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The Effect of Intrauterine Oxytocin-Soaked Gauze on Postoperative Bleeding in Cesarean Section: A Double-Blind Randomized Clinical Trial

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Abstract

Background

Postpartum hemorrhage remains a major cause of maternal morbidity following cesarean delivery. Although intravenous oxytocin is standard prophylaxis, systemic adverse effects encourage evaluation of alternative adjunctive delivery methods. This study assessed whether intrauterine oxytocin-soaked gauze reduces blood loss and improves hemodynamic stability.

Methods

In this double-blind randomized trial, 120 term women undergoing elective cesarean delivery under spinal anesthesia were allocated to oxytocin-soaked gauze (n = 40), saline-soaked gauze (n = 43), or dry gauze control (n = 37). The primary outcome was total intraoperative blood loss. Secondary outcomes included changes in hemoglobin, hematocrit, blood pressure, heart rate, temperature, and oxygen saturation. Appropriate parametric or nonparametric tests were applied with a significance threshold of 0.05.

Results

Median blood loss was significantly lower in the oxytocin group (440 mL [IQR 350–530]) compared with saline (540 mL [420–625]) and control (625 mL [475–700]; $p < 0.001$). Hematocrit reduction was attenuated (–1.56 ± 0.81% vs. − 2.46 ± 1.37% and − 3.62 ± 1.23%; $p = 0.0003$), while hemoglobin changes were similar ($p = 0.976$). Systolic and diastolic blood pressure remained stable in the oxytocin group but declined in comparators ($p < 0.05$). No significant differences in heart rate or serious adverse events were observed.

Conclusion

Intrauterine oxytocin-soaked gauze during cesarean delivery reduces surgical blood loss and supports maternal hemodynamic stability without added complications. Larger multicenter studies are warranted to confirm these findings.

Callouts

- Postpartum hemorrhage remains a major clinical challenge, and current preventive methods do not always provide adequate control.
- Oxytocin is the foundation of postpartum hemorrhage prevention, but common administration routes may cause hemodynamic instability and cardiovascular side effects.

- This study shows that intrauterine oxytocin-soaked gauze can reduce blood loss and maintain hemodynamic stability without increasing adverse events.

Introduction

Postpartum hemorrhage (PPH) remains one of the leading causes of maternal mortality worldwide, accounting for nearly one-quarter of all maternal deaths (1). In women undergoing cesarean section, excessive bleeding is a major contributor to maternal morbidity and mortality (2). In developing countries, the risk of maternal death due to PPH is estimated at approximately 1 in every 1,000 births (3), making it a persistent and pressing public health concern (4, 5).

PPH is clinically defined as blood loss exceeding 500 mL after vaginal delivery, more than 1,000 mL following cesarean section, or greater than 1,500 mL during cesarean hysterectomy (6). Uterine atony is the most common primary cause, accounting for approximately 70% of PPH cases (7–9). The mainstay of management continues to be uterotonic agents, particularly oxytocin, which is routinely administered after childbirth to promote uterine contractions and reduce blood loss. Oxytocin alone has been shown to reduce the incidence of PPH by up to 40% (5, 10).

Despite being the gold standard for both prevention and treatment of PPH, intravenous administration of oxytocin is associated with cardiovascular side effects such as tachycardia, hypotension, vasodilation, and chest pain, which may pose significant risks in high-risk patients (11, 12). These concerns have prompted researchers to explore alternative, less invasive routes of administration for oxytocin (13). One such approach is direct- intra myometrial injection of the drug. A study by Hossu et al. demonstrated that intramyometrial oxytocin significantly reduced intraoperative blood loss and surgical duration, and also shortened the length of hospital stay (14). Similarly, Mangla's research found this method to be effective in reducing the incidence and complications of PPH (15). However, current evidence on the safety and efficacy of this technique remains limited and inconclusive (16, 17).

Given the critical role of the third stage of labor in the prevention of hemorrhage and the importance of oxytocin in its management, identifying safe and innovative delivery methods for this drug is essential. In this context, the present study was designed to evaluate the effect of intrauterine application of oxytocin-soaked gauze on postoperative bleeding in cesarean section. If proven effective, this method may represent a novel and practical intervention for reducing PPH and improving maternal outcomes.

Methods

This double-blind, parallel-group randomized clinical trial was conducted to evaluate the effect of intrauterine oxytocin-soaked gauze on postoperative bleeding following elective cesarean section. Pregnant women scheduled for elective cesarean delivery under spinal anesthesia at Hakim Hospital, Neyshabur, were screened for eligibility. Inclusion criteria were: term pregnancy (≥ 37 weeks' gestation), American Society of Anesthesiologists physical status II, and willingness to undergo spinal anesthesia. Exclusion criteria were including core body temperature > 37.5°C, abnormal obstetric ultrasound findings,

intrauterine fetal demise, active hemorrhage requiring transfusion, preterm pregnancy (< 37 weeks), and failed spinal anesthesia.

Based on effect sizes reported by Anita et al. (18), with α = 0.05 and 95% power, 29 subjects per group were required. Allowing 10% attrition increased the target to 32 per group (n = 96). To further enhance statistical power and control for potential dropouts, 120 participants were ultimately enrolled and randomized. Participants were allocated to three groups using block randomization with blocks of six to ensure balanced allocation. The three groups were the oxytocin-soaked gauze group (Group O), saline-soaked gauze group (Group S), and dry-gauze control group (Group C).

For the oxytocin group, five 10-IU ampoules of oxytocin were dissolved in 500 mL of normal saline maintained at 4°C, resulting in a final concentration of 1 IU/mL. Immediately before application, 50 mL of the prepared oxytocin solution was used to soak two small gauzes. Excess solution was gently expressed from the gauzes before intrauterine placement to minimize free fluid accumulation while maintaining adequate impregnation with the study solution. The two gauzes were placed intrauterinely for one minute and were then removed, followed by routine uterine cleaning.

Participants in the saline group received two small gauzes soaked in 50 mL of 4°C normal saline using the same procedure and handling conditions. Participants in the control group underwent intrauterine cleaning with two dry gauzes for one minute, consistent with the routine surgical procedure.

All gauze interventions were prepared by a dedicated research assistant who was independent of clinical care and outcome assessment and was responsible for managing group allocation.

Participants were unaware of their group allocation. All personnel responsible for outcome assessment, including those measuring blood loss, recording vital signs, and assessing hemoglobin and hematocrit levels, remained blinded to group allocation throughout the study.

Although the operating surgeon was aware of the type of gauze used during the procedure, the surgeon had no role in outcome assessment or data collection. Thus, participants and outcome assessors remained blinded to group allocation throughout the study.

After informed consent, demographic and baseline clinical data were collected using a structured questionnaire. Before spinal anesthesia, all participants received intravenous fluid preload with normal saline at 8 mL/kg, followed by maintenance fluid at 10 mL/kg/h. Intravenous fluids were administered at a temperature consistent with the operating-room temperature.

Standard monitoring, including noninvasive blood pressure, pulse oximetry, heart rate, and electrocardiography, was applied to all participants. Vital signs were recorded at 5-minute intervals throughout the surgical procedure and during the recovery period. Spinal anesthesia was performed at the L3–L4 or L4–L5 intervertebral space using a 27-gauge Quincke needle and 12.5 mg of 0.5% bupivacaine. Given the established role of systemic oxytocin in the prevention of postpartum hemorrhage, withholding routine uterotonic prophylaxis would not have been ethically appropriate.

Accordingly, all participants received a total dose of 50 IU of intravenous oxytocin as a slow infusion over two hours, spanning the intraoperative and immediate recovery periods, as part of routine standard care. The same systemic oxytocin regimen was administered to all three groups. Therefore, the intrauterine gauze intervention was evaluated as an adjunct to, rather than a replacement for, routine uterotonic prophylaxis.

Intravenous fluid therapy was continued postoperatively for 24 hours according to the routine postoperative protocol.

The primary outcome was total intraoperative blood loss. Blood loss from gauzes and laparotomy sponges was determined by weighing them before and after use. The difference in weight was converted to blood volume using a conversion factor of 1 g of weight gain equivalent to 1 mL of blood. The calculated blood loss from gauzes and laparotomy sponges was combined with the recorded suctioned volume to estimate total intraoperative blood loss. The suctioned volume included blood and amniotic fluid generated during cesarean delivery. The same suction-based measurement procedure was applied uniformly to all participants. All blood-loss measurements were performed by personnel blinded to group allocation. Baseline hemoglobin and hematocrit levels were obtained before surgery, and both parameters were reassessed 24 hours after cesarean delivery. Vital signs were also reassessed at 24 hours postoperatively. Allowable blood loss (ABL) was calculated for each participant using standard formulas. To minimize potential confounding and improve data consistency, all cesarean deliveries were performed by the same surgical team under standardized perioperative conditions, including consistent operating-room temperature, type and temperature of intravenous fluids, anesthesia team, and perioperative medications

Ethics Statement

This study was approved by the Research Ethics Committee of Neyshabur University of Medical Sciences (IR.NUMS.REC.1400.021) and registered in the Iranian Registry of Clinical Trials (IRCT20160825029520N3). The study was conducted in accordance with the Declaration of Helsinki. Written informed consent was obtained from all participants prior to enrollment.

Consent

Written informed consent was obtained from all participants prior to enrollment.

Statistical Analysis

Statistical analyses were performed to compare the effects of intrauterine interventions (oxytocin-soaked gauze, saline-soaked gauze, and dry gauze) on hematologic parameters (hemoglobin and hematocrit), hemodynamic variables (systolic and diastolic blood pressure, heart rate, temperature, and oxygen saturation), and the volume of surgical blood loss.

Normality of continuous variables was assessed using the Shapiro–Wilk test. Normally distributed data were reported as mean ± standard deviation (SD), whereas non-normally distributed variables were presented as median and interquartile ranges (IQR). Between-group comparisons for normally distributed variables were conducted using one-way analysis of variance (ANOVA), followed by Tukey's HSD test for pairwise comparisons. When assumptions of normality or homogeneity of variances were violated, the non-parametric Kruskal–Wallis test was used, with post hoc pairwise comparisons via Dunn's test with Bonferroni correction.

For within-group comparisons of repeated measures, repeated measures ANOVA (RMANOVA) was applied to normally distributed variables. When the sphericity assumption was not met, the Greenhouse–Geisser correction was employed. The Wilcoxon signed-rank test was used for non-normally distributed paired data.

Intraoperative blood loss (measured via suction canisters, gauze weight, and total estimated loss) was assessed using Kruskal–Wallis tests due to non-normal distribution, with subsequent pairwise group comparisons using Dunn's test.

All statistical tests were two-sided with a significance level of $\alpha = 0.05$. Analyses were performed using IBM SPSS Statistics version 26.

Results

A total of 120 eligible women were enrolled and randomly assigned into three groups: oxytocin group (n = 40), control group (n = 37), and saline group (n = 43) (Figs. 1). Baseline characteristics were consisted of age (mean ± SD: 31.25 ± 5.2 in oxytocin, 31.54 ± 4.8 in control, and 31.58 ± 5.1 in saline group; p = 0.76), height, weight, gestational age, number of previous pregnancies, and surgery duration were statistically comparable across the groups (P > 0.05), confirming the success of randomization and baseline homogeneity (Table 1).

Table 1
Baseline characteristics of participants

Variable	Oxytocin group (n = 40)	Control group (n = 37)	Saline group (n = 43)	P-value
Age (years)	31.25 ± 5.2	31.54 ± 4.8	31.58 ± 5.1	0.76
Height (cm)	162.1 ± 4.3	161.7 ± 5.0	162.0 ± 4.5	0.83
Weight (kg)	72.5 ± 5.1	73.0 ± 6.2	71.8 ± 5.7	0.73
Gestational age (weeks)	38.9 ± 1.2	39.1 ± 1.3	39.0 ± 1.1	0.67
Number of pregnancies	2.1 ± 0.8	2.0 ± 0.7	2.2 ± 0.9	0.88
Duration of surgery (min)	47.5 ± 5.3	48.0 ± 6.0	47.2 ± 5.5	0.91

Values are presented as mean ± SD for continuous variables and n (%) for categorical variables. No statistically significant differences were observed between groups (P > 0.05).

Repeated measures ANOVA revealed a significant decrease in hemoglobin levels post-intervention in all three groups ($p < 0.001$). Specifically, mean hemoglobin dropped from 12.05 ± 0.86 to 11.16 ± 0.83 g/dL in the oxytocin group, from 13.01 ± 1.03 to 12.12 ± 1.04 in the control group, and from 12.63 ± 1.23 to 11.72 ± 1.20 in the saline group (Table 2). However, one-way ANOVA on ΔHb showed no significant between-group difference ($F(2,117) = 0.0243$, $p = 0.976$), and Tukey's post hoc comparisons confirmed this finding (Oxy vs Ctrl: $p = 1.000$; Oxy vs Sal: $p = 0.981$; Ctrl vs Sal: $p = 0.980$).

Table 2
Comparison of Hemoglobin and Hematocrit Changes Between Groups

Variable	Group	n	Baseline (Mean ± SD)	Follow-up (Mean ± SD)	Δ (Mean ± SD)	F (df = 2, 117)	p (ANOVA)	Tukey HSD Post-hoc Comparisons (adjusted p)
ΔHb	Oxytocin	40	−13.82 ± 1.15	−14.71 ± 1.03	−0.89 ± 0.70	0.0243	0.9760	Oxy vs Ctrl: p = 1.000 (ns)Oxy vs Sal: p = 0.981 (ns)Ctrl vs Sal: p = 0.980 (ns)
	Control	37	−13.75 ± 1.10	−14.64 ± 1.07	−0.89 ± 0.72			
	Saline	43	−13.79 ± 1.12	−14.71 ± 1.27	−0.92 ± 0.79			
ΔHct	Oxytocin	40	41.23 ± 2.10	39.67 ± 1.95	−1.56 ± 0.81	8.798	0.0003	Oxy vs Ctrl: p = 0.0002
	Control	37	40.98 ± 2.24	37.36 ± 1.89	−3.62 ± 1.23			Oxy vs Sal: p = 0.143 (ns)
	Saline	43	41.15 ± 2.32	38.69 ± 2.03	−2.46 ± 1.37			Ctrl vs Sal: p = 0.047

Baseline and follow-up values of hemoglobin (Hb) and hematocrit (Hct), and their mean changes (Δ) across the three groups. One-way ANOVA showed no significant difference in ΔHb (p = 0.976), but a significant difference in ΔHct (p = 0.0003). Post-hoc Tukey tests showed greater Hct reduction in the control group compared to oxytocin and saline

Hematocrit levels also declined significantly in all groups ($p < 0.001$). In the oxytocin group, hematocrit decreased from 35.29 ± 2.12% to 33.73 ± 2.11%; in the control group from 38.96 ± 3.20% to 35.34 ± 2.93%; and in the saline group from 37.52 ± 3.50% to 35.06 ± 3.57%. One-way ANOVA on ΔHct indicated a significant between-group difference ($F(2,117) = 8.798$, $p = 0.0003$). Tukey's post hoc test revealed a greater reduction in the control group compared to both the oxytocin ($p = 0.0002$) and saline groups ($p = 0.047$), while the difference between oxytocin and saline groups was not statistically significant ($p = 0.143$) (Table 2).

Blood pressure changes showed notable patterns. RMANOVA indicated a significant decrease in systolic blood pressure post-intervention in the control and saline groups ($P < 0.05$), but not in the oxytocin group (109.5 to 110.8 mmHg; $P = 0.582$). In the control group, systolic BP dropped from 123.0 (IQR 119.75–129.50) to 101.3 ± 15.2 mmHg, and from 116.9 ± 18.4 to 104.1 ± 12.8 mmHg in the saline group. A similar trend was observed in diastolic BP, with significant reductions in the control and saline groups ($P < 0.05$) but not in the oxytocin group ($P = 0.468$). One-way ANOVA demonstrated that reductions in systolic and diastolic BP were significantly greater in the control and saline groups compared to the oxytocin group ($P = 0.001$ and $P = 0.012$, respectively) (Table 3, Figs. 2 and 3).

