 500 ml and 1000 ml respectively, although clinical estimation of blood loss at delivery is notoriously inaccurate as it relies on visual observation rather than objective measurement[5].

Most cases of PPH are caused by uterine atony, and demographic risk factors do not reliably predict who will develop PPH[6,7]; the importance of prevention is therefore obvious. Routine use of uterotonic drugs in the third stage of labour has substantially reduced uterine atony as a cause of PPH[3]. Drugs commonly used for prophylaxis include oxytocin, ergometrine and syntometrine. The World Health Organization (WHO) currently recommends prophylactic administration of oxytocin 10 IU intramuscularly immediately after delivery of the baby[8], a practice now routine in many countries, including Bangladesh. Bolus administration of large doses of oxytocin should be avoided because of the risk of hypotension[9]. Injectable ergometrine 0.2 mg IV or IM is also used, but is contraindicated in hypertension, cardiac disease, Rh-negative mothers, and pre-eclampsia or eclampsia[10].

Misoprostol, a potent synthetic analogue of prostaglandin E_1, is a uterotonic agent originally marketed for the prevention and treatment of peptic ulcer disease but increasingly applied in obstetric practice for cervical ripening, induction of labour, medical management of miscarriage, and prevention and treatment of PPH[11]. It is inexpensive, easily stored at room temperature, and has few systemic side effects[12]. Misoprostol can be administered orally, sublingually, vaginally, or rectally, and its effects on the postpartum uterus have been shown to be rapid[9]. A randomised controlled trial demonstrated the efficacy of rectal misoprostol in the treatment of primary PPH secondary to atony[13], and several studies have examined its use in the third stage of labour[14]. One investigation concluded that rectally administered misoprostol is an effective treatment for PPH unresponsive to oxytocin and ergometrine, with potential advantages including stability in light and at room temperature, low cost, ease of administration, and a favourable side-effect profile[15].

Unlike standard uterotonics, misoprostol is not contraindicated in women with hypertension and may be a particularly important option for women with pre-eclampsia. Given these advantages, misoprostol may serve as an alternative or adjunct to conventional oxytocic drugs for the prevention of atonic PPH following both vaginal and caesarean deliveries. Locally generated evidence on the rectal route of misoprostol in caesarean section, however, remains limited in Bangladesh, where most deliveries occur in resource-constrained settings and PPH continues to drive a substantial share of preventable maternal mortality. The present study aims to evaluate the use of rectal misoprostol in the prevention of PPH following caesarean section at a tertiary care hospital in Dhaka.

Methods

This was a cross-sectional comparative study conducted in the Department of Obstetrics and Gynaecology, Institute of Child and Mother Health (ICMH), Matuail, Dhaka, from November 2012 to April 2013, to evaluate the effect of rectal misoprostol on intra- and post-operative blood loss and the incidence of postpartum haemorrhage following caesarean section.

Pregnant women, both primigravida and multigravida, with a gestational age of 37 weeks or more who were delivered by caesarean section during the study period were eligible. A total of 110 women fulfilling the inclusion criteria were enrolled by consecutive sampling and assigned to two groups of 55 each: Group A (Trial group), who received rectal misoprostol in addition to standard oxytocin, and Group B (Control group), who received standard oxytocin alone. Inclusion criteria were gestational age ≥37 weeks, planned or emergency caesarean delivery, no contraindications to misoprostol, and written informed consent. Women with a known hypersensitivity to prostaglandins, coagulation disorders, or those who declined consent were excluded.

In Group A, 400 mcg of misoprostol (two 200 mcg tablets) was inserted per rectum immediately after delivery of the baby and clamping of the umbilical cord, prior to delivery of the placenta. Both groups received standard active management of the third stage of labour as per WHO 2012 recommendations, including 10 IU of oxytocin intravenously or intramuscularly at delivery of the anterior shoulder, controlled cord traction, and uterine massage following delivery of the placenta[8]. Intra- and post-operative blood loss was estimated using a combination of visual assessment by the attending obstetrician, gravimetric measurement of soaked sponges, and measurement of suction canister volume after subtraction of amniotic fluid; PPH was defined as estimated blood loss exceeding 1000 ml following caesarean delivery, in line with contemporaneous definitions[3,5].

