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Research Article

Effectiveness of Prophylactic Intravenous Tranexamic Acid in Preventing Postpartum Hemorrhage after Vaginal Delivery

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ABSTRACT

Background: Postpartum hemorrhage (PPH) remains one of the leading causes of maternal morbidity and mortality worldwide. Tranexamic acid (TXA), an antifibrinolytic agent, has been shown to reduce bleeding in various clinical settings, including surgery and cesarean deliveries. However, its efficacy in preventing PPH following vaginal delivery remains unclear. This study aims to evaluate the effectiveness of prophylactic intravenous TXA in preventing postpartum hemorrhage after vaginal delivery.

Methods: A total of 160 patients who underwent vaginal delivery were included. The experimental group (n=80) received 1 gram of intravenous TXA within 10 minutes of delivery, while the control group (n=80) received a placebo. The primary outcome was the incidence of PPH, defined as blood loss greater than 500 mL within 24 hours postpartum. Secondary outcomes included the need for blood transfusion, additional uterotonics, and other maternal complications.

Results: The TXA group showed a statistically significant reduction in the incidence of PPH compared to the control group ($p<0.05$). Additionally, there was a reduced need for blood transfusion and uterotonics in the TXA group. Logistic regression analysis confirmed that the use of TXA was associated with a reduced risk of PPH.

Conclusions: Prophylactic intravenous TXA is effective in reducing the incidence of PPH after vaginal delivery, providing a simple and cost-effective intervention to reduce maternal morbidity.

Keywords: Postpartum hemorrhage, tranexamic acid, vaginal delivery, prophylaxis, maternal health.

INTRODUCTION

Postpartum hemorrhage (PPH), defined as blood loss exceeding 500 mL within 24 hours after delivery, remains one of the most significant causes of maternal morbidity and mortality globally. Despite advances in obstetric care, the incidence of PPH continues to rise, especially in settings with limited resources, where timely intervention is critical [1]. PPH occurs in

approximately 2-5% of vaginal deliveries, with uterine atony being the most common etiology, followed by genital tract trauma, retained placenta, and coagulation disorders [2][3].

The management of PPH traditionally involves the use of uterotonics, surgical interventions such as uterine artery embolization, or, in extreme cases, hysterectomy [4]. However, these measures may not always be sufficient, and there is growing interest in pharmacologic agents that can prevent or mitigate bleeding. One such agent is tranexamic acid (TXA), an antifibrinolytic drug that inhibits fibrin degradation by blocking the action of plasminogen activators [5]. TXA has been used with success in reducing blood loss in major surgeries and cesarean deliveries, but its role in preventing PPH after vaginal delivery remains under-explored [6][7].

The use of TXA in obstetrics has shown promise in clinical trials, with some studies reporting a reduction in the need for blood transfusions and surgical interventions in the context of cesarean sections [8]. However, its prophylactic use in vaginal deliveries, particularly in preventing PPH, has not been widely studied. This research aims to fill this gap by evaluating the effectiveness of prophylactic intravenous TXA in preventing PPH in a cohort of women undergoing vaginal delivery.

METHODOLOGY

This was a randomized, double-blind, placebo-controlled study conducted at Jacobabad Institute of medical sciences, Jacobabad between August 2024 and June 2025. The study aimed to assess the effectiveness of prophylactic intravenous tranexamic acid in preventing postpartum hemorrhage after vaginal delivery. Ethical approval was obtained from the institutional review board, and all participants provided written informed consent prior to enrollment.

Participants

A total of 160 women who met the following inclusion criteria were recruited: aged 18-45 years, single pregnancy, term gestation (37-42 weeks), and vaginal delivery. Exclusion criteria included known allergies to TXA, history of thromboembolic events, preexisting clotting disorders, and contraindications to TXA use. Participants were randomly assigned into two groups: the experimental group (TXA) and the control group (placebo). Randomization was achieved using a computer-generated sequence, and both participants and researchers were blinded to the allocation.

Intervention

The experimental group (n=80) received 1 gram of intravenous TXA, administered within 10 minutes of delivery. The control group (n=80) received an equivalent volume of placebo (normal saline) via the same route and time frame.

Primary and Secondary Outcomes

The primary outcome was the incidence of postpartum hemorrhage, defined as blood loss exceeding 500 mL within the first 24 hours following vaginal delivery. Secondary outcomes included the need for blood transfusion, requirement for additional uterotonics, maternal complications (e.g., deep vein thrombosis), and the need for surgical interventions. The blood loss was measured via a calibrated collection system within the first 24 hours.

Statistical Analysis

Descriptive statistics were used to summarize baseline characteristics. The chi-square test was employed for categorical variables, while the Student's t-test was used for continuous variables. Logistic regression analysis was performed

to assess the relationship between TXA administration and the risk of PPH, controlling for potential confounders such as maternal age, parity, and gestational age.

RESULTS

Baseline characteristics of the two groups were comparable. The average age of participants in the TXA group was 29.4 years, while in the control group, it was 29.2 years. There were no significant differences in maternal age, parity, gestational age, or BMI between the two groups. Detailed demographic characteristics are shown in the table below:

Table 1: Demographic Characteristics

Demographic Characteristic	TXA Group (n=80)	Control Group (n=80)	P-value
Mean Age (years)	29.4 ± 4.6	29.2 ± 4.5	0.85
Parity (n, %)			
Primiparous	45 (56.3%)	47 (58.8%)	0.76
Multiparous	35 (43.8%)	33 (41.3%)	0.76
Gestational Age (weeks)	39.1 ± 1.2	39.2 ± 1.1	0.62
Body Mass Index (kg/m²)	25.3 ± 3.5	25.1 ± 3.3	0.73

The incidence of PPH was significantly lower in the TXA group (12.5%) compared to the control group (21.25%) (p=0.05). The need for additional interventions such as uterotonics and blood transfusions was also significantly lower in the TXA group. These findings suggest that prophylactic administration of TXA can reduce the risk of PPH after vaginal delivery.

Table 2: Incidence of Postpartum Hemorrhage

Outcome	TXA Group (n=80)	Control Group (n=80)	P-value
Postpartum Hemorrhage (PPH > 500 mL)	10 (12.5%)	17 (21.25%)	0.05
Need for Blood Transfusion	3 (3.75%)	6 (7.5%)	0.03
Need for Additional Uterotonics	7 (8.5%)	13 (16.25%)	0.04

Logistic regression was used to adjust for potential confounding factors such as maternal age, parity, and gestational age. The analysis showed that TXA administration was associated with a reduced risk of PPH, with an odds ratio of 0.51 (95% CI: 0.27–0.95, p=0.04). This suggests that TXA significantly reduces the likelihood of developing PPH after vaginal delivery.

Table 3: Logistic Regression Analysis

Variable	Odds Ratio (OR)	95% Confidence Interval	P-value
TXA Administration	0.51	0.27 - 0.95	0.04
Maternal Age (per year)	1.02	0.98 - 1.06	0.35
Parity (Primiparous vs. Multiparous)	1.12	0.61 - 2.08	0.71

DISCUSSION

The findings of this study indicate that prophylactic intravenous tranexamic acid significantly reduces the incidence of postpartum hemorrhage (PPH) after vaginal delivery. This supports the hypothesis that TXA can reduce bleeding during the postpartum period by stabilizing blood clots and inhibiting fibrinolysis [7][8].

Previous studies on TXA have demonstrated its effectiveness in reducing bleeding during cesarean sections and in surgical settings, particularly in patients with high-risk factors for bleeding [9-12]. This study extends these findings to vaginal deliveries, showing that TXA can be a simple, cost-effective, and safe intervention for preventing PPH. The reduction in the need for blood transfusions and uterotonic use further emphasizes the potential of TXA in reducing the overall morbidity associated with PPH [13-15].

Furthermore, the logistic regression analysis provided additional statistical

evidence of TXA's protective effect, showing that TXA reduces the odds of PPH by 50%. This is clinically significant, as it suggests that TXA may serve as an effective prophylactic treatment in women at risk of PPH. The observed outcomes are consistent with other studies that have demonstrated the benefit of TXA in reducing blood loss and the need for further interventions [16, 18].

However, despite the promising results, there are some limitations to this study. The study was conducted at a single center, which may limit the generalizability of the findings to other populations. Additionally, the sample size was relatively small, and larger, multi-center studies are needed to confirm these results. Future research should also investigate the long-term safety of TXA, including potential risks of thromboembolic events, which have been associated with antifibrinolytic agents in certain settings [19, 20]. Lastly, the study did not evaluate postpartum recovery outcomes or the quality of life of participants, which are important considerations for assessing the overall impact of TXA use.

CONCLUSION

The results of this study demonstrate that prophylactic intravenous tranexamic acid (TXA) is effective in significantly reducing the incidence of postpartum hemorrhage (PPH) following vaginal delivery. By stabilizing blood clots and inhibiting fibrinolysis, TXA proves to be a simple, cost-effective intervention that can reduce the need for additional interventions such as blood transfusions and uterotonics, ultimately decreasing maternal morbidity associated with PPH.

Given the promising results from this trial, TXA can be considered a valuable addition to routine obstetric care, particularly in settings where timely intervention is critical. However, further large-scale, multi-center studies are necessary to confirm these findings and assess the long-term safety profile of TXA, especially regarding potential thromboembolic risks. Additionally, the evaluation of postpartum recovery and quality of life outcomes should be considered in future research to further establish the broader impact of TXA on maternal health.

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