Table 3
Changes in vital signs before and after surgery

Parameter	Group	Before (Mean ± SD)	After (Mean ± SD)	Δ	P-value (Within)	P-value (Between)	Post-hoc
SBP (mmHg)	Oxytocin	109.5 ± 12.0	110.8 ± 13.0	+ 1.3	0.582	0.012	a
	Control	123.0 ± 8.0	103.6 ± 15.2	– 19.4	< 0.001		b
	Saline	116.9 ± 18.4	104.1 ± 12.8	– 12.8	< 0.001		ab
DBP (mmHg)	Oxytocin	68.2 ± 8.5	58.6 ± 9.2	–9.6	0.468	0.034	a
	Control	69.9 ± 10.0	53.5 ± 8.3	– 16.5	< 0.001		b
	Saline	72.3 ± 9.8	53.7 ± 9.4	– 18.6	< 0.001		b
Heart rate (bpm)	Oxytocin	92.6 ± 10.8	95.8 ± 11.2	+ 3.2	0.286	0.219	a
	Control	99.97 ± 15.0	98.86 ± 14.0	–1.1	0.434		a
	Saline	98.07 ± 13.0	97.51 ± 13.5	–0.6	0.712		a
Temperature (°C)	Oxytocin	36.72 ± 0.47	36.54 ± 0.45	– 1.19	< 0.001	< 0.001	a
	Control	36.97 ± 0.68	36.36 ± 0.67	– 0.61	< 0.001		b
	Saline	36.96 ± 0.72	36.58 ± 0.65	– 0.38	< 0.001		b

Mean ± SD; RMANOVA for within-group changes, ANOVA + Tukey for between-group Δ comparisons. SBP: systolic BP; DBP: diastolic BP; bpm: beats/min.

Heart rate changes were not statistically significant in any of the groups (P > 0.05). Mean heart rate shifted from 92.6 to 95.8 bpm in the oxytocin group, from 99.97 to 98.86 bpm in the control group, and from 98.07 to 97.51 bpm in the saline group (Table 3) respectively.

Body temperature significantly decreased postoperatively in the control (P < 0.001) and saline (P < 0.001) groups, but not significantly in the oxytocin group (P = 0.093). One-way ANOVA on the magnitude of temperature change revealed a significant between-group difference (F = 4.84, P = 0.0095). Post hoc comparison showed that the reduction was significantly greater in the control group (36.97 ± 0.47 to 36.36 ± 0.43°C; Δ = −0.61 ± 0.51°C) compared with the oxytocin group (36.72 ± 0.48 to 36.54 ± 0.44°C; Δ

= −0.19 ± 0.68°C; P = 0.009). The change in the saline group (36.96 ± 0.41 to 36.58 ± 0.49°C; Δ = −0.37 ± 0.58°C) did not differ significantly from either the oxytocin or control groups (P > 0.05) (Table 3).

One of the key findings pertained to intraoperative blood loss. Kruskal–Wallis test showed a significant difference in suction blood volume among the groups (H = 60.99, p < 0.001). Dunn's post hoc test revealed that suction blood loss was significantly higher in the control group compared to saline (p = 0.02), and saline was higher than oxytocin (p = 0.01), supporting the greater efficacy of oxytocin in reducing intraoperative bleeding (Table 4, Fig. 4).

Table 4
Comparison of Intraoperative Blood Loss Between Groups (Mean ± SD, mL)

Variable	Group	Mean ± SD (mL)	H (df = 2)	p (KW)	Post-hoc Dunn (adjusted p)
Suction	Oxytocin	350 ± 100	60.99	< 0.001	Control vs Saline: p = 0.02Saline vs Oxytocin: p = 0.01Control vs Oxytocin: p < 0.001
	Control	475 ± 120			
	Saline	420 ± 110			
Gas	Oxytocin	90 ± 50	42.67	< 0.001	Control vs Saline: p = 0.03Saline vs Oxytocin: p = 0.015Control vs Oxytocin: p < 0.001
	Control	150 ± 60			
	Saline	120 ± 70			
Total Bleeding	Oxytocin	440 ± 130	58.34	< 0.001	Control vs Saline: p = 0.02Saline vs Oxytocin: p = 0.005Control vs Oxytocin: p < 0.001
	Control	625 ± 150			
	Saline	540 ± 160			

This table summarizes the mean (± SD) intraoperative bleeding volumes across the three intervention groups (Oxytocin, Saline, Control) for suction, gauze, and total bleeding. Kruskal–Wallis tests revealed statistically significant differences among groups for all three bleeding measures: suction (H = 60.99, p < 0.001), gauze (H = 42.67, p < 0.001), and total bleeding (H = 58.34, p < 0.001). Post-hoc analysis using Dunn's test with Bonferroni correction showed that the oxytocin group consistently had significantly lower blood loss compared to the saline and control groups. The control group showed the highest bleeding volumes in all categories.

A similar trend was observed for blood absorbed by gauze. Kruskal–Wallis test confirmed a significant difference between groups (H = 42.67, p < 0.001), and Dunn's test indicated significantly more blood in the control group than in saline (p = 0.03), and in oxytocin (p = 0.015) (Table 4, Fig. 5).

Total blood loss (suction + gauze) was also significantly different between groups (H = 58.34, p < 0.001). Post hoc analysis showed that total loss was significantly greater in the control group than in saline (p = 0.02), and in oxytocin (p = 0.005). These consistent patterns highlight the potential of intrauterine oxytocin in effectively reducing blood loss during cesarean section (Table 4, Fig. 6).

Although all three groups exhibited significant decreases in hematologic indices, the oxytocin group demonstrated superior hemodynamic stability. It was the only group without a significant blood pressure drop while also exhibiting the lowest bleeding volumes across most measures.

Discussion

This study was conducted to evaluate the effect of intrauterine gauze soaked in oxytocin on blood loss following cesarean section. The primary outcome including total blood loss (suction plus gauze absorption), was significantly lower in the oxytocin group compared with the saline and control groups. In addition, the reduction in hematocrit postoperatively was less pronounced in the oxytocin group, indicating clinically less blood loss, although changes in hemoglobin did not differ significantly between groups.

