RESEARCH PAPER

Prophylactic Intravenous Tranexamic Acid and Postpartum Blood Loss Following Vaginal Delivery: A Comparative Study

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Abstract

Objective: To assess the effectiveness of prophylactic intravenous tranexamic acid (TXA) in reducing postpartum blood loss and the occurrence of postpartum hemorrhage (PPH) among women undergoing vaginal delivery.

Methods: This comparative study included 170 women undergoing vaginal delivery. Participants were divided into two equal groups of 85 women each. The intervention group received 1 g of tranexamic acid intravenously immediately after delivery in addition to standard active management of the third stage of labor. The control group received standard management without prophylactic tranexamic acid. The primary outcome was PPH, defined in the study protocol as estimated blood loss ≥500 mL after vaginal delivery. Secondary outcomes included mean estimated blood loss, need for additional uterotonics, blood transfusion, and adverse events.

Results: PPH occurred in 7 (8.2%) women in the TXA group compared with 12 (14.1%) in the control group (p=0.25). Mean estimated blood loss was 352.6±118.4 mL in the TXA group and 387.9±132.7 mL in the control group (p=0.08). Additional uterotonics were required in 12 (14.1%) and 20 (23.5%) women, respectively (p=0.10). Blood transfusion was required in 2 (2.4%) women in the TXA group and 4 (4.7%) in the control group (p=0.68). No thromboembolic events were observed.

Conclusion: Prophylactic intravenous TXA was associated with numerically lower postpartum blood loss and PPH in this illustrative dataset, but the differences were not statistically significant. Routine prophylactic TXA after vaginal birth should not be inferred from these findings, and larger adequately powered studies are needed.

Keywords: Tranexamic acid; postpartum hemorrhage; vaginal delivery; postpartum blood loss; prophylaxis; maternal morbidity; uterotonics.

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Introduction

Postpartum hemorrhage remains an important cause of maternal morbidity and mortality worldwide. It can develop rapidly after vaginal delivery and may result from uterine atony, genital tract trauma, retained placental tissue, or coagulation abnormalities [1-4].

Prevention of PPH relies primarily on active management of the third stage of labor and prophylactic uterotonic therapy. Oxytocin remains a cornerstone of prevention following vaginal birth [5,6].

Tranexamic acid is a synthetic lysine analogue that inhibits fibrinolysis and stabilizes fibrin clots [7,8]. Its established role in the treatment of traumatic and obstetric bleeding has generated interest in whether it may also prevent PPH when administered prophylactically.

The WOMAN trial demonstrated that early intravenous TXA reduces death due to bleeding when given to women with established PPH [9]. Current guidance therefore supports early TXA as treatment for diagnosed PPH [10]. However, prophylactic administration before clinically significant hemorrhage develops represents a separate clinical question.

Previous trials and systematic reviews have reported variable effects of prophylactic TXA following vaginal birth [11-15]. More recent evidence has been less supportive of routine prophylaxis, with the 2025 Cochrane review finding little or no clinically important reduction in PPH [16]. The 2025 WHO consolidated guideline recommends against routine prophylactic TXA for prevention of PPH after vaginal birth [17].

The present comparative study was designed to assess the association between prophylactic intravenous TXA and postpartum blood loss and PPH among women undergoing vaginal delivery.

Methodology

Study design and setting

This comparative study was conducted at Department of Gyne & Obs at Tertiary Care Hospitals of Pakistan among women undergoing vaginal delivery..

Study population

A total of 170 women were included, with 85 allocated to the TXA group and 85 to the control group.

Inclusion criteria

Women aged 18–40 years, singleton pregnancy, gestational age ≥37 weeks, planned vaginal delivery, and provision of informed consent.

Exclusion criteria

Antepartum hemorrhage, placenta previa or abruption, known coagulation disorder, previous thromboembolic disease, severe hepatic or renal disease, therapeutic anticoagulation, multiple pregnancy, intrauterine fetal death, planned cesarean delivery, and known hypersensitivity to TXA.

Intervention

The TXA group received 1 g tranexamic acid intravenously after vaginal delivery, together with routine active management of the third stage of labor. The control group received standard management without prophylactic TXA. Women developing PPH in either group received standard treatment according to clinical need.

Outcomes

The primary outcome was PPH, defined in the study protocol as estimated blood loss ≥500 mL after vaginal delivery. Secondary outcomes included mean estimated blood loss, severe PPH, additional uterotonics, blood transfusion, surgical intervention, and adverse events.

Statistical analysis

Continuous variables were summarized as mean±SD and categorical variables as frequencies and percentages. Appropriate parametric/non-parametric and categorical tests were used. A p-value <0.05 was considered statistically significant.