Demographic, obstetric, intra-operative, and post-operative data were recorded on a structured data collection sheet through patient interview, clinical examination, and review of operative and postnatal records. Variables included age, educational status, occupational status, socioeconomic status, parity, gestational age, indication for caesarean section, estimated blood loss, occurrence of PPH, and side effects (pyrexia, nausea, diarrhoea). Data were analysed using SPSS for Windows version 16.0. Categorical variables were summarised as frequencies and percentages and compared using the chi-square test or Fisher's exact test where expected cell counts were small; continuous variables were summarised as mean ± standard deviation and compared using the independent-samples t-test. A p-value of less than 0.05 was considered statistically significant.

Ethical approval for the study was obtained from the Institute of Child and Mother Health's institutional ethics committee prior to initiation. Written informed consent was obtained from each participant after explanation of the study aims, procedures, potential risks, and benefits in a language she understood. Participation was entirely voluntary, and women were free to withdraw at any time without affecting their clinical care. Confidentiality and anonymity of all participants and their records were strictly maintained.

Results

A total of 110 women were enrolled and analysed, with 55 women in each group. Demographic characteristics, obstetric history, indication for caesarean section, intra- and post-operative blood loss, occurrence of PPH, and side effects were compared between the two groups.

Table 1. Distribution of age of the patients (n = 110)

Age (years)	Group A (Trial) n	Group A %	Group B (Control) n	Group B %	p-value
≤20	29	52.7	22	40.0	0.843
21–25	14	25.5	23	41.8	
26–30	8	14.5	10	18.2	
31–35	4	7.3	0	0.0	
Mean ± SD	21.90 ± 3.73		22.83 ± 3.51		

Table I shows that in Group A, 52.7% of women were ≤20 years, 25.5% were 21–25 years, 14.5% were 26–30 years, and 7.3% were 31–35 years. In Group B, 40.0% were ≤20 years, 41.8% were 21–25 years, and 18.2% were 26–30 years. The mean age was 21.90 ± 3.73 years in Group A and 22.83 ± 3.51 years in Group B; the difference between groups was not statistically significant ($p > 0.05$).

Table 2. Distribution of educational status of the patients (n = 110)

Education	Group A (Trial) n	Group A %	Group B (Control) n	Group B %	p-value
Illiterate	6	10.9	6	10.9	0.033
Primary	27	49.1	33	60.0	
Secondary	14	25.5	16	29.1	
Higher secondary	8	14.5	0	0.0	

As shown in Table II, in Group A, 49.1% had completed primary education, 25.5% had completed secondary education, 14.5% had completed higher secondary education, and 10.9% were illiterate. In Group B, 60.0% had completed primary education, 29.1% had completed secondary education, and 10.9% were illiterate. The difference in educational status between the two groups reached statistical significance ($p < 0.05$); this baseline imbalance is acknowledged as a limitation in interpreting group comparisons.

Table 3. Distribution of occupational status of the patients (n = 110)

Occupation	Group A (Trial) n	Group A %	Group B (Control) n	Group B %	p-value
Housewife	49	89.1	53	96.4	0.142
Service holder	6	10.9	2	3.6	

Most participants in both groups were housewives (89.1% in Group A vs 96.4% in Group B), with a small proportion in service occupations (10.9% vs 3.6%). The difference between the two groups was not statistically significant ($p > 0.05$).

Table 4. Distribution of socioeconomic status of the patients (n = 110)

Socioeconomic class	Group A (Trial) n	Group A %	Group B (Control) n	Group B %	p-value
Lower (<5,000 Tk)	8	14.5	17	30.9	0.109
Lower middle (5,000–15,000 Tk)	39	70.9	33	60.0	
Middle (15,000–40,000 Tk)	8	14.5	5	9.1	

In Group A, 14.5% of patients were from the lower socioeconomic class, 70.9% from the lower middle class, and 14.5% from the middle class. In Group B, 30.9% were from the lower class, 60.0% from the lower middle class, and 9.1% from the middle class. The difference in socioeconomic distribution between the two groups was not statistically significant ($p > 0.05$).

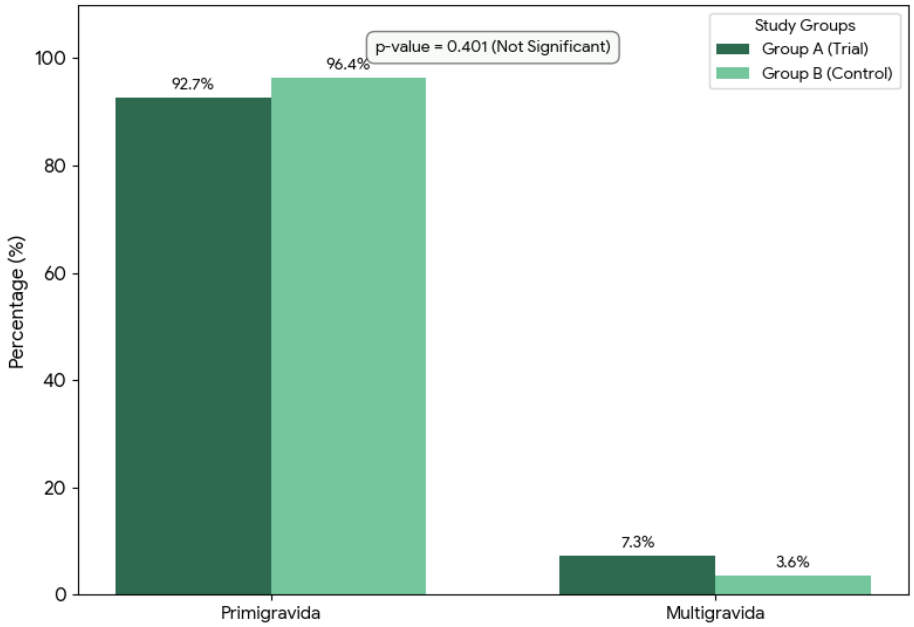


Figure 1: Distribution of parity (n = 110)

The majority of women in both groups were primigravida, accounting for 92.7% in Group A and 96.4% in Group B; multigravida women constituted 7.3% and 3.6% respectively. The difference between the two groups was not statistically significant ($p > 0.05$).

Table 5. Distribution of gestational age of the patients (n = 110)

Gestational age	Group A (Trial) n	Group A %	Group B (Control) n	Group B %	p-value
37–39 weeks	17	30.9	23	41.8	0.234
40–42 weeks	38	69.1	32	58.2	

Most women in both groups delivered at 40–42 weeks (69.1% in Group A vs 58.2% in Group B), while the remainder delivered at 37–39 weeks (30.9% vs 41.8%). The difference between the two groups was not statistically significant ($p > 0.05$).

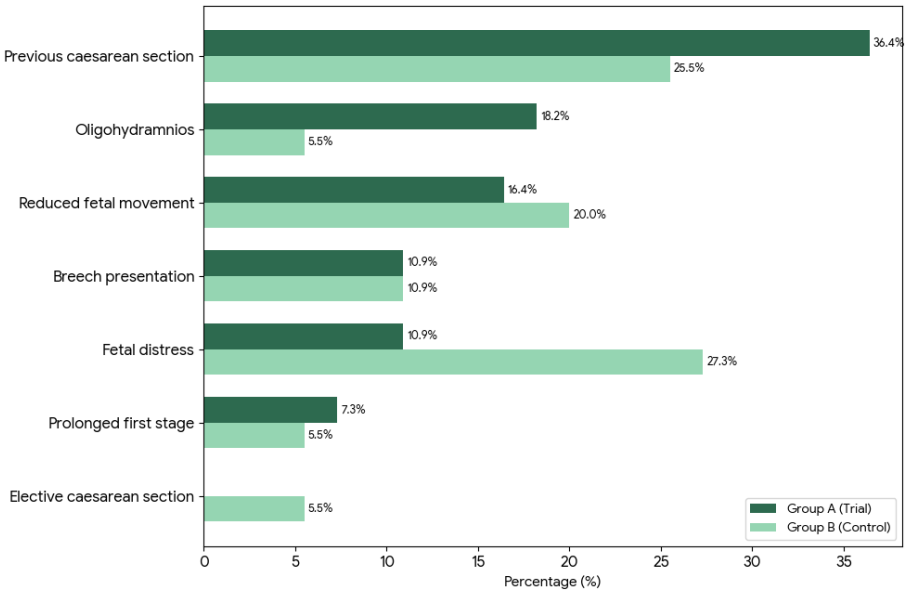


Figure 2: Indication for caesarean section (n = 110)

The leading indications for caesarean section in Group A were previous caesarean section (36.4%), oligohydramnios (18.2%), reduced fetal movement (16.4%), breech presentation (10.9%), fetal distress (10.9%), and prolonged first stage of labour (7.3%). In Group B, the leading indications were fetal distress (27.3%), previous caesarean section (25.5%), reduced fetal movement (20.0%), breech presentation (10.9%), and prolonged first stage of labour or oligohydramnios (5.5% each). The overall distribution of indications did not differ significantly between the two groups ($p > 0.05$).

The incidence of postpartum haemorrhage was identical in the two groups, with 3.6% (2 of 55) in Group A and 3.6% (2 of 55) in Group B ($p = 1.000$), reflecting that overt PPH (estimated blood loss > 1000 ml requiring intervention beyond standard care) was uncommon in both arms.

Table 6. Distribution of postpartum haemorrhage in the study population (n = 110)

PPH	Group A (Trial) n	Group A %	Group B (Control) n	Group B %	p-value
Yes	2	3.6	2	3.6	1.000
No	53	96.4	53	96.4	

Blood loss < 1,000 ml was significantly more common in Group A than in Group B (61.8% vs 29.1%), while blood loss > 1,000 ml was more frequent in Group B than in Group A (70.9% vs 38.2%). This difference was statistically significant (p = 0.001), suggesting that rectal misoprostol administered in addition to standard oxytocin was associated with a meaningful reduction in intra- and post-operative blood loss following caesarean section.

Table 7. Distribution of estimated blood loss following caesarean section (n = 110)

Blood loss	Group A (Trial) n	Group A %	Group B (Control) n	Group B %	p-value
< 1,000 ml	34	61.8	16	29.1	0.001
> 1,000 ml	21	38.2	39	70.9	

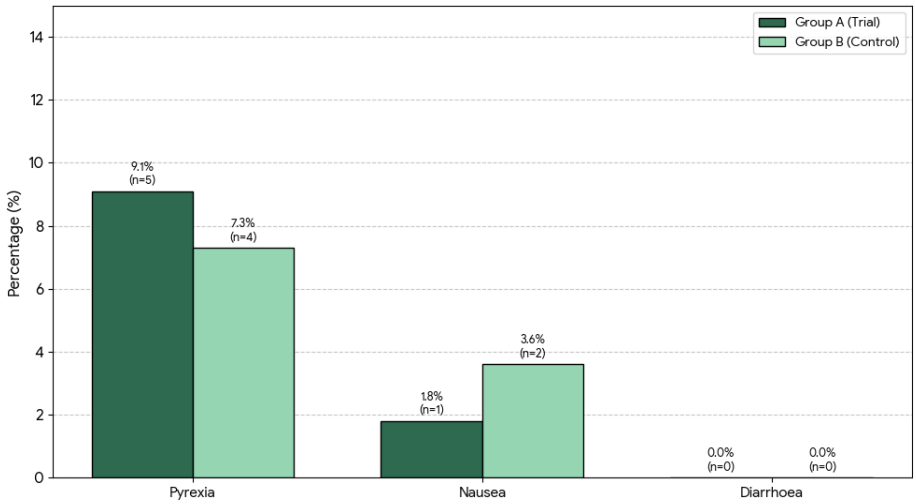


Figure 3: Side effects of misoprostol (n = 110)

Side effects were uncommon and largely self-limiting in both groups. Pyrexia occurred in 9.1% of Group A and 7.3% of Group B, nausea in 1.8% and 3.6% respectively, and no woman in either group reported diarrhoea. The difference in side-effect frequency between the two groups was not statistically significant (p > 0.05), and no woman discontinued the study or required additional intervention due to side effects.

Discussion

Postpartum haemorrhage remains a leading cause of preventable maternal mortality, particularly in low- and middle-income countries where access to standard injectable uterotonics, blood products, and emergency obstetric care can be limited. Although oxytocin is the recommended first-line uterotonic for active management of the third stage of labour, its requirement for cold-chain storage and intravenous or intramuscular administration constrains its utility in many settings[8]. Misoprostol, a low-cost prostaglandin E_1 analogue that is thermo-stable and amenable to multiple routes of administration, has therefore attracted considerable interest as an alternative or adjunctive agent for PPH prevention[11,12].

In the present study, the mean age of participants was 21.90 ± 3.73 years in Group A and 22.83 ± 3.51 years in Group B, with the majority of women in both groups being primigravida (92.7% and 96.4% respectively). This relatively young age profile contrasts with reports from older case series of PPH-affected women[36,37], and likely reflects the demographic pattern of comparatively early childbearing in this population. Most participants were housewives from lower or lower-middle socioeconomic strata, consistent with the catchment area of a public tertiary hospital in Dhaka.

The principal finding of this study was a significantly lower proportion of women with estimated blood loss exceeding 1,000 ml in the misoprostol group (38.2%) compared with the control group (70.9%), with a corresponding increase in the proportion of women with blood loss below 1,000 ml in Group A (61.8% vs 29.1% in Group B; p = 0.001). The incidence of overt postpartum haemorrhage was identical at 3.6% in both arms, suggesting that misoprostol's effect was most apparent in reducing intermediate-volume blood loss rather than in averting the small number of severe events. This pattern is consistent with the broader literature, in which adjunctive misoprostol has been associated with reductions in mean blood loss and in the proportion of women crossing higher blood-loss thresholds, with smaller effects on the frequency of clinically diagnosed PPH itself[13,14,15,17].

Side effects were uncommon and similar between groups. Pyrexia occurred in 9.1% of women in the misoprostol group compared with 7.3% in the control group, and nausea occurred in 1.8% and 3.6% respectively, with no statistically significant difference. No woman in either group reported diarrhoea, and none required discontinuation of the protocol or additional treatment as a result of side effects. The relatively low frequency of pyrexia and the absence of severe hyperthermia in this study are consistent with the rectal route, which has been associated with slower absorption and lower peak serum concentrations than oral or sublingual administration[11,15].

The distribution of indications for caesarean section differed somewhat between the two groups, with previous caesarean section and oligohydramnios more common in Group A and fetal distress more common in Group B; however, the overall distribution did not reach statistical significance. A statistically significant difference in educational status was observed between the groups (p = 0.033), highlighting a limitation of the consecutive sampling design in achieving fully balanced groups, although the principal outcome of blood loss is unlikely to be substantially mediated by educational level.

Taken together, these findings suggest that rectal misoprostol administered as a single 400 mcg dose immediately after delivery of the baby, in addition to standard oxytocin and active management of the third stage of labour, may meaningfully reduce intra- and post-operative blood loss following caesarean section. Given misoprostol's low cost, thermal stability, and ease of administration, the rectal route is a particularly attractive option for tertiary facilities in resource-constrained settings where adjunctive uterotonic strategies may enhance standard oxytocin-based prophylaxis.

Limitations of the study

This study has several limitations that should be considered when interpreting the findings. First, the cross-sectional comparative design and consecutive sampling, rather than randomised allocation, limit causal inference and leave the analysis vulnerable to residual confounding by unmeasured factors; the statistically significant baseline imbalance in educational status (p = 0.033) is consistent with this concern. Second, the study was conducted at a single tertiary hospital in Dhaka over a six-month period with a modest sample size of 110 women, which limits statistical power for less frequent outcomes such as overt PPH (3.6% in

each group) and constrains the generalisability of the findings to other settings, particularly community-level deliveries. Third, blood loss was estimated using a combination of visual assessment, weighing of soaked materials, and suction canister volume, all of which have known measurement limitations and may underestimate true blood loss. Fourth, blinding the attending obstetrician was not feasible given the rectal route of administration, raising the possibility of observer bias in blood-loss estimation. Finally, longer-term outcomes such as transfusion requirement, post-operative haemoglobin trajectory, length of hospital stay, and maternal morbidity were not captured. Larger, adequately powered, randomized, and, where possible, blinded trials are needed to confirm these findings and to define optimal dosing and timing.

Conclusion

In this cross-sectional comparative study of 110 women undergoing caesarean section at a tertiary care hospital in Dhaka, a single 400 mcg dose of rectal misoprostol given as an adjunct to standard oxytocin and active management of the third stage of labour was associated with a statistically significant reduction in intra- and post-operative blood loss compared with oxytocin alone (38.2% vs 70.9% with blood loss > 1,000 ml; $p = 0.001$), with comparable rates of overt postpartum haemorrhage and a similar side-effect profile. Given its low cost, thermal stability, and ease of administration, rectal misoprostol may have an important adjunctive role in PPH prevention at caesarean section in resource-constrained tertiary settings. Adequately powered randomised controlled trials are recommended to confirm these findings, define the optimal dose and timing, and clarify generalisability to community-level deliveries.

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