The exact mechanism by which intrauterine oxytocin exerts its effect remains uncertain. Direct diffusion across the decidua is likely limited within the short application period. A more plausible explanation is vascular absorption through the exposed placental bed following placental delivery, with subsequent redistribution via the uterine circulation to stimulate myometrial oxytocin receptors. Given that oxytocin receptor expression peaks in the term myometrium (19), even limited systemic absorption may contribute to enhanced uterine contractility (20). However, further pharmacokinetic studies are required to clarify the precise pathway of action.

Because all participants received the same systemic oxytocin regimen, the present study evaluates intrauterine oxytocin-soaked gauze as an adjunctive intervention rather than as an alternative to systemic uterotonic prophylaxis. Consequently, the observed between-group differences represent the additional effect observed with the intrauterine intervention in the presence of standard systemic oxytocin administration.

Previous research has highlighted the critical role of the oxytocin administration route. A Cochrane review by Oladapo et al. (2020) demonstrated that intravenous oxytocin in the third stage of labor significantly reduces the risk of severe postpartum hemorrhage compared with intramuscular injection (21). Our findings similarly confirm a marked reduction in bleeding with the local application method. In other words, intrauterine gauze soaked in oxytocin, alongside standard injectable protocols, effectively decreases immediate blood loss—consistent with studies on intramyometrial injection. Dissanayake et al. (2017) showed that intramyometrial oxytocin during elective cesarean is as effective as IV administration in improving hemoglobin and hematocrit and reducing adjunctive uterotonic requirement, without significant hemodynamic side effects (22). Likewise, Akinaga et al. (2016) reported that intramyometrial oxytocin maintains hemodynamic stability while controlling surgical bleeding on par with IV oxytocin (23) .

Conversely, some randomized controlled trials, such as Okaforcha et al. (2024), found no significant difference in blood loss between IV and IM routes (254.17 vs. 249.40 mL; p = 0.21) (24). These results

underscore the overall efficacy of oxytocin but also emphasize the importance of selecting the optimal delivery route.

A Cochrane systematic review further indicated that oral or injectable oxytocin is more effective than misoprostol at preventing severe hemorrhage (≥ 1,000 mL), though the combination reduces the need for supplemental uterotonics at the cost of increased side effects such as vomiting (RR = 2.11) and fever (RR = 3.14) (25). Therefore, our protocol—relying solely on oxytocin via an innovative local route—may offer an effective, lower-adverse-event alternative.

Although oxytocin remains the gold standard for PPH prevention and treatment, IV administration carries potential serious cardiovascular side effects—tachycardia, hypotension, vasodilation, and chest pain—that can pose risks in high-risk patients (11,12). Consequently, exploring safer, less adverse-effect routes is warranted, and our topical approach may fulfill this need.

In terms of secondary outcomes, hemodynamic parameters were more stable in the oxytocin group. Neither systolic nor diastolic blood pressure declined significantly in this group, whereas both fell markedly in the control and saline groups. This finding aligns with Akinaga et al. (2016) on better hemodynamic preservation with intramyometrial oxytocin (23), and Zagrodnik et al. (2025) who reported that local oxytocin reduces systemic blood pressure fluctuations compared to carbetocin (26) .

Theoretical advantages of topical oxytocin include direct uterine wall contact, yielding a more focused, sustained uterotonic effect while minimizing systemic side effects. Dissanayake (2021) noted less hypotension and tachycardia with intramyometrial versus IV oxytocin (20), suggesting similar hemodynamic benefits may accrue with soaked gauze application.

Body temperature decreased significantly in the oxytocin group but remained within a managed range, without clinically significant hypothermia or fever. No severe adverse events were reported, and maternal clinical stability was maintained, supporting the safety of the local method comparable to IV administration.

Intrauterine application of oxytocin-soaked gauze during cesarean delivery is a simple, low-cost, and effective method for reducing postoperative blood loss while preserving maternal hemodynamic stability and avoiding increased adverse events. It represents a promising innovative alternative in PPH prevention protocols and optimizing drugs' efficacy.

Limitation

Despite these positive results, limitations like being single-center study with a relatively small sample and lack of long-term maternal or neonatal outcomes (e.g., transfusion need after 24 hours, infection) must be acknowledged. Multicenter trials with larger cohorts and extended follow-up are needed to confirm and generalize these findings.

Declarations

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Author Contribution

S.M.S., Z.S., and K.B. contributed to the conceptualization and design of the study. K.B. supervised the study and contributed to the methodology and study implementation. S.M.S., Z.S., M.K., and M.A. contributed to data collection and study implementation. Z.A. and A.G. performed the statistical analysis. K.B. and S.M.S. contributed to the interpretation of the results and drafted the manuscript. K.B. and all co-authors critically reviewed and revised the manuscript. All authors approved the final version of the manuscript and agreed to be accountable for all aspects of the work

