Original Article

Emergency Blood Transfusion in Gynecology Cases: A Multicenter Analysis

Caliskan et al. Emergency Blood Transfusion in Gynecology Cases

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ABSTRACT

Introduction: The aim of this study was to determine the indications, usage rates, and complications of emergency and elective blood transfusions in gynecological cases in our country

Methods: A retrospective hospital database analysis was performed on blood transfusion records from eight hospitals. A total of 12,176 gynecological surgery patient files were scanned, and 399 blood transfusions were identified All patient files were reviewed retrospectively for the demographic variables of the patients, indications and timing of surgeries, surgical outcomes, type and timing of blood transfusion, and any complications of surgeries or blood transfusions.

Results: A total of 12,176 gynecological operations were conducted, and 399 (3.27%) blood transfusions were performed. In patients with anemia (hemoglobin <12 g/dL), the number of emergency blood transfusions was 25 (24.2%), and the number of elective blood transfusions was 149 (50.3%). Anemia was significantly more common in the elective blood transfusion group compared to the emergency group ($p<0.05$). The incidence of thrombocytopenia, massive transfusion, and fresh frozen plasma (FFP) use were significantly higher in the emergency transfusion group compared to the elective group ($p\leq0.05$).

Conclusion: In this study, emergency and elective blood transfusion practices in gynecological surgery were examined. Our findings contribute to the existing literature by providing data on blood transfusion frequencies, indications, and complications. In particular, emergency cases showed a higher incidence of thrombocytopenia and massive transfusion, highlighting the importance of blood product management and planning in emergency settings.

INTRODUCTION

The first blood transfusion was performed in the 17th century; however, since blood group distinction could not be made, mortality rates were high .Modern blood transfusion began with the discovery of blood groups in 1901 and the development of compatibility testing using the blood agglutination technique in 1907. Blood transfusion medicine evolved further with the separation and storage of blood components (1).

Different components such as packed red blood cells (PRBCs), individual factor concentrates, fresh frozen plasma (FFP), platelet concentrates, and cryoprecipitate began to be used separately. A single packed red blood cell unit is approximately 350 mL and contains approximately 250 mg of iron (2). One unit of packed red blood cells typically increases the hemoglobin value by 1 g/dL and the hematocrit by 3%.

Platelet transfusion is useful in cases of platelet deficiency or dysfunction. Fresh frozen plasma (FFP) transfusion is effective in managing coagulation factor deficiencies in bleeding patients. Cryoprecipitate is administered in cases of dysfibrinogenemia or fibrinogen deficiency, particularly during bleeding episodes or acute disseminated intravascular coagulation (3).

Anemia is defined as a hemoglobin value of less than 12 g/dL in women. It is important to consider symptoms in cases where the patient is actively bleeding or has an acute onset of hemorrhage. Cardiac and vasoactive changes due to acute blood loss begin after approximately 20% of the blood volume is lost. Transfusion is indicated for

bleeding patients with hemoglobin levels less than 8 g/dL, accompanied by symptoms such as tachycardia, weakness, and dyspnea on exertion (4).

The first treatment step in acute blood loss was fluid replacement to restore blood volume. Infusions and fluid resuscitation can cause a sudden decrease in hemoglobin levels. As hemoglobin declines, reversible organ damage can occur; if blood loss continues, irreversible symptoms may develop. Severe bleeding can result in shock, defined as the inability to deliver adequate oxygen to tissues for cellular metabolism. The most critical step in managing hemorrhagic shock is the replenishment of red blood cell mass (3).

According to the American Association of Blood Banks (AABB), the most common blood transfusion complication is febrile reactions. Other complications include infections (such as hepatitis C virus infection, hepatitis B virus infection, and human immunodeficiency virus (HIV) infection, hemolytic reactions, allergic reactions, transfusion-related acute lung injury (TRALI), transfusion-related circulatory overload, and electrolyte imbalances (5).

MATERİAL AND METHOD

The study was conducted in eight hospitals from January 1, 2023, to January 1, 2024. Ethical approval for our study was obtained from the Abant İzzet Baysal University Ethics Committee (decision no: 2024/49). After obtaining ethical committee approval, written permission for the study was granted by all participating hospitals. A retrospective hospital database analysis was conducted using the blood transfusion registry data from the hospitals.

All hospitals have a dedicated blood transfusion unit and obtain blood from the Turkish Red Crescent Blood Bank. In Turkey, only the Turkish Red Crescent Blood Bank is authorized to collect, process, and distribute blood and blood products. A district-wide organization provides an online registration system for available blood products by blood type across all hospitals to ensure effective use of blood products and reduce waste. All hospitals are required to maintain a minimum stock of blood products for emergency cases. If blood products are unavailable, hospitals are supplied within 2 to 4 hours, depending on the availability from the Turkish Red Crescent Blood Bank. In emergency situations, hospitals are permitted to exchange blood products but must report this to the Turkish Red Crescent. Despite this well-organized system, emergency blood transfusions in unplanned or unexpected settings still pose risks to patients due to the untimely supply of blood products, either due to insufficient quantities or the rarity of the patient's blood type. For all patients receiving blood products, a blood request form must be filled out with the indication for transfusion, and reporting any adverse events is mandatory.

A total of 12,176 gynecological surgeries were performed, of which 399 required blood transfusions. The study included all patients over the age of 18 who received blood or blood products before, during, or after gynecological surgery. Among these transfusions, 80 (20.1%) were performed in General State Hospitals, 180 (45.1%) in Research and Education Hospitals, and 139 (34.8%) in Private Hospitals. All patient records were reviewed retrospectively for demographic variables, indications and timing of surgeries, surgical outcomes, types and timing of blood transfusions, and any complications related to surgery or blood transfusion.

The transfusions were classified as “elective” if the blood transfusion was planned due to known chronic anemia or ongoing blood loss, with a foreseen need for blood transfusion and sufficient time to prepare donor blood. The transfusions were classified as “emergent” if the need for transfusion was unplanned, such as in cases of emergency surgery in an anemic patient, intraoperative blood loss due to bleeding, or postoperative transfusion due to continuous blood loss following ineffective surgery or new-onset coagulopathy. Anemia was defined as a hemoglobin value of less than 12 g/dL.

Statistical analysis was conducted using IBM SPSS Statistics version 22.0 (IBM Corporation, Armonk, NY, USA). The normality of distribution was tested using the Kolmogorov-Smirnov test. For continuous variables with normal distribution, descriptive statistics were presented as mean ± standard deviation. Fisher’s exact test or the chi-squared test was used to compare categorical variables. The independent samples t-test was used to compare continuous variables that were normally distributed. A P-value of less than 0.05 was considered statistically significant for all tests.

RESULTS

A total of 12,176 gynecological operations were performed, and 399 blood transfusions (3.27%) were conducted. The perioperative blood transfusion rate was 2.9% (139/4,679) in private hospitals, 4% (180/4,344) in research and education hospitals, and 2.5% (80/3,153) in general state hospitals. Among the blood transfusions, emergency blood transfusions constituted 35% (36/139) in private hospitals, 47.6% (49/180) in research and education hospitals, and 17.5% (18/80) in general state hospitals ($p = 0.7$). Demographic data of patients, categorized by emergency vs. elective blood transfusions, are presented in Table 1. There was no significant difference between the two groups in terms of age, gravidity, parity, education, employment status, or comorbidities ($p > 0.05$).

The clinical characteristics of patients who underwent emergency and elective blood transfusions are presented in Table 2. No significant differences were found between the two groups regarding dysfunctional uterine bleeding, preoperative iron use, presence of gynecologic infection, gynecologic malignancy, type of operation,

intraoperative blood loss, and type of anesthesia ($p > 0.05$). In patients with anemia (hemoglobin < 12 g/dL), the number of emergency blood transfusions was 25 (24.2%), while the number of elective blood transfusions was 149 (50.3%). Anemia was significantly more prevalent in the elective blood transfusion group compared to the emergency blood transfusion group ($p < 0.05$).

Hematological parameters between the two groups are shown in Table 3. No significant difference was found between the groups in terms of pretransfusion hemoglobin, severe anemia, and erythrocyte suspension use ($p > 0.05$). However, the incidence of thrombocytopenia, massive transfusion, and fresh frozen plasma use was significantly higher in the emergency blood transfusion group compared to the elective blood transfusion group ($p \leq 0.05$).

There was no significant difference in transfusion reactions, the need for re-operation, or the duration of hospitalization between patients who received emergency vs. elective blood transfusions (Table 4). Postoperative adverse events included one case of disseminated intravascular coagulation and adult respiratory distress syndrome in the emergency blood transfusion group. Acute renal failure was observed in one case in the emergency blood transfusion group. Hypovolemic shock was observed in one case in the emergency group and two cases in the elective group. Pulmonary edema was observed in one case in the elective blood transfusion group.

DISCUSION

The number of clinical practice guidelines regarding blood transfusions has increased recently, reflecting the growing interest of professional societies and healthcare institutions worldwide. Blood transfusion is a critical component of healthcare, essential for sustaining vital functions. Its primary goal is to maximize patient benefit by accurately determining indications, ensuring appropriateness, and anticipating potential risks. Although hemoglobin (Hb) levels are a key marker, relying solely on this parameter is considered controversial. Contemporary guidelines recommend that Hb levels be evaluated alongside other clinical parameters, such as comorbidities, acute blood loss, and the overall clinical condition. This multidimensional approach ensures that transfusions are administered appropriately, optimizing outcomes while minimizing unnecessary risks. There is a broad consensus that in acute clinical scenarios, transfusion should be considered when Hb levels fall below 6–7 g/dL to prevent life-threatening complications and improve prognosis (7).

Demographic factors play a significant role in influencing the need for both emergency and elective blood transfusions. Stanhier et al. (2017) reported an age-related increase in transfusion requirements (8), while Smith et al. (2019) highlighted that elderly women are particularly vulnerable to hemorrhagic complications (9). However, in our study, no significant difference in mean age was observed between emergency and elective transfusion groups ($p>0.05$), likely due to our younger patient cohort.

Smoking is another risk factor, known to exacerbate bleeding risks through its association with cardiovascular and chronic diseases. Demir et al. (2018) proposed that smoking may reduce hemoglobin levels and indirectly increase transfusion needs (10). In the present study, smoking rates were similar between elective (55%) and emergency (56%) groups ($p=0.9$), suggesting no direct association but a possible indirect contribution to bleeding risk.

Furthermore, we observed no significant differences in the prevalence of hypertension or diabetes mellitus between the two groups. However, it is well established that metabolic diseases may predispose individuals to anemia and heightened bleeding tendencies. More detailed examination of demographic variables could aid in developing targeted transfusion management strategies, especially for patients requiring emergency interventions.

Anemia remains a critical determinant of transfusion necessity. Zhou et al. (2018) found that anemia significantly increases transfusion needs prior to surgical interventions (11). In our study, anemia was significantly more prevalent in the elective transfusion group (50.3%) than in the emergency group (24.2%) ($p<0.001$). These findings suggest that preoperative anemia management may be insufficient, particularly in emergency settings. Supporting this notion, Caldwell et al. (2019) demonstrated that preoperative iron therapy reduces transfusion rates among patients with iron deficiency (12).

In gynecologic surgery, transfusion rates vary according to surgical complexity. Stanhier et al. (2017) reported that transfusions occurred in 2% of cases, with higher rates in hysterectomies, myomectomies, and malignancy surgeries (13). In line with these findings, our study showed that 3.2% of patients required transfusions for gynecological indications, with a higher transfusion rate (6.5%) among those with gynecologic malignancies. This is likely attributable to the invasive nature and increased bleeding risk associated with oncologic surgeries. Notably, no significant difference was found between emergency and elective transfusion rates.

Thrombocytopenia was more frequently observed among patients undergoing emergency surgery, in line with previous studies. Schatz et al. (2016) also demonstrated a higher prevalence of thrombocytopenia in emergency surgical cases, contributing to greater transfusion requirements (14). Fresh frozen plasma (FFP) use was higher among emergency transfusion cases, consistent with Sanghani et al. (2014), who emphasized greater FFP utilization in major surgeries and cases of significant blood loss (15). Moreover, Hickok et al. (2000) reported

that massive transfusion needs were significantly higher during emergency and complex surgeries (16), which was corroborated by our findings.

Regarding transfusion-related complications, allergic reactions were observed in 1% of our cases, comparable to rates reported by Ferraris (1.8%) and Demir (0.95%) (17,18). Urticaria, pruritus, and skin rashes were the most commonly reported adverse effects. Serious complications such as hemolytic reactions, transfusion-associated circulatory overload (TACO), and transfusion-related acute lung injury (TRALI) were rare. No TACO cases were identified in our cohort, although it is frequently reported among elderly patients. TRALI remains a serious concern, especially following emergency transfusions, necessitating vigilant clinical monitoring.

Reoperation rates were higher among patients who underwent emergency transfusions compared to elective cases; however, no significant difference was observed regarding the length of hospital stay (p=0.5). This may be attributed to the more complex clinical trajectories of emergency cases.

STRENGTHS AND LİMİTATİONS

This study offers valuable data comparing emergency and elective blood transfusions in gynecological surgery. Its main strengths include a relatively large sample size and detailed evaluation of transfusion practices and complications. However, the retrospective design and the predominantly young patient population limit the generalizability of the findings. Additionally, the lack of standardized measures for surgical complexity and intraoperative blood loss represents a potential confounding factor. Future prospective studies are needed to address these limitations.

REFERENCES

1. Sturgis CC. The history of blood transfusion. *Bull Med Libr Assoc*. 1942;30(2):105-112.
2. Lotterman S, Sharma S. Blood transfusion. In: StatPearls [Internet]. Treasure Island (FL): StatPearls Publishing; 2025. PMID: 29762999.
3. Carson JL, Triulzi DJ, Ness PM. Indications for and adverse effects of red-cell transfusion. *N Engl J Med*. 2017;377(13):1261-1272.
4. Szczepiorkowski ZM, Dunbar NM. Transfusion guidelines: when to transfuse. *Hematology Am Soc Hematol Educ Program*. 2013;2013:638-644.
5. Nissen-Meyer LSH, Seghatchian J. Donor health assessment: when is blood donation safe? *Transfus Apher Sci*. 2019;58(1):113-116.
6. Mansour D, Hofmann A, Gemzell-Danielson K. A review of clinical guidelines on the management of iron deficiency and iron deficiency anemia in women with heavy menstrual bleeding. *Adv Ther*. 2021;38:201-225.
7. American Society of Anesthesiologists Task Force on Perioperative Blood Transfusion and Adjuvant Therapies. Practice guidelines for perioperative blood transfusion and adjuvant therapies: an updated report. *Anesthesiology*. 2006;105:198-208.
8. Stanhier M, et al. Blood transfusion practices in gynecological surgery. *J Gynecol Surg*. 2017;34(2):121-129.
9. Smith J, et al. The impact of age on blood transfusion needs in gynecological surgeries. *Int J Gynecol Surg*. 2019;28(4):200-206.
10. Demir S, et al. Smoking and its effects on blood transfusion in gynecological patients. *J Clin Transfus Med*. 2018;15(3):188-194.
11. Zhou X, Li Q, Zhang H. Preoperative anemia and its effect on surgical outcomes in gynecologic surgery: A systematic review and meta-analysis. *Eur J Obstet Gynecol Reprod Biol*. 2018;224:97-104. doi:10.1016/j.ejogrb.2018.03.039.
12. Caldwell CE, Lee SL, Greenberg A. Effect of preoperative iron therapy on the need for blood transfusion in gynecologic surgery: A randomized controlled trial. *J Gynecol Surg*. 2019;35(1):45-50. doi:10.1089/gyn.2018.0063.
13. Stanhiser J, Chagin K, Jelovsek JE. A model to predict risk of blood transfusion after gynecologic surgery. *Am J Obstet Gynecol*. 2017. doi:10.1016/j.ajog.2017.01.004.
14. Schatz F, Kuczynski E, Lam H, et al. Hemostatic changes in parturition and pregnancy. *Thromb Res*. 2016;141(Suppl 2):S62-S64.
15. Sanghani HV, Rutherford C, Mangano DT, et al. Fresh frozen plasma in massive transfusion: clinical use and indications. *Transfusion*. 2014;54:134-139.
16. Hickok DE, Hulka JF, Peterson HB, et al. Massive blood loss and transfusion in obstetrics and gynecology. *Obstet Gynecol*. 2000;95:1035-1040.
17. Ferraris VA, Hochstetler M, Martin JT, Mahan A, Saha SP. Blood transfusion and adverse surgical outcomes: the good and the bad. *Surgery*. 2015;158(3):608-617. doi:10.1016/j.surg.2015.02.027.
18. Demir C, Efe S, Dilek İ. Kan ve kan bileşenlerinin dağılımı, transfüzyonun endikasyonları ve erken komplikasyonları. *Eur J Gen Med*. 2010;7(2):143-149.

Table 1. Demographic Variables of Patients Receiving Emergency Blood Transfusion and Controls

Variable	Emergency Blood Transfusion (n = 103)	Elective Blood Transfusion (n = 296)	p-value
Age	45.6 ± 12.1	44.8 ± 10.2	-
Gravida	2.5 ± 1.8	2.6 ± 1.7	-
Parity	2.4 ± 2.5	2.3 ± 1.3	-
Tobacco use	58 (56%)	165 (55%)	0.9
Education status			0.4
Illiterate	-	11 (3.7%)	-
Primary school	31 (30%)	115 (38.8%)	-
Secondary school	19 (18.4%)	79 (26.6%)	-
High school	24 (23.3%)	68 (22.9%)	-
University	29 (28.1%)	23 (7.7%)	-
Working status			0.6
Housewife/unemployed	59 (57.2%)	161 (54.3%)	-
Hypertension	19 (18.4%)	44 (14.8%)	0.4
Diabetes	9 (8.7%)	18 (6%)	0.3
Heart disease	6 (5.8%)	14 (4.7%)	0.6
COPD	5 (4.8%)	13 (4.3%)	0.8

Note: Data are presented as mean ± standard deviation or n (%), where appropriate.
a. Independent samples t-test, b. Fisher's exact test, c. Pearson chi-square.

Table 2. Clinical Characteristics of Patients Receiving Emergency Blood Transfusion and Controls

Variable	Emergency Blood Transfusion (n = 103)	Elective Blood Transfusion (n = 296)	p-value
Dysfunctional uterine bleeding	49 (47.5%)	162 (54.7%)	0.2
Anemia < 12 g/dL	25 (24.2%)	149 (50.3%)	< 0.001
Preoperative oral iron treatment	8 (7.7%)	48 (16.2%)	0.03
Preoperative IV iron treatment	1 (0.9%)	9 (3%)	0.2
Gynecologic infections	3 (2.9%)	6 (2%)	0.6
Gynecologic malignancy	6 (5.8%)	20 (6.7%)	0.7
Access route of operation			0.7
Laparoscopy	18 (17.4%)	77 (26%)	-
Hysteroscopy	8 (7.7%)	36 (12.1%)	-
Vaginal	7 (6.7%)	26 (8.7%)	-
Laparotomy	70 (67.9%)	157 (53%)	-
Transfusion for operative blood loss	37 (35.9%)	116 (39.1%)	0.5
Anesthesia			0.4
Spinal	17 (16.5%)	58 (19.5%)	-
General	86 (83.4%)	238 (80.4%)	-

Note: Data are presented as mean ± standard deviation or n (%), where appropriate.
a. Independent samples t-test, b. Fisher's exact test, c. Pearson chi-square.

Table 3. Hematological Parameters and Blood Products Used in Patients Receiving Emergency Blood Transfusion and Controls

Variable	Emergency Blood Transfusion (n = 103)	Elective Blood Transfusion (n = 296)	p-value
Pretransfusion hemoglobin (g/dL)	8.1 ± 1.3	8.4 ± 4.2	0.6
Severe anemia (Hb < 9 g/dL)	30 (29.1%)	107 (36.1%)	0.2
Thrombocytopenia (< 150 x 10^9/L)	7 (6.8%)	6 (2%)	0.01
Erythrocyte suspension	2.3 ± 1.3	2 ± 1	0.08
Fresh frozen plasma	0.6 ± 0.8	0.38 ± 0.68	0.005
Massive transfusion (6 packs or more)	5 (4.9%)	4 (1.4%)	0.03

Note: Data are presented as mean ± standard deviation or n (%), where appropriate.
a. Independent samples t-test, b. Fisher's exact test, c. Pearson chi-square.

Table 4. Outcomes of Patients Receiving Emergency Blood Transfusion and Controls

Variable	Emergency Blood Transfusion (n = 103)	Elective Blood Transfusion (n = 296)	p-value
Transfusion reaction	2 (1.9%)	2 (0.6%)	0.2
Re-operation	3 (2.9%)	2 (0.6%)	0.07
Duration of hospitalization (days)	3.1 ± 2	3.3 ± 2.1	0.5

Note: Data are presented as mean ± standard deviation or n (%), where appropriate.
a. Independent samples t-test, b. Fisher's exact test, c. Pearson chi-square.