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Determination of the Knowledge Level of Nurses and Midwives Working at A University Hospital About Transfusion of Blood and Blood Products

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ABSTRACT

Blood transfusion is actually a tissue transplant and the possible complications are of vital importance. Thus, the healthcare personnel, who will perform the transfusion, should be trained in this regard. The aim of the present study is to determine the knowledge level of the nurses and midwives working at our hospital, about transfusion. In this study, we found that the in-service training of the participants about transfusion and education levels is important in terms of determining the adequacy of this training. A total of 534 nurses and widwives working at the Medical Faculty Hospital of Sivas Cumhuriyet University were included in the study. The questionnaire includes 9 questions about personal information, 9 questions on knowledge about pre-transfusion, 7 questions on the process of blood transfusion, 6 questions on blood and blood products, and 3 questions about the blood transfusion reaction. According to the scores taken in the questionnaire, the participants were divided in two sub-groups as group I (0-85) and group II (86-100). In the questionnaire, correct answer rate of the participants was 93.28% in questions about nursing responsibilities before transfusion, 95.2% in questions about transfusion process, 94.5% in questions about identifying and managing transfusion reactions, and 71.71% in questions about knowledge levels of blood and blood products. In general, it can be asserted that the nurses and midwives working at the hospital have good transfusion skills in parallel to their education, previous in-service transfusion training and their transfusion and reaction experiences.

Keywords: Blood, Knowledge level, Midwife, Nurse, Reaction, Transfusion

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Introduction

Blood is a living tissue; therefore, blood transfusion is actually a tissue transplant, not a simple fluid infusion process. Upon the discovery of blood group antigens, typing methods and donor-recipient comparison tests at the beginning of the 20th century, blood transfusion entered the field of medicine. Blood transfusion; It has many indications such as providing blood volume in cases that cause fluid loss such as bleeding, trauma or surgical intervention, increasing the hemoