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Evaluation of blood transfusion rate in obstetric patients

Short title: Blood transfusion rate in obstetric patients

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ABSTRACT

Objectives: The aim of this study was to analyse the obstetric patients who underwent transfusion in the gynecology and obstetrics clinic.

Material and methods: Obstetric patients who underwent a blood transfusion in the peripartum period were included in the study. A total of 213 patients who needed blood transfusion were identified. Patients' age, gravida, parity, gestational week, delivery types, blood transfusion indication and time, transfusion rate, blood products used, number of transfusions, peripartum hysterectomy status, neonatal APGAR scores and hemoglobin (Hb), hematocrit (Hct), red blood cell (RBC), platelet (Plt) values which counted before and after transfusion were recorded by scanning patient files from the hospital registry system.

Results: The overall blood transfusion rate of the patients who gave birth in our clinic was 2.51%. Uterine atony (50.7%) and chronic anemia (32.9%) were found as the most frequent indications of blood transfusion in the patients included in the study. Antenatal mean Hb of all

transfusion patients was 9.8; postpartum mean Hb was 8.2. Pre-transfusion mean Hb, RBC, Hct, Plt values calculated as 7, 3.9, 30.3, 245.2, respectively; post-transfusion mean Hb, RBC, Hct, Plt values were 9, 3.52, 27.5, 215.1, respectively.

Conclusions: Due to blood replacement, supply difficulties and transfusion complications, the profit-loss relationship should be individualized and clearly demonstrated before it is applied to the patient. In unpredictable obstetric situations that cause bleeding, staying up to date on current guidelines on pharmacological, hematological and surgical interventions and having an active blood transfusion center in the healthcare provider is very important in reducing maternal mortality and morbidity rates.

Key words: blood; transfusion; pregnancy; obstetrics

INTRODUCTION

Although many pregnancies and births are eventless, all pregnancies are at risk. Blood transfusions may be required during obstetric care. Blood products should be used for therapeutic purposes only if no other means are available in case of significant morbidity or mortality. Obstetric hemorrhage is the leading cause of maternal mortality and severe morbidity worldwide. Blood transfusions usually are performed inevitably due to obstetric complications like severe bleeding. There are many etiologic factors that cause obstetric hemorrhage. The most common cause of bleeding is uterine atony, abnormal placentation, genital trauma, and coagulation disorders also contribute to morbidity and mortality [1]. Although bleeding is mostly minor, transfusion is inevitable in some cases. Although the blood transfusion rate is between 0.16% and 6% in obstetrics, transfusion rates vary among countries, hospitals and doctors due to different practices [2]. Several studies in the literature have shown that the use of restrictive erythrocyte suspension (ES) transfusions has better clinical outcome benefits for patients, including reduced morbidity and mortality, shorter hospital stay, and reduced risk of intensive care unit admission [3]. Recently, there was a tendency to decrease the use of blood transfusion in obstetric practice. Researches

investigating the topic showed that obstetric outcomes were better despite the decrease in blood transfusion rates [2].
Our study was conducted to determine the total of obstetric patients who received transfusions in the gynecology and obstetrics clinic, transfusion rate, transfusion time, transfusion indications, and the presence of risk factors in patients who received transfusions.

MATERIAL AND METHODS

A total of 213 obstetric patients who received blood transfusion in the peripartum period between the date of January 2015 and August 2020 in University Faculty of Medicine Research and Practice Hospital Gynecology and Obstetrics Clinic were included in the study. The study was designed retrospectively. Ethics committee approval was obtained from the ethics committee of university before the study (approval no: 20-KAEK-271). Patients were evaluated with physical examination, routine hematologic parameters by scanning patient files from the hospital registry system, patients' age, gravity, parity, gestational week, delivery types, hemoglobin values, blood transfusion indication and time, the transfusion rate [number of transfused patients/total number of patients x 100], used blood products and neonatal APGAR scores were recorded. Hemogram parameters were analyzed in a device (Mindray BC-6800, China) with regular control and maintenance. Gestational week determined by the first day of the last menstrual period (LMP), or the first trimester ultrasonography measurements were considered in patients whose last menstrual period was unknown. Obstetric transfusion was defined as the receipt of this blood component at any point during pregnancy from birth to discharge. Antenatal and postpartum hemogram results of all patients were recorded. Then, hemoglobin (Hb), hematocrit (Hct), red blood cell (RBC) and platelet (Plt) values were evaluated before and after transfusion. Due to the differences between blood transfusion applications; antenatal, intraoperative and postpartum periods were examined separately, and hematological parameters were evaluated in order to be more objective. Blood samples were taken and analyzed before and after transfusion of this blood and its component products. Pre-transfusion samples were accepted as controls for statistical analysis.
Statistical analyses were performed using SPSS software version 19.0 (IBM Corp., Armonk, NY, USA). It was used for statistical evaluation of demographic, transfusion and obstetric data. The data evaluation of the study was performed using descriptive statistical methods (mean, standard deviation, minimum, maximum median, ratio, frequency). Differences

between groups were examined with the Dependent Sample T-Test. When p values were calculated less than 0.05, it was considered statistically significant.

RESULTS

A total of 8467 delivery records of patients who gave birth in our clinic were examined. There were 2532 vaginal deliveries in total, including 1055 primipara, 9 multiple pregnancies, and 5935 births, including 210 multiple pregnancies, were performed by cesarean section during the study period. Two hundred thirteen patients who needed blood transfusion were included in the study. The mean age of the patients was 27.44 years. Demographic characteristics and hemoglobin values of the patients are given in Table 1.

The mean antenatal hemoglobin value of all transfused patients was 9.84 gr/dL, while the mean postpartum Hb values were 8.22 gr/dL. The overall blood transfusion rate was 2.51% in obstetric patients, giving birth in our clinic. Blood transfusion was needed in 2.88% and 2.35% among vaginal and cesarean delivery, respectively. Blood transfusions were performed in 73 (34.3%) patients who had vaginal delivery and 140 (65.7%) patients who had cesarean delivery. Considering parities of patients, 83 (38.9%) nulliparous and 21 (9.8%) grand multipara (5 or more pregnancies) pregnancy were seen. The mean gestational week of the patients was 36.78 ± 3.72 (18–41), and the age was 27.44 ± 5.87 (17–43) years (Tab. 1).

Blood transfusion was performed for 24 (11.3%) patients in the prenatal period, 20 (9.4%) patients during the delivery (intra-operative) and 169 (79.3%) patients in the postpartum period (Tab. 2). In total, 11 (5.1%) patients were transfused blood and blood products at different and repetitive times. The erythrocyte suspension (ES), which is one of the most blood products used in patients who underwent transfusion, was administered 2.09 ± 1.252 (0–6) units and fresh frozen plasma (FFP) 0.52 ± 1.57 (0–18) units. No one patient who developed serious complications during and after transfusion was found.

Uterine atony (n = 108, 50.7%) and chronic anemia (n = 70, 32.9%) were found as the main indications of blood transfusions in the patients included in the study. A total of 29 (13.6 %) patients needed blood transfusion due to placental anomalies [placenta previa (n = 16), ablatio placenta (n = 8), placental invasion anomaly (n = 3), retained placenta (n = 2)]. Patients transfused due to three (1.4%) episiotomy complications and one (0.5%) cervical laceration (Genital Tract Injury n = 4, 1.8%). In 2 (1%) patient, intraabdominal adhesion was reported as

a transfusion indication. Causes of anemia leading to blood transfusion are listed in Table 2.

In order to achieve postpartum bleeding control, postpartum hysterectomy was performed in nine (4.2%) patients, while a Bakri Balloon was used in 12 (5.6%) patients. Nine of these patients had a hysterectomy because of placental anomaly (7 placenta previa, 2 placenta percreta). (Tab. 2). About APGAR scores were in 7.42 ± 1.97 (0–9) and 8.38 ± 2.02 (0–10) in a first and fifth minute, respectively, while 8 babies were accepted as stillbirths. When the blood transfusion practices of our clinic in obstetric patients are evaluated; Prenatal transfusion was observed in patients with antenatal hemoglobin level < 7. In intraoperative period, it was observed that transfusion was performed in acute bleedings that caused anemia and disrupted the hemodynamics of the patient, such as uterine atony, intra-abdominal adhesions, placental and genital system injuries.

It was observed that transfusion was given to patients with tachycardia, hypotension, hemodynamically unstable, hemoglobin value < 7g/dL, pre- and postnatal hemoglobin more than four units, and hemodynamically unstable patients in the postpartum period. Statistically significant changes were observed in pre-transfusion and post-transfusion hematological parameters of all patients who received blood transfusion. While Hb values increased in the post-transfusion periods, Plt values decreased. In the analysis performed considering the blood transfusion administration times, the mean Hb, RBC, Hct and Plt values of the antenatal period before and after transfusion are shown in the Table 3.

DISCUSSION

Depending on surgical interventions, minor or major complications such as wound infection, pulmonary embolism, atelectasis, scar, adhesion, wound dehiscence or bleeding may occur. Bleeding may also occur during obstetric procedures. Although the blood transfusion rate in obstetrics is between 0.16% and 6%, this rate varies due to different applications [2]. During the study, the overall blood transfusion rate in patients admitted to our clinic for delivery was found to be 2.51%. In a study conducted in Canada, there were 460.370 deliveries in 44 hospitals; 3823 of the women received an obstetrical blood transfusion during pregnancy (8.3 per 1000). In this study, obstetric-related blood transfusion rate between hospitals varied 0.37–2.36%, but the average was reported as 0.83 [4]. In another study, the blood transfusion

rate for obstetric reasons was found to be 4.6% [5]. Our transfer rate was compatible with the literature.

Although the number of transfusion patients who gave birth by cesarean was higher, the blood transfusion rate was found to be higher in patients who had a vaginal delivery. In the literature, studies have been shown that the blood transfusion rate is higher in patients who gave birth by cesarean section compared to those who delivered vaginally [6, 7]. Especially emergency cesarean sections have a higher risk of blood transfusion than elective cesarean sections. The low number of vaginal deliveries and the high rate of vaginal delivery blood transfusion rates were attributed to the high number of risky patients referred from other hospitals because our university hospital was a tertiary center. In a study conducted in Ireland, blood transfusion rate was found 1.5% in 10-year screening in obstetric patients in 1991, and it was reported that this rate decreased to one percent in 2001 [8]. In a previous study conducted in our clinic, the blood transfusion rate in 2013 was found to be 4% [9].

The low blood transfusion rate in our study, according to the literature may attribute to the regular preconceptional follow-up and pregnancy follow-up of the patients, the appropriate treatment of iron deficiency to reduce severe anemia, the close follow-up of the patients during and after delivery, and our experience in the use of pharmacological and surgical methods. When these two studies conducted in our clinic were evaluated together, it was determined that the rate of blood transfusion could be reduced with clinical experience.

Transfusion is a life-saving practice. However, an adverse reaction is observed in approximately 1% of all transfusions despite the precautions taken. Massive transfusion problems such as hemolytic reactions, infections, acute transfusion-related acute lung injury (TRALI), hypomagnesemia, hyperkalemia, hypocalcemia, hypothermia, metabolic acidosis, and coagulation abnormalities should be avoided with the use of random blood products [10, 11]. When the files of the patients included in the study were examined, no patient who developed serious complications during and after transfusion was found.

In a study conducted in Canada, it was found that there is a threefold difference in obstetric blood transfusion rates of hospitals in the same state, and this difference between hospitals shows that there is a potential for misuse of blood products in some centers [4]. It has been stated in the literature that transfusion application should be used in cases where the benefits of transfusion outweigh the risks and there are no suitable alternatives and that laboratory tests should not be the only determining factor for transfusion [12]. Similar risk factors associated with pregnancy and delivery that will require blood transfusion have been identified in the literature, including anemia, excessive uterine distention (polyhydramnios,

multiple pregnancy), preterm labor, preeclampsia / eclampsia, placental pathologies (placental detachment, insertion anomaly, previa, rest placenta), includes trauma, induction of labor, operative delivery and emergency caesarean [7, 13].

Considering the blood transfusion timing in our study, generally it was performed in the postpartum period. The most common transfusion indication was uterine atony in this period. In another study, uterine atony is most common cause of postpartum hemorrhage and is responsible for 70–80% [14]. Other main reason for transfusion in our study was chronic anemia. Anemia during pregnancy is defined as the hemoglobin value below 11 g/dL in each trimester, according to the World Health Organization (WHO) [15]. Anemia is an important risk factor in postpartum bleeding [3]. This suggest that it is associated with unfollowed pregnancies that do not attend pregnancy follow-ups and do not use iron supplements. Current Swiss guidelines recommend that hemoglobin levels should be screened regularly at least once every trimester, and iron levels should be screened in the first trimester [3]. Various algorithms have been emphasized in postpartum hemorrhage, especially in massive bleeding, although the benefits of fibrinogen and tranexamic acid are shown, more studies are needed [16]. Patients should be followed carefully and closely in the postnatal period. Placental placement and invasion anomaly are important risk factors for obstetric bleeding. The location of the placenta and the invasion of the uterus should be checked as much as possible with prenatal ultrasonography. The European Perinatal Health Report states that between 0.2 and 1 peripartum hysterectomy are performed per 1000 births [17]. In the literature, uterine atonia and placental invasion anomaly were reported as the main reasons in more than 85% of patients who underwent peripartum hysterectomy [18].

In our study, the most used blood products in transfused patients were determined as erythrocyte suspension and then fresh frozen plasma. In the ACOG bulletin, it is recommended that blood products such as erythrocyte suspension, FFP and platelet suspension should be given to the patient in certain proportions in patients in whom massive blood transfusion is planned, and that this ratio should be regulated to be 1: 1: 1 [19]. In our study, the low FFP rates were attributed to different applications of different surgeons and the non-routine application of FFP after ES transfusions performed outside the postpartum period (prenatal and intraoperative period). A decrease in Plt was observed after transfusion in all periods. This decrease made us think that there was not enough FFP transfusion in addition to ES transfusion in our clinic. In our study, it was observed that the changes in hematological parameters after transfusion were consistent with previous studies [20, 21].

The strength of our study is that our clinic has evaluated the rate of obstetric blood transfusion over a period of approximately five years. However, the limitations of our study were that the study was conducted retrospectively, the duration of the operation could not be determined for this reason, there was no body mass index information, and it was not separately evaluated which blood product made how much change in hematological parameters. In addition, abortions were not included in the study and the number of deliveries was low compared to the number of cesarean sections because of our hospital is a tertiary health institution.

CONCLUSIONS

Due to supply difficulties and transfusion complications, the profit-loss relationship should be individualized and clearly demonstrated before blood transfusion is applied to the patient. In the presence of important risk factors such as abnormal placentation, high number of previous cesarean sections, coagulation disorders, planning the delivery in tertiary centers is important for patient health. It should not be neglected to give iron supplements to women who have iron deficiency before and during pregnancy and women should be encouraged to use supplements. Early diagnosis and treatment of anemia will reduce the need for blood transfusion. In unpredictable and sudden obstetric indications that causing bleeding, staying up to date on pharmacological, hematological and surgical interventions in treatment protocols, and the presence of active blood bank in health provider are very important in reducing maternal mortality and morbidity. Evaluating blood transfusion rates and indications at certain time intervals in obstetrics clinics will be beneficial in reducing the blood transfusion rate.

Conflict of interest

The authors declared no conflict of interest.

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Table 1. Distribution of demographic values and hemoglobin levels (n = 213)

	Mean ± St.	Min–Max
Age (year)	27.44 ± 5.87	17–43
Gravida	2.41 ± 1.55	1–9
Parite	1.13 ± 1.26	0–6
Gestational age (week)	36.78 ± 3.72	18–41
Antenatal hemoglobin [g/dL]	9.98 ± 1.78	6.5–14.2
Postpartum hemoglobin [g/dL]	8.22 ± 1.22	5.5–11.8

Table 2. Distribution of qualitative values (n = 213)

		n	%
Type of delivery	Vaginal delivery	73	34.3
	Cesarean delivery	140	65.7
Pregnancy	Singleton	202	94.8
	Multiple	11	5.2
Transfusion timing	Antenatal	24	11.3
	Intra-operative	20	9.4
	Postpartum	169	79.3
Presence of hysterectomy		9	4.2

Bakri balloon placement		12	5.6
Causes of anemia	Chronic anemia	70	32.9
	Atony	108	50.7
	Placenta (Previa + abruption + accreta + retained)	29	13.6
	Genital tract injury (episiotomy bleeding + cervical laceration)	4	1.8
	Adhesion-related bleeding	2	1

Table 3. Hematological parameters

		n	Ort ± SS	Min–Max	P-value
Antenatal	Antenatal Hb [g/dL]	24	8.16 ± 2.05	3.3–14.2	0.384
	Postpartum Hb [g/dL]	24	8.51 ± 1.33	6.6–11.4	
	PreTx Hb [g/dL]	24	7.35 ± 1.51	3.3–10.8	**< 0.001***
	PostTx Hb [g/dL]	24	9.25 ± 1.02	7.6–11.6	
	PreTx RBC [millions/µL]	24	3.74 ± 0.77	0.83–4.81	0.065
	PostTx RBC	24	3.99 ± 0.68	2.48–5.64	
	PreTx Hct (%)	24	26.43 ± 5.29	9.5–37.6	**0.014***
	PostTx Hct (%)	24	29.12 ± 3.87	21.75–38.8	
	PreTx Plt [lakhs/mm^3]	24	280.58 ±	89–521.0	**0.003***
	PostTx Plt [lakhs/mm^3]	24	236.89 ±	58.44–461.0	
Intraoperative	Antenatal Hb [g/dL]	20	9.83 ± 1.37	8.3–13.1	**0.003***
	Postpartum Hb [g/dL]	20	8.5 ± 1.32	6.3–11.8	
	PreTx Hb [g/dL]	20	7.79 ± 1.15	6.3–10.5	**< 0.001***
	PostTx Hb [g/dL]	20	9.02 ± 0.96	7.4–11.8	
	PreTx RBC [millions/µL]	20	3.74 ± 0.54	2.67–4.4	**0.008***
	PostTx RBC	20	3.33 ± 0.63	2.43–4.51	
	PreTx Hct (%)	20	30.13 ± 3.48	24.8–37.5	**0.013***
	PostTx Hct (%)	20	26.74 ± 3.47	20.6–35.2	
	PreTx Plt [lakhs/mm^3]	20	244.22 ± 85.87	115.0–416.0	**< 0.001***
	PostTx Plt [lakhs/mm^3]	20	189.43 ± 66.87	40–329	
Postpartum	Antenatal Hb [g/dL]	169	10.09 ± 1.88	6.4–14.2	**< 0.001***
	Postpartum Hb [g/dL]	169	8.5 ± 1.32	6.3–11.8	
	PreTx Hb [g/dL]	169	7.34 ± 0.81	5.3–9.2	**< 0.001***
	PostTx Hb [g/dL]	169	9.12 ± 0.92	7.0–11.5	
	PreTx RBC [millions/µL]	169	3.95 ± 0.58	2.28–6.4	**< 0.001***
	PostTx RBC	169	3.47 ± 0.51	2.34–5.07	
	PreTx Hct (%)	169	30.89 ± 4.88	20.0–42.9	**< 0.001***
	PostTx Hct (%)	169	27.47 ± 3.41	7.3–36.0	
	PreTx Plt [lakhs/mm^3]	169	240.39 ± 80.85	50.0–495.0	**< 0.001***
	PostTx Plt [lakhs/mm^3]	169	215.07 ± 81.68	34.0–710.0	
Total	Antenatal Hb [g/dL]	213	9.85 ± 1.95	3.30–14.5	**< 0.001***
	Postpartum Hb [g/dL]	213	8.22 ± 1.23	5.50–11.8	

	PreTx Hb [g/dL]	213	7.38 ± 0.96	3.30–10.8	**< 0.001***
	PostTx Hb [g/dL]	213	9.13 ± 0.93	7.00–11.8	
	PreTx RBC [millions/µL]	213	3.91 ± 0.61	0.83–6.4	**< 0.001***
	PostTx RBC	213	3.52 ± 0.57	2.34–5.64	
	PreTx Hct (%)	213	30.32 ± 5.00	9.50–42.9	**< 0.001***
	PostTx Hct (%)	213	27.59 ± 3.50	7.30–38.8	
	PreTx Plt [lakhs/mm^3]	213	245.28 ± 84.67	50.00–521.0	**< 0.001***
	PostTx Plt [lakhs/mm^3]	213	215.13 ± 83.32	34.00–710.0	

p-value — Dependent Sample T-Test; * Significant < 0.05

Hb —hemoglobin; Hct — hemotokrit; Plt — Platelet; PostTx — After Transfusion; PreTx — Before Transfusion; RBC — red blood cell