

## Effectiveness of Tranexamic Acid in Preventing Postpartum Hemorrhage in Cesarean Delivery of High-Risk Pregnancy

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### ABSTRACT

**Background:** Caesarean section delivery is associated with severe maternal morbidity, including obstetric haemorrhage, hysterectomy, anaemia, blood transfusion, and infection. Among these operative morbidities associated with CS, obstetric haemorrhage is the leading cause of maternal mortality worldwide.

**Objective:** The aim of this work was to achieve the minimal blood loss during elective cesarean section (CS) in order to decrease patients' morbidity by using tranexamic acid (TXA) injection before operation time.

**Patients and Methods:** The current study was randomized-controlled clinical trial that was conducted at Department of Obstetrics and Gynecology, Zagazig University Hospitals through the period from April 2021 to September 2022.

**Results:** The mean of blood loss during CS in tranexamic acid intervention group was 484.87 cc and mean of blood loss during CS in control group was 705 cc. The difference was highly statistically significant  $p=0.0001$ . Per cent of blood loss was 37% more among control group.

**Conclusions.** Tranexamic acid is a good option to reduce the amount of blood loss during CS on high risk pregnancy.

**Keywords:** Tranexamic acid (TXA), Postpartum haemorrhage, Caesarean section.

### INTRODUCTION

Cesarean section (CS) rates have increased to as high as 25 – 30% in many areas of the world. Women delivering in a private health facility were slightly more likely than women delivering in a government facility to have a cesarean delivery. The likelihood of a cesarean delivery increased with the age of the mother and decreased with the child's birth order. 37% of urban births were cesarean deliveries compared to 22% of rural births. Considering place of residence, urban Lower Egypt had the highest proportion of Cesarean deliveries (43%) followed by the Urban Governorates (39%). The likelihood of a cesarean delivery increased with both the mother's educational status and was greater among women working for cash than among other women<sup>(1)</sup>. The incidence of cesarean delivery is increasing, and the average blood loss during cesarean delivery (1000 mL) is double the amount lost during vaginal delivery (500 mL). The hematocrit falls by 10% and blood transfusion is required in 6% of women undergoing cesarean delivery compared with 4% of women who have a vaginal birth<sup>(2)</sup>.

Obstetric hemorrhage remains one of the major determinants of maternal death in both developed and developing countries. Because of its weight as a leading cause of maternal mortality and morbidity, obstetric hemorrhage (ante-partum and post-partum hemorrhages) must be investigated for national guideline development<sup>(3)</sup>. In severe cases, CS may result in major obstetric hemorrhage, hysterectomy, admission to an intensive care unit, or maternal death. Medications, such as oxytocin, misoprostol, prostaglandin F<sub>2α</sub>, and methyl ergonovine, have been used to control bleeding after CS<sup>(4)</sup>. Tranexamic acid (TXA), a synthetic derivative of the amino acid lysine, is an antifibrinolytic that reversibly

inhibits the activation of plasminogen, thus inhibiting fibrinolysis and reducing bleeding<sup>(5)</sup>. TXA has been used to reduce blood loss and the need for allogeneic blood transfusion in cardiac surgery, liver transplantation, and orthopedic surgical procedures, with variable results. Furthermore, the clinical randomization of an antifibrinolytic in significant haemorrhage study concluded that tranexamic acid decreases the risk of death in bleeding trauma patients<sup>(6)</sup>. Tranexamic acid decreases post-partum blood loss after vaginal birth and after cesarean section based on randomized controlled trials (RCTs)<sup>(7)</sup>. In gynecology and obstetrics, TXA is most commonly used to treat idiopathic menorrhagia and is an effective and well-tolerated treatment when administered orally<sup>(6, 8)</sup>. Bleeding associated with pregnancy (placental abruption, placenta previa) has also been treated with TXA<sup>(9)</sup>.

The aim of this study was to achieve the minimal blood loss during elective cesarean section (CS) in order to decrease patients' morbidity by using Tranexamic acid (TXA) injection before operation time.

### PATIENTS AND METHODS

The current study was randomized-controlled clinical trial conducted at Department of Obstetrics and Gynecology, Zagazig University Hospitals through the period from April 2021 to September 2022. The study included 78 women who were divided into two groups 39 in each group: **Group 1 (study Group) who were subjected to 1 gm tranexamic acid (kapron®, Amoun, Egypt) (2 ampules = 10 ml) were administered intravenous 10 minutes before skin incision slowly infused (over 5 min). After delivery of the neonate, oxytocin 10 units IV drip were administered. Group II (The control group) who were subjected to 10 ml**



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normal saline solution were administered intravenous 10 minutes before skin incision slowly infused (over 5 min), Oxytocin 10 units IV drip given after delivery of the neonate.

**Ethical approval:**

A verbal and written consent was obtained from each patient before participation and the study was approved by the Hospital Ethics Committee of Zagazig University. The Ethics Committee of the Institute approved the study and performed as per the ethical standards laid down in 1964 (Declaration of Helsinki and its later amendments).

**The Inclusion criteria:** Pregnancy duration from 35-42 weeks of gestation. Elective CS delivery. Women at risk of postpartum hemorrhage. Parity equal to or greater than four. Multiple pregnancies. Uterine fibroid. Previous postpartum hemorrhage. History of antepartum hemorrhage in the current or previous pregnancy. Anemia with hemoglobin level < 10.5 g/dl. Fetal macrosomia (fundal height 40 cm or clinical ultrasound estimated fetal weight 3.8-4.0 kg). Polyhydramnios (more than one amniotic fluid pocket 8 cm or AFI 25 cm).

**Exclusion criteria:** Severe medical and surgical complications involving the heart, liver or kidney, brain disease and blood disorders. Bleeding tendency. Hypersensitivity to (TXA). History of thrombo-embolic disorders.

All patients were assessed by full history (with particular attention to bleeding tendency + thrombotic events). Clinical examination had been done including abdominal examination for assessment of gestational age, fetal weight, amount of liquor, fetal lie and

presentation, fetal heart sounds, uterine contractions and scar of previous surgeries.

**Investigations:** Laboratory investigations included CBC to evaluate hemoglobin level (Hb), packed red cell volume (PCV), hematocrit value and Rh type. Urine analysis for protein by dip-sticks.

Trans-abdominal ultrasound study were done for laboring women for assessment of gestational age, implantation site of the placenta and fetal weight.

The blood loss were measured following placental delivery till end of (CS) at closure of uterus and skin. Maternal blood pressure and vital signs were measured immediately after delivery.

**Statistical analysis**

The collected data were coded, processed and analyzed using the SPSS (Statistical Package for Social Sciences) version 22 for Windows® (IBM SPSS Inc, Chicago, IL, USA). Data were tested for normal distribution using the Shapiro Walk test. Qualitative data were represented as frequencies and relative percentages. Chi square test ( $\chi^2$ ) to calculate difference between two or more groups of qualitative variables. Quantitative data were expressed as mean  $\pm$  SD. Independent samples t-test was used to compare between two independent groups of normally distributed variables (parametric data). P value < 0.05 was considered significant.

**RESULTS**

Table (1) showed that the mean age of tranexamic acid intervention group was  $28.62 \pm 6$  years (ranging from 20-40 years) and mean age of control group was  $27.38 \pm 7.1$  years and ranged from (20-48). The difference was statistically non-significant

**Table (1):** Age per years of studied groups

Variables	Studied groups		t	p-value
	Tranexamic Acid intervention group (n.39)	Control group (n.39)		
Age per years- Mean $\pm$ SD	$28.62 \pm 6$	$27.38 \pm 7.1$	0.826	0.411

t= t test of sig, p > 0.05 non-significant

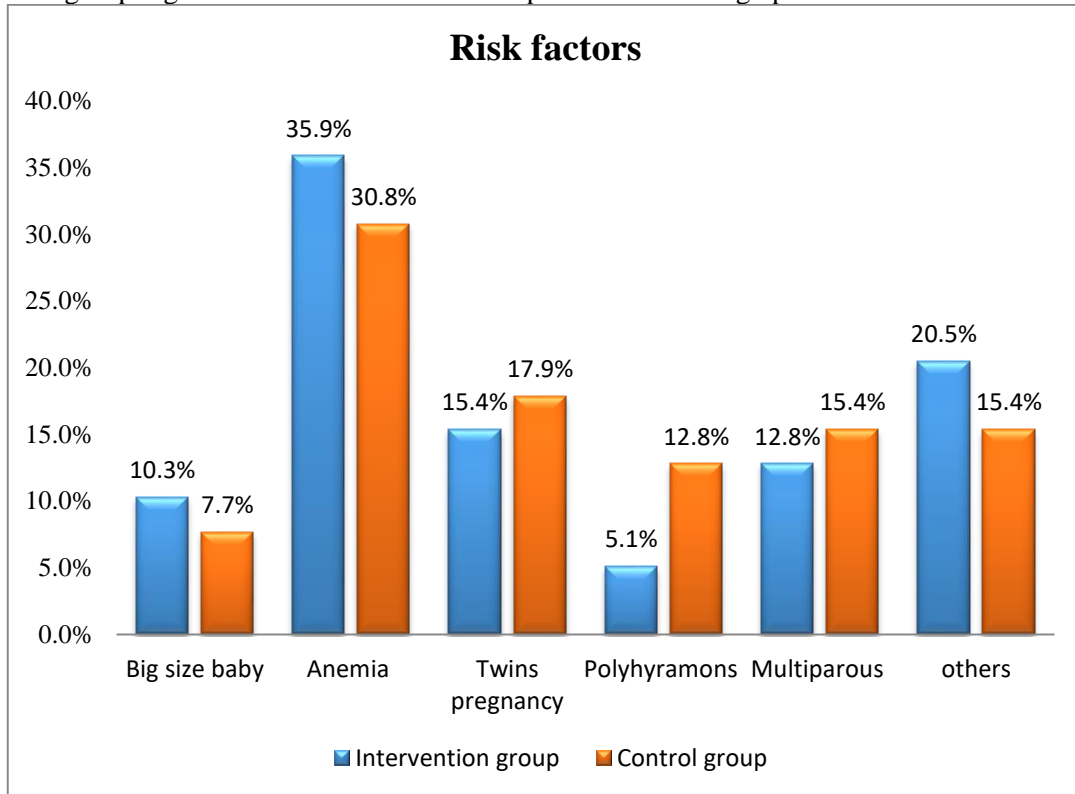
Table (2) showed that there was statistically insignificant difference between tranexamic acid intervention group and control group regarding their obstetric history p > 0.05.

**Table (2):** Obstetric history of studied groups

Variables	Studied groups		U	p-value
	Tranexamic Acid intervention group (n.39)	Control group (n.39)		
Parity			$\chi^2$ 0.458	0.489
Primi	4(10.3%)	6(15.4%)		
Multipara	35(89.7%)	33(84.6%)		
Gravida -Median (range)	4 (1-9)	3(1-9)	0.683	0.494
Para- Median (range)	2(1-7)	2(1-6)	0.227	0.821
Previous Cs- Median (range)	3 (1-6)	2(1-4)	0.706	0.480
Abortion- Median (range)	2(1-7)	1.(1-4)	1.421	0.155
Gs age(weeks)			1.03	0.307
Mean $\pm$ SD	$37.5 \pm 1.45$	$37.82 \pm 0.91$		
Median (range)	38(35-41)	38(36-39)		

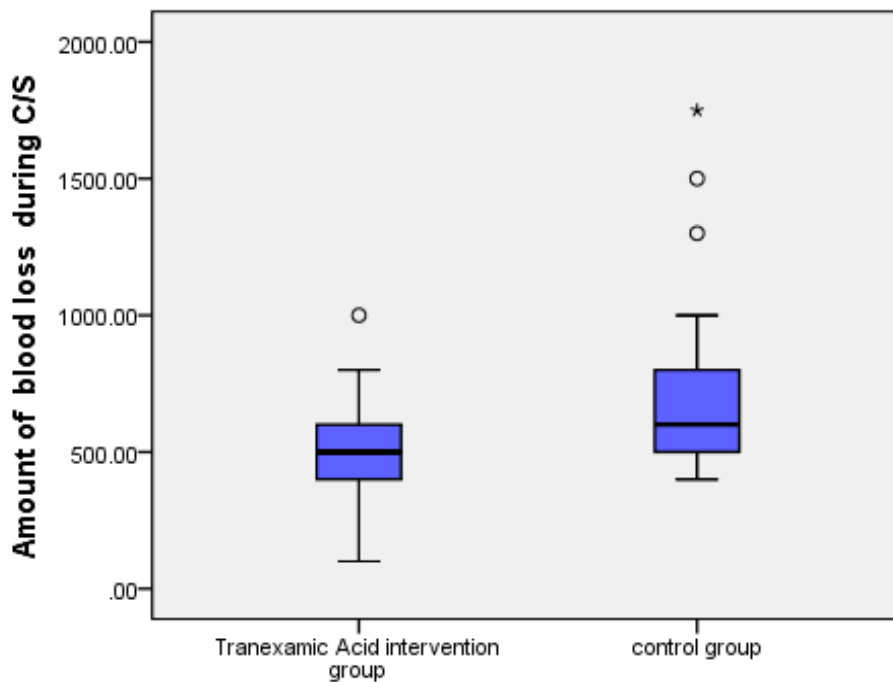
U= Mann-Whitney U test,  $\chi^2$  Chi square test, p > 0.05 non-significant

Figure (1) showed that there was statistically insignificant difference between tranexamic acid intervention group and control group regard their Risk factors for Postpartum Hemorrhage  $p>0.05$ .



**Figure (1):** Percentage distribution of risk factors for Postpartum Hemorrhage in Cesarean Delivery of high-risk pregnancy of studied groups

Figure (2) showed that the mean of blood loss during C/S of tranexamic acid intervention group was 484.87 cc (ranging from 100-1000) and mean of blood loss during C/S of control group was 705 cc (ranging from (400-1750)). The difference was highly statistically significant ( $p=0.0001$ ). Percent of blood loss was 37% more among control group compared to tranexamic acid intervention group.



**Figure (2):** Mean and range of blood loss in Cesarean Delivery of high-risk pregnancy among studied groups.

## DISCUSSION

The current study shows that the mean age of tranexamic acid intervention group was  $28.62 \pm 6$  years (ranging from 20-40 years) and mean age of control group was  $27.38 \pm 7.1$  years (ranging from 20-48) and the difference was statistically non-significant. Also, there was statistically insignificant difference between tranexamic acid intervention group and control group regarding their obstetric history and their risk factors for postpartum hemorrhage. Mean gestational age in case group was 37.5 weeks and in control group was 37.8 weeks with no statistical difference. These findings are similar to **Perveen et al.**<sup>(10)</sup> who found that mean age of tranexamic acid intervention group was  $28.80 \pm 3.72$  years with no significant difference between the studied groups. Average gestational age was  $38.94 \pm 0.814$  weeks in TXA group and  $39.02 \pm 0.864$  weeks in control group with no statistical difference.

**Yehia et al.**<sup>(7)</sup> also reported  $28.4 \pm 4.9$  years mean age in women with postpartum hemorrhage, which is close to our study results. A study conducted in China by **Xu et al.**<sup>(11)</sup> reported that mean age was  $26.7 \pm 3.7$  years, which is also close to our study results. Besides, **Goswami et al.**<sup>(12)</sup> reported  $23.6 \pm 2.5$  years mean age in women having PPH, which is in compliance with that of our study results.

**Fayyaz et al.**<sup>(13)</sup> from Peshawar reported  $29.69 \pm 7.10$  years mean age which is close to our study results. In addition, a study conducted by **Rasheed et al.**<sup>(14)</sup> also reported that mean age was  $28.86 \pm 2.94$  years which is close to our study results and **Chohan et al.**<sup>(15)</sup> also reported similar results.

This study showed that the mean blood loss during CS of tranexamic acid intervention group was 484 cc and mean blood loss during C/S of control group was 705 cc, where the difference highly statistically significant ( $p=0.000$ ). **Perveen et al.**<sup>(10)</sup> found that the mean blood loss after therapy was  $382.14 \pm 42.34$  ml in their study cases and efficacy noted in 92.4% of their study cases. A French study also reported 93 % efficacy with TA which is in compliance with our study results<sup>(16)</sup>.

The limitations of the study include a small sample size. So, we recommend further studies involving larger sample size to exclude any long-term side effect OF TXA on the mother or the fetus.

## CONCLUSIONS

Tranexamic acid is a good option to reduce the amount of blood loss during CS on high risk pregnancy. Tranexamic acid is safe and economic drug with no short-term side effect on the mother or the fetus.

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**Conflict of interest:** Nil.

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