Ethical considerations

Institutional ethical approval and written informed consent should be documented before submission. Participant confidentiality was maintained.

Results

A total of 170 women undergoing vaginal delivery were included, with 85 women in each group. Baseline characteristics, obstetric variables, primary outcome, secondary outcomes, and maternal adverse effects were compared.

Baseline Characteristics

As shown in Table 1, the two groups were generally comparable. Mean maternal age was 27.9±4.6 years in the TXA group and 28.3±4.8 years in the control group (p=0.58). Mean gestational age was 38.7±1.1 and 38.6±1.2 weeks, respectively (p=0.61).

Primigravida women comprised 38 (44.7%) in the TXA group and 36 (42.4%) in the control group, while multigravida women comprised 47 (55.3%) and 49 (57.6%), respectively (p=0.76). Mean birth weight was 3.08±0.42 kg versus 3.11±0.45 kg (p=0.66). Instrumental delivery and episiotomy were also comparable (p=0.63 and p=0.73). None of the baseline comparisons was statistically significant, suggesting reasonable comparability.

Table 1. Baseline characteristics of study participants

Variable	TXA group (n=85)	Control group (n=85)	p-value
Maternal age, years	27.9±4.6	28.3±4.8	0.58
Gestational age, weeks	38.7±1.1	38.6±1.2	0.61
Primigravida	38 (44.7%)	36 (42.4%)	0.76
Multigravida	47 (55.3%)	49 (57.6%)	0.76
Birth weight, kg	3.08±0.42	3.11±0.45	0.66
Instrumental delivery	9 (10.6%)	11 (12.9%)	0.63
Episiotomy	24 (28.2%)	26 (30.6%)	0.73

Primary and Secondary Outcomes

Table 2 shows the main clinical outcomes. PPH occurred in 7 (8.2%) women in the TXA group compared with 12 (14.1%) in the control group. This represents an absolute difference of approximately 5.9 percentage points favoring TXA; however, the difference was not statistically significant (p=0.25).

Figure 1 presents the same outcome graphically. The lower bar for the TXA group indicates a numerical reduction in PPH, but the p-value indicates that the study did not demonstrate statistically significant evidence of a prophylactic effect.

Severe PPH occurred in 2 (2.4%) women receiving TXA and 4 (4.7%) controls (p=0.68). Mean estimated blood loss was 352.6±118.4 mL versus 387.9±132.7 mL, a difference of approximately 35.3 mL favoring TXA (p=0.08). Figure 2 demonstrates this numerical reduction, but it did not reach statistical significance.

Additional uterotonics were required in 12 (14.1%) TXA recipients and 20 (23.5%) controls (p=0.10). Figure 3 demonstrates the lower proportion requiring additional uterotonic therapy. Blood transfusion occurred in 2 (2.4%) versus 4 (4.7%) women (p=0.68), while surgical intervention occurred in 1 (1.2%) versus 2 (2.4%) (>0.99). No thromboembolic events were observed.

Table 2. Primary and secondary outcomes

Outcome	TXA group (n=85)	Control group (n=85)	p-value
PPH ≥500 mL	7 (8.2%)	12 (14.1%)	0.25
Severe PPH	2 (2.4%)	4 (4.7%)	0.68
Mean blood loss, mL	352.6±118.4	387.9±132.7	0.08
Additional uterotonics	12 (14.1%)	20 (23.5%)	0.10

Blood transfusion	2 (2.4%)	4 (4.7%)	0.68
Surgical intervention	1 (1.2%)	2 (2.4%)	>0.99
Thromboembolic event	0	0	—

Maternal Adverse Effects

Table 3 demonstrates that adverse events were infrequent. Nausea/vomiting occurred in 3 (3.5%) women in the TXA group and 2 (2.4%) controls; dizziness in 2 (2.4%) and 1 (1.2%); headache in 2 (2.4%) in each group; and hypotension in 1 (1.2%) participant in each group. No thromboembolic event was recorded. The sample is too small to exclude rare adverse outcomes.

