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# Role of Preoperative Tranexamic Acid in Decreasing Blood Loss in Preeclamptic Patients Undergoing Cesarean Section

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## Abstract

**Background:** Abnormal bleeding associated with preeclampsia can be explained by the various pathophysiological changes especially vascular and hematological. Preeclampsia is thus considered a risk factor for postpartum hemorrhage. **Aim and objectives:** To detect the role of preoperative TA in decreasing blood loss in preeclamptic patients undergoing CS.

**Patient and methods:** After receiving clearance from the hospital ethics committee, this prospective randomized control double-blinded experiment was done in the Obstetrics and Gynecology Department of Al-Hussein and Sayed Galal Hospital, Al-Azhar University, between September 2021 and February 2022. 140 preeclamptic women with singleton conceptions who were planned for either optional or urgent lower segment CS procedures were included in the research.

**Result:** Regarding estimated blood loss, group II considerably outperformed group I ( $P$  value < 0.001)

**Conclusion:** Blood loss during CS was greatly decreased by TXA. Being in a hypercoagulable condition during pregnancy increases the risk of thrombotic events. But there were no negative side effects or problems in the early postpartum period when this antifibrinolytic was used. TXA may thus be used to people receiving LSCS in a safe and efficient manner.

**Keywords:** Blood loss, Cesarean section, Preeclamptic patients, Preoperative, Tranexamic acid

## 1. Introduction

In the globe, preeclampsia is thought to be the primary cause of maternal and neonatal morbidity and death, accounting for an estimated 50,000–60,000 fatalities annually. Preeclampsia is thought to complicate 2–8% of pregnancies globally.<sup>1</sup>

Abnormal bleeding associated with preeclampsia can be explained by the various pathophysiological changes especially vascular and hematological. Preeclampsia is thus considered a risk factor for postpartum hemorrhage.<sup>2</sup>

A synthetic amino acid called tranexamic acid (TA) blocks the transformation of plasminogen to plasmin and prevents fibrinolytic action by blocking

the binding of plasmin to fibrin.<sup>3</sup> The efficiency of the patient's own hemostatic systems may be improved by TA.<sup>4</sup>

When given orally, TA is an efficient and well-tolerated therapy for idiopathic menorrhagia, which is the condition it is most often employed to treat in gynecology and obstetrics.<sup>5</sup>

TA has also been utilized to manage pregnancy-related hemorrhage (placental abruption, placenta previa). Furthermore, TA is said to lessen blood loss following CS in a number of randomized controlled investigations.<sup>6</sup>

The goal of this research was to detect the role of preoperative TA in reducing blood loss in preeclamptic patients undergoing CS.

## 2. Patients and methods

A prospective randomized control double-blinded experiment was used in this investigation. After receiving clearance from the hospital's ethical council, this research was done in the Department of Obstetrics and Gynaecology at Al-Hussein and Sayed Galal Hospital, Al-Azhar University, between September 2021 and February 2022.

### 2.1. Patients

In order to do an elective or emergency lower segment CS, 140 pregnant women with preeclampsia and singletons were recruited.

The patients that were recruited met the following inclusion and exclusion requirements:

**Inclusion criteria:** Age: 18–40-year-old, undergoing elective or emergency CS, gestational age: 28–38 weeks and primigravida.

**Exclusion criteria:** Anemia (Hemoglobin < 9 gm/dl), history of thromboembolic event, recognized tranexamic acid allergy, abnormal placentation, polyhydramnios, uterine Fibroid, patients receiving anticoagulation, intrauterine fetal death, placental abruption, and preeclampsia associated with thrombocytopenia and other medical disorders.

### 2.2. Methodology

Blood pressure above 140 mmHg systolic or 90 mmHg diastolic with proteinuria following 20 weeks is considered preeclampsia. Preeclampsia was further stratified into severe and non-severe according to ACOG.<sup>7</sup> Gestational age was calculated based on last menstrual period, if the patient was unsure of her dates, the gestational age was calculated according to first trimesteric ultrasound, if not available, biometry was used. All subjects provided a thorough medical history, and an obstetric ultrasonography was done. Prothrombin time, prothrombin level, CBC, liver function tests, and kidney functioning tests were among the laboratory tests carried out. The body mass index of the mother was computed after measuring her length and weight. The pulse rate, blood pressure, and respiratory rate were measured as vital signs. Participants were randomized to receive either intravenous (IV) tranexamic acid or IV glucose before to CS on the day of their planned operation in a 1:1 ratio. Computer-generated random numbers were used for randomization. To the group assignment, the participants and the surgeons were concealed. Participants were split into one of two groups at

random: The tranexamic acid group ( $n = 70$ ) had iv tranexamic acid 1 gm (10 ml) (Kapron: Amoun, Egypt; maintained in a dry jar at 15 C-30 C) diluted in 20 ml of 5% glucose and given IV slowly 15 min before to skin incision during a 5-min period 15 min prior to making the skin incision, the placebo group ( $n = 70$ ) got IV 30 ml of 5% glucose slowly administered during a 5-min interval. Following birth, patients in both groups received an IV bolus of 20 IU oxytocin in 500 ml lactated Ringer solution (infused at a rate of 125 ml/h) and 5 IU oxytocin (Novartis, Syntocinon, Basel, Switzerland) in 500 ml lactated Ringer solution. After 1 min and 5 min, the infant's condition is assessed utilizing the Apgar score.

**Outcome measures:** **Primary outcome:** Reduced intraoperative blood loss in preeclamptic patients due to tranexamic acid during CS. **Secondary outcome:** impact of TA on reducing blood loss in cases of severe vs mild preeclampsia and on the fate of the neonate.

**Ethical considerations:** The AL Azhar University Faculty of Medicine's Obstetrics and Gynecology Department's ethical committee submitted the research protocol for approval. Each participant in the research gave informed verbal and written permission after being informed of the purpose and methods of the investigation.

### 2.3. Statistical analysis

Data input into the computer was evaluated utilizing IBM SPSS software version 20.0. (Armonk, NY: IBM Corp). Quantitative data were described utilizing percentages and numbers. Utilizing the Shapiro-Wilk test, the distribution's normality was evaluated. Quantitative variables were described utilizing the range (minimum and maximum), median, standard deviation, mean, and interquartile range (IQR). The 5% threshold of significance was employed to determine the findings' significance.

## 3. Results

### Table 1.

Between the two groups, there were no statistically substantial demographic variations [Table 2](#).

Regarding the kind of CS and the average operational length, there were no statistically substantial variations between the two groups [Table 3](#).

As regard estimated blood loss it was substantially greater in group II than GROUP I  $P$  value < 0.001.

There were no substantial variation between two groups as regard Mean prothrombin time (s), Mean partial thromboplastin time (s). [Fig. 1](#), [Table 4](#).

Table 1. Comparison of the two study groups based on demographic information.

Demographic data	Group I (n = 70)	Group II (n = 70)	t	P
<b>Maternal age(yrs)</b>				
Min.–Max.	25.0–30.0	25.0–30.0		
Mean ± SD.	27.14 ± 1.65	26.94 ± 1.91	0.662	0.509
Median (IQR)	27.0 (26.0–29.0)	26.0 (25.0–29.0)		
<b>BMI (kg/m<sup>2</sup>)</b>				
Min. – Max.	25.0–31.0	25.0–30.0		
Mean ± SD.	27.94 ± 1.82	27.57 ± 1.74	1.235	0.219
Median (IQR)	28.0 (27.0–29.0)	28.0 (26.0–29.0)		
<b>GA (wks)</b>				
Min.–Max.	37.0–39.0	36.0–39.0		
Mean ± SD.	38.31 ± 0.67	37.97 ± 0.95	2.470*	0.015*
Median (IQR)	38.0 (38.0–39.0)	38.0 (38.0–39.0)		

IQR, Inter quartile range; SD, Standard deviation; t: Student *t*-test.

There were little variations in the requirement for further ecobolics and intraoperative blood transfusions between the two groups.

As regard Neonatal birth weight (grams) it was insignificantly different between two groups. Fig. 2.

As regard Apgar 1,5 min there was insignificant variation between two groups. Fig. 3.

There were no substantial variations between the two groups in terms of NICU admission, with a *P* value of 0.114. Fig. 4.

As regard maternal side effects founded in 8 cases in group I in form of vomiting in 6 cases and 2cases had nausea on the other hand group II 10 cases had complications in form of vomiting in 4 cases, nausea in 4 cases and 3 cases had hypotension. Fig. 5.

#### 4. Discussion

Abnormal bleeding associated with preeclampsia can be explained by the various pathophysiological changes especially vascular and hematological. Preeclampsia is thus considered a risk factor for postpartum hemorrhage.<sup>2</sup>

After receiving clearance from the hospital ethics committee, this prospective randomized control double-blinded experiment was done in the Obstetrics and Gynecology Department of Al-Hussein and Sayed Galal Hospital, Al-Azhar University, between September 2021 and February 2022.

Table 2. Comparison of the two groups investigated in terms of operational length.

Duration of operation (minutes)	Group I (n = 70)	Group II (n = 70)	t	P
Min.–Max.	43.0–52.0	43.0–52.0		
Mean ± SD.	46.77 ± 2.72	47.14 ± 2.37	0.860	0.391
Median (IQR)	46.0 (45.0–49.0)	48.0 (46.0–49.0)		

IQR, Inter quartile range; t, Student *t*-test.

*P*: *P* value used to compare the researched groups.

Seventy women with preeclampsia whose singleton pregnancies were planned for elective or emergency lower segment CS procedures were included in the research.

Regarding demographic information, the variations between the two groups were negligible (maternal age, BMI and GA).

Our findings were consistent with research of Milani *et al.*,<sup>8</sup> as they revealed that Overall, the average age of the TXA- and placebo-treated women was 29.33 ± 5.59 and 31.2 ± 5.53, respectively. According to the findings, there was no substantial variation in the groups' ages (*P* = 0.199). In terms of average age, there was no substantial distinction between the women aged < and >30 years. Additionally, there were no discernible changes between the experimental and control groups as regard mean age groups and average gestational age.

Similarly, in the study of Lakshmi & Abraham,<sup>9</sup> 120 women had Caesarean sections performed. Computer generated random number tables were used to assign them to either the researched or Control group. In contrast to the control group, which only received standard care, the study group received TXA prior to surgery along with routine treatment (Immediately after the baby's delivery, 10 units of oxytocin were administered to the IV drip).

Table 3. Comparison of the estimated blood loss (mL) between the two study groups.

Estimated blood loss (ml)	Group I (n = 70)	Group II (n = 70)	t	P
Min.–Max.	345.0–700.0	567.0–1000.0		
Mean ± SD.	455.34 ± 97.63	713.86 ± 152.73	11.932*	<0.001*
Median (IQR)	452.0 (435.0–456.0)	675.0 (587.0–876.0)		

IQR, Inter quartile range; SD, Standard deviation; t, Student *t*-test.

*P*: *P* value used to compare the researched groups.