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Figures

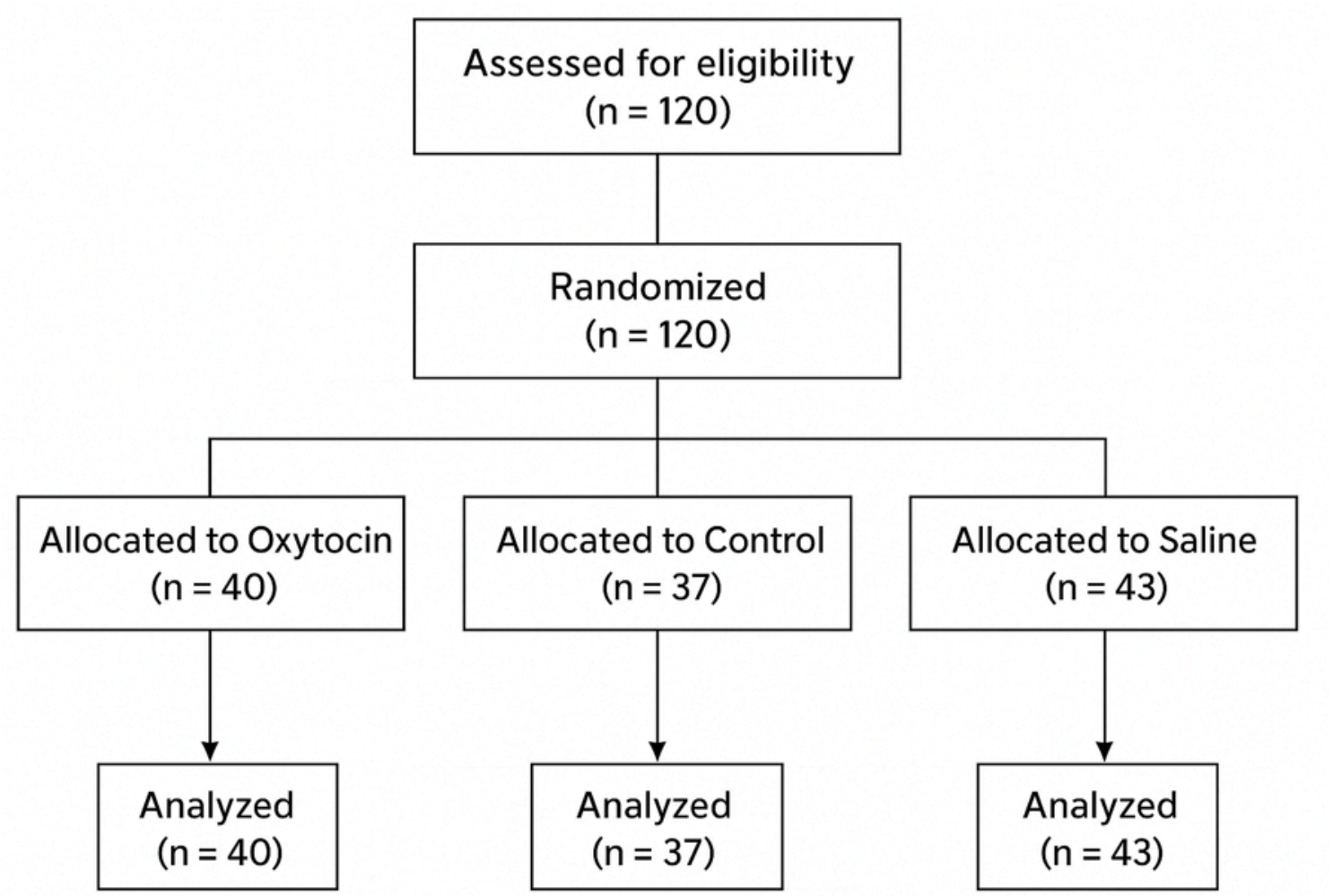


Figure 1

Consort flow chart

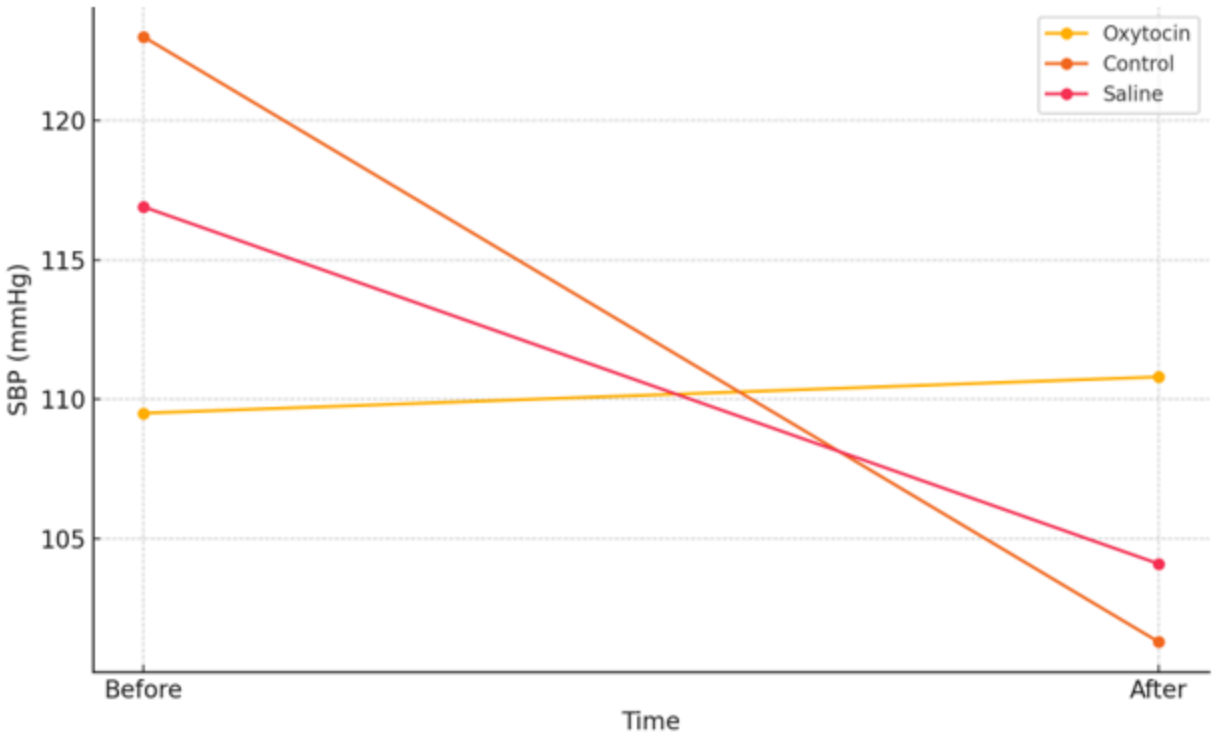


Figure 2

Systolic Blood Pressure Changes

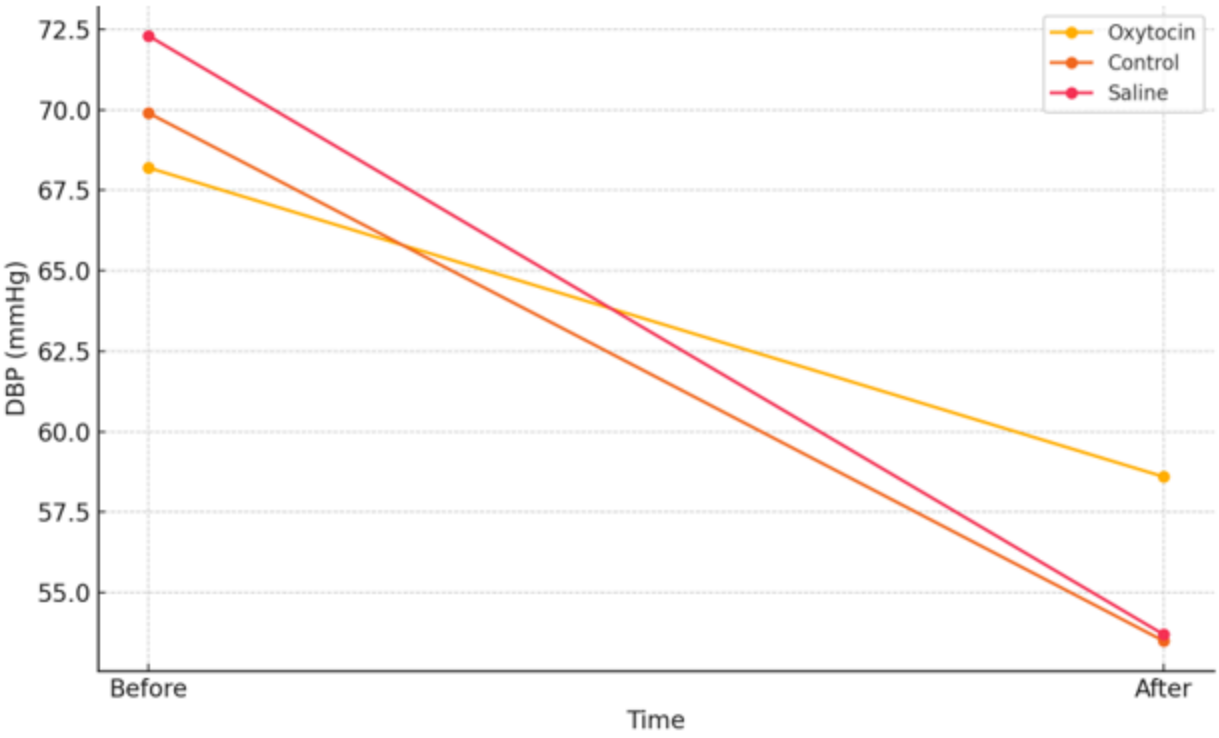


Figure 3

Diastolic Blood Pressure Changes

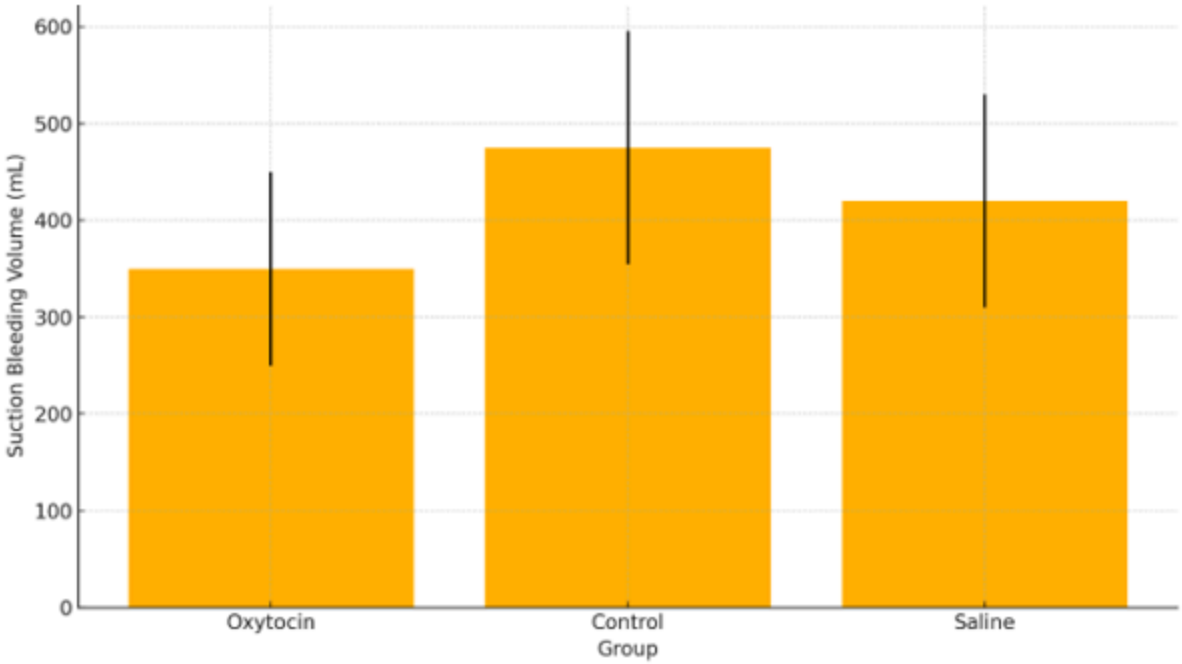


Figure 4

Suction Blood Loss by Group

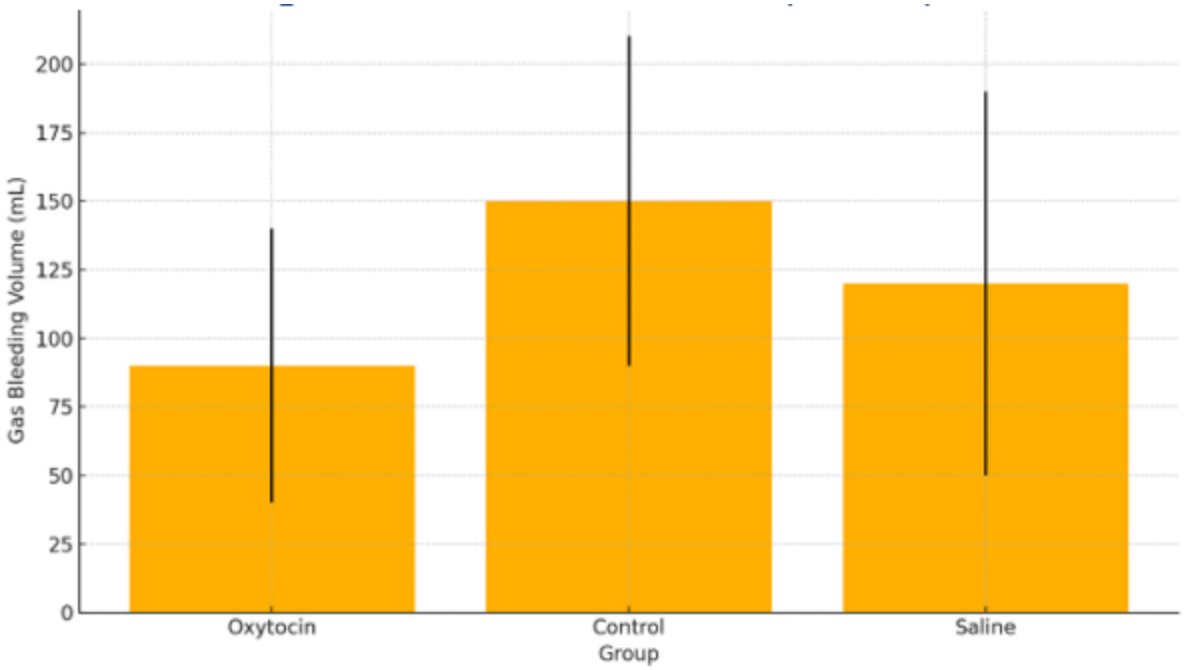


Figure 5

Gaz Blood Loss by Group

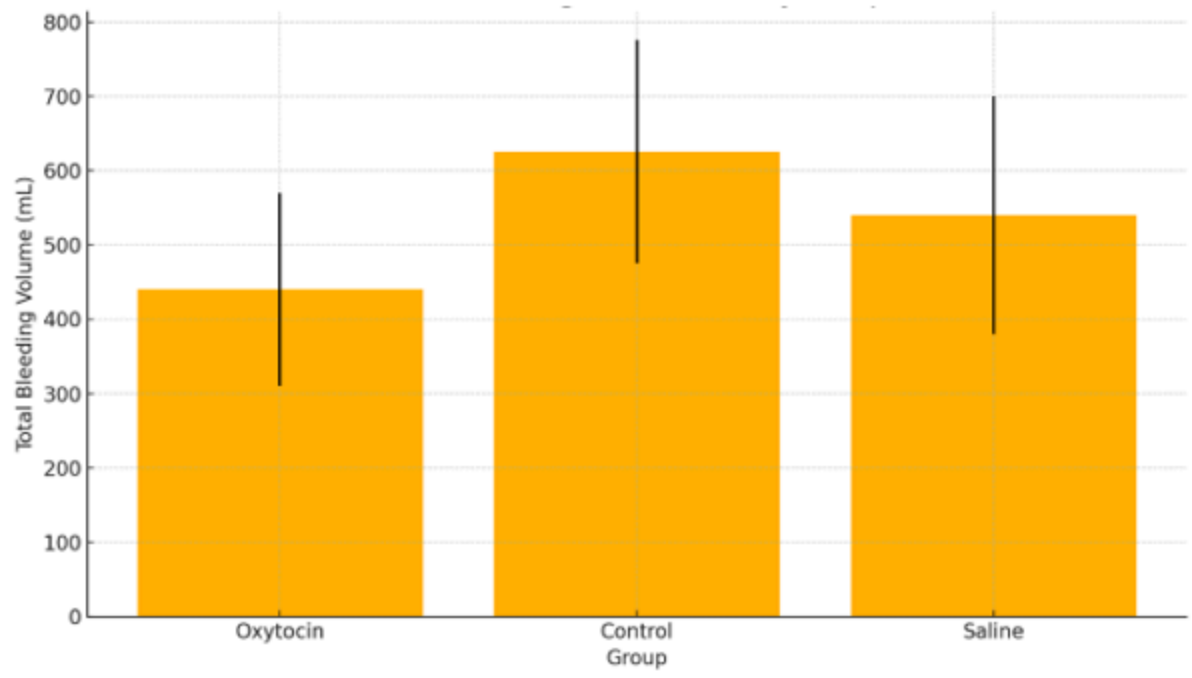


Figure 6

Total Blood Loss by Group