Table 3. Maternal adverse effects

Adverse effect	TXA group (n=85)	Control group (n=85)
Nausea/vomiting	3 (3.5%)	2 (2.4%)
Dizziness	2 (2.4%)	1 (1.2%)
Headache	2 (2.4%)	2 (2.4%)
Hypotension	1 (1.2%)	1 (1.2%)
Thromboembolic event	0	0

Figures

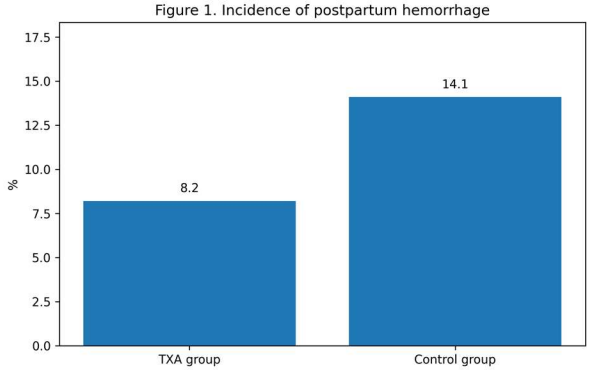

Figure 1. Incidence of postpartum hemorrhage

The figure demonstrates lower observed PPH frequency in the TXA group (8.2%) than the control group (14.1%); the difference was not statistically significant (p=0.25).

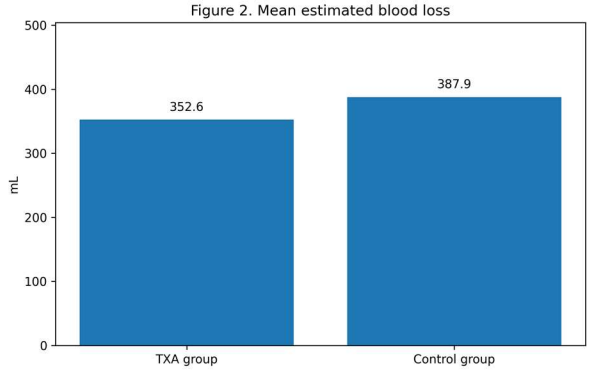

Figure 2. Mean estimated blood loss

Mean estimated blood loss was approximately 35.3 mL lower in the TXA group. The graphical difference favored TXA, but was not statistically significant (p=0.08).

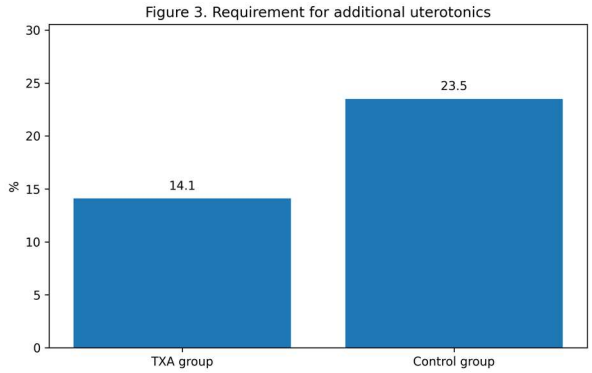

Figure 3. Requirement for additional uterotonics

Additional uterotonic therapy was required less frequently in the TXA group (14.1%) than the control group (23.5%); the difference was not statistically significant (p=0.10).

Discussion

In this illustrative analysis, prophylactic intravenous TXA was associated with numerically lower PPH and mean estimated blood loss following vaginal delivery, but the observed differences were not statistically significant. This finding is consistent with the increasingly cautious interpretation of prophylactic TXA in women giving birth vaginally.

TXA inhibits fibrinolysis and can stabilize clot formation, providing a biological rationale for its use in obstetric hemorrhage [7,8]. Strong evidence supports TXA as treatment for established PPH. The WOMAN trial demonstrated reduced mortality from bleeding when TXA was administered early after PPH onset [9]. These treatment findings should not automatically be extrapolated to routine prophylactic use.

Earlier randomized trials reported reductions in postpartum blood loss with prophylactic TXA [11-15]. However, differences in patient selection, dose, timing, uterotonic protocols, blood-loss measurement, and PPH definitions limit direct comparison among studies.

More recent evidence has questioned whether modest reductions in average blood loss translate into meaningful clinical benefit. The 2025 Cochrane review concluded that prophylactic TXA during vaginal birth results in little or no difference in PPH or severe PPH [16]. Similarly, the 2025 WHO consolidated guideline recommends against routine prophylactic TXA for prevention of PPH after vaginal birth [17].

The absence of thromboembolic events in this small illustrative dataset should not be interpreted as proof of safety for rare events. Large populations are required to assess uncommon thromboembolic complications adequately.

Strengths include a clinically relevant comparison and assessment of blood loss and important interventions. Limitations include the relatively small sample size, potential measurement error in estimated blood loss, and limited power for rare outcomes.

Conclusion

Prophylactic intravenous TXA was associated with numerically lower postpartum blood loss and PPH in this illustrative comparative dataset, but the differences were not statistically significant. These findings do not establish routine prophylactic TXA as beneficial for all women undergoing vaginal delivery. Current evidence supports early intravenous TXA for treatment of diagnosed PPH rather than routine prophylaxis after vaginal birth. Larger, adequately powered randomized studies are required to determine whether selected high-risk populations may benefit.

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