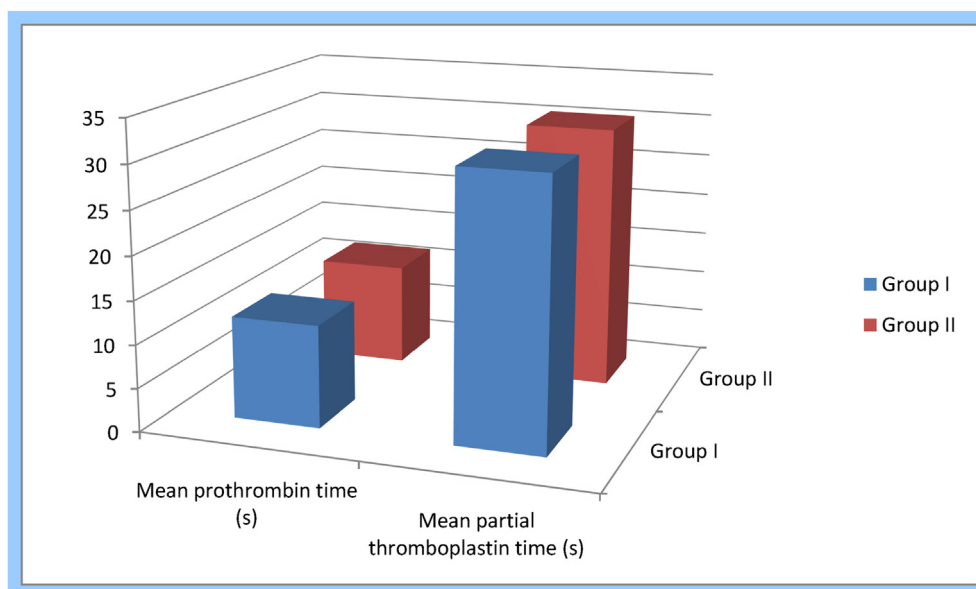


Fig. 1. Comparison of the mean prothrombin time (s) and mean partial thromboplastin time (s) between the two study groups.

Age, weight, height, parity, and gestational age were the baseline parameters that did not significantly vary between the two groups.

The findings of this research revealed that there was no substantial variation in the kind of CS and median operating time between the two groups.

Also, Ali *et al.*,<sup>10</sup> a randomized, controlled trial involving 200 pregnant women who received optional CS was conducted. Following the birth of the baby, 100 of them got oxytocin in addition to tranexamic acid 20 min earlier than the other 100 patients. There were negligible variations in the median operational time between the two groups.

The present investigation revealed that group II had considerably more estimated blood loss than group I, with a  $P$  value of  $<0.001$ .

Considering our findings from a study of Sanad *et al.*,<sup>11</sup> as they showed that the median blood loss amount in group I (TA group) was  $364.82 \pm 33.16$  ml, while in group II (no TA) was  $454.5 \pm 40.23$  ml.

Table 4. Comparison of the requirement for additional ecbolics and necessity for intraoperative blood transfusion between the two study groups.

	Group I (n = 70) Number (%)	Group II (n = 70) Number (%)	$\chi^2$	<sup>FE</sup> P
<b>Need for further ecbolics</b>				
No	67 (95.7)	64 (91.4)	1.069	0.493
Yes	3 (4.3)	6 (8.6)		
<b>Need for intraoperative blood transfusion</b>				
No	67 (95.7)	64 (91.4)	1.069	0.493
Yes	3 (4.3)	6 (8.6)		

$\chi^2$ , Chi square test; FE, Fisher Exact.

When the two study groups were compared, it was shown that group I had much less blood loss than did group II ( $P = 0.001$ ).

Furthermore, Li *et al.*,<sup>12</sup> TA's effectiveness and safety in minimizing blood loss in patients having cesarean birth have been evaluated. Finally, there were 25 articles totaling 4747 participants. According to their findings, TA decreased the amount of blood lost during surgery, thereafter, and overall, by a median volume of 141.25 ml ( $P < 0.00001$ ), 36.42 ml ( $P < 0.00001$ ), and 154.25 ml ( $P < 0.00001$ ) in patients with CS. TA may also lower the frequency of PPH and severe PPH. The results showed that IV TA for caesarean section patients was efficient and secure.

Also, Fahmy *et al.*,<sup>13</sup> demonstrated that in terms of blood loss, there was a statistically substantial variation between the two groups ( $P$  value  $< 0.001$ ); the investigation group (TXA) had less blood loss than the control group ( $416.12 \pm 89.95$  and  $688.68 \pm 134.77$ , respectively).

Our findings demonstrated that preoperative Hb and hematocrit % variations between the two groups were not statistically substantial, but postoperative Hb and hematocrit% values were significantly greater in group I than in group II, with a  $P$  value of  $<0.001$ .

Study of Oseni *et al.*,<sup>14</sup> validated our findings as they showed that Women in the experimental group were given IV 10 ml of tranexamic acid, whereas those in the control group were given the same amount of normal saline.

Also, Maged *et al.*,<sup>15</sup> revealed that in the tranexamic acid group, postoperative hemoglobin,

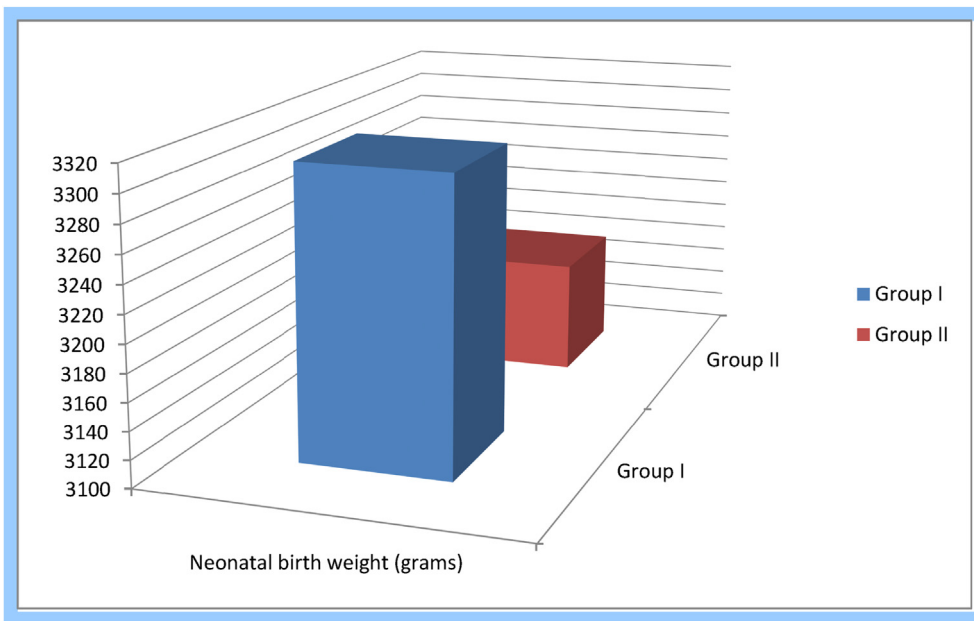


Fig. 2. Comparison between the two study groups as regard to neonatal birth weight (grams).

hematocrit, and platelet count were all substantially greater than in the placebo group ( $P \leq 0.014$  for all). When compared to the placebo group, the TA group saw significantly less percent change between pre and postoperative levels for each of the three measurements ( $P < 0.001$  for all).

However, Milani *et al.*,<sup>8</sup> revealed that Preoperative and postoperative Hb levels did not change significantly between the groups ( $P = 0.236$  &  $P = 0.818$ ). Preoperative values in the intervention

and control groups were  $12.41 \pm 1.16$  and  $12.77 \pm 1.13$ , respectively, whereas postoperative values were  $11.78 \pm 1.0$  and  $11.7 \pm 1.69$ , respectively. Further, there was no substantial change between preoperative and postoperative Hb values ( $P = 0.11$ ); there was no variation at all.

In the study of Shalaby *et al.*,<sup>16</sup> Postoperative hemoglobin and hematocrit were both decreased, and their changes ratios were greater in the placebo group compared to the TXA group.

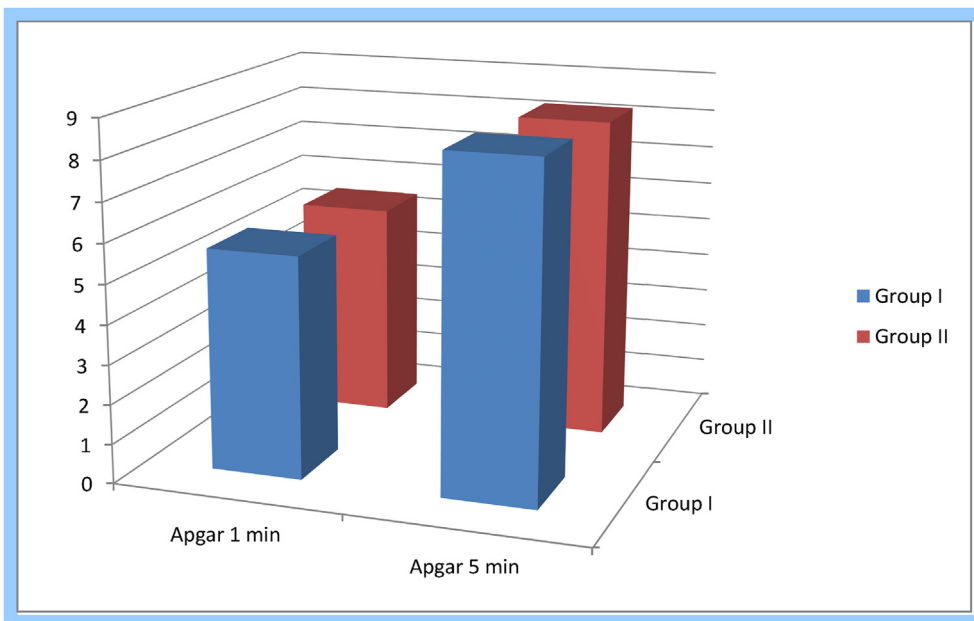


Fig. 3. Comparison between the two study groups regarding to apgar score.

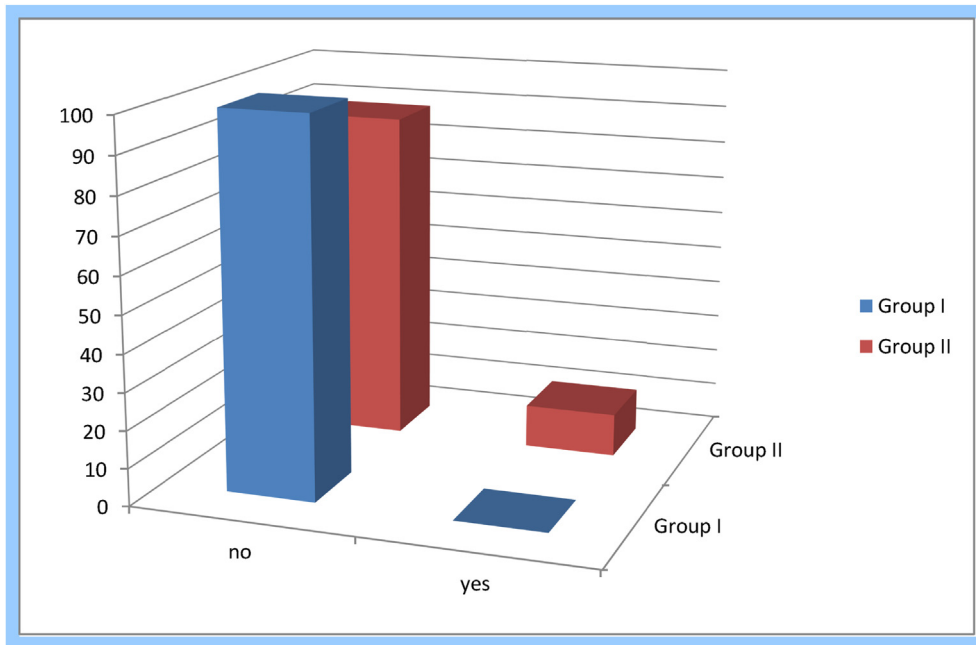


Fig. 4. Comparison of the two study populations based on NICU admission.

In the research we were involved in, there were no substantial variations between the two groups in terms of the requirement for intraoperative blood transfusions and future ecbolic therapy.

In contrary to our results research of Shalaby *et al.*,<sup>16</sup> as they revealed that Compared to the TXA group, the requirement for additional ecbolic medication was greater in the placebo group ( $P < 0.001$ ).

Our results showed that as regard neonatal birth weight (grams), there were no substantial variations between two groups. Regarding Apgar 1,5 min there was no substantial variations between two groups. Regarding NICU admission there was no substantial variations between two groups  $P$  value 0.114.

As regard maternal complication founded in 12 cases in group I in form of vomiting in 8 cases and 4 cases had nausea on the other hand group II 22 cases

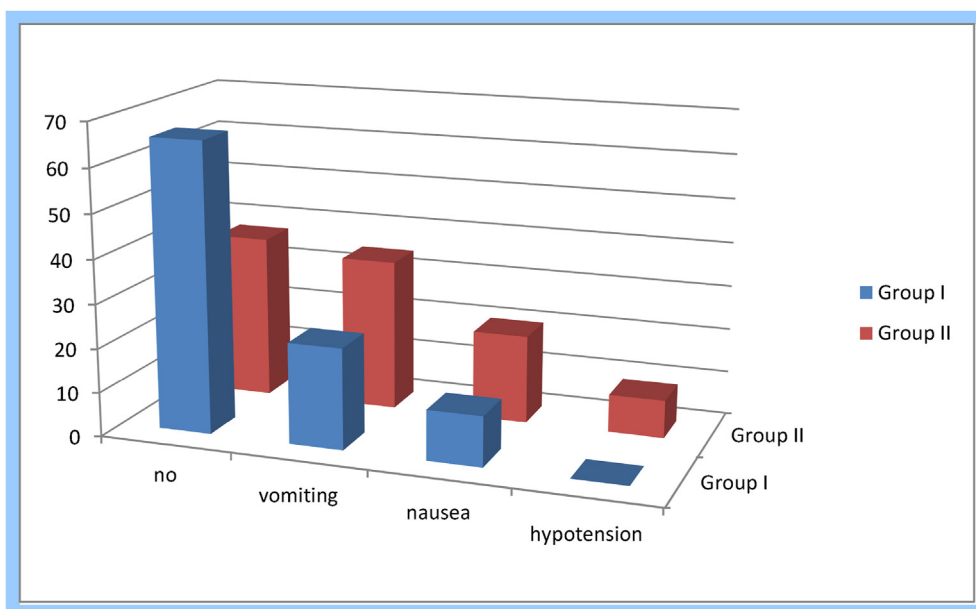


Fig. 5. Comparison between the two study groups regarding to maternal side effects.

had complications in form of vomiting in 12 cases, nausea in 7 cases and 3 cases had hypotension with no substantial variations between the two groups.

Fahmy *et al.*,<sup>13</sup> showed that regarding the frequency of problems, there was no statistically substantial variation between the groups.

Similarly, Lakshmi & Abraham,<sup>9</sup> revealed that in this research, there were no negative effects, postpartum problems, or neonatal difficulties.

In the study of Naeiji *et al.*,<sup>17</sup> no adverse reaction was documented.

While in the study of Oseni *et al.*,<sup>14</sup> on the postoperative problems in the two groups of patients. In the study group, 17 patients (13.9%) and 31 patients (25.4%) with postpartum anemia were detected. The study group had considerably less postpartum anemia ( $X^2 = 5.08$ ,  $P = 0.04$ ).

#### 4.1. Conclusion

Blood loss during CS was greatly decreased by TXA. Being in a hypercoagulable condition during pregnancy increases the risk of thrombotic events. But there were no negative side effects or problems in the early postpartum period when this anti-fibrinolytic was used. TXA may thus be used to people receiving LSCS in a safe and efficient manner.

#### Consent for publication

I verify that all authors have agreed to submit manuscript.

#### Availability of data & material

Available.

#### Conflicts of interest

There are no conflicts of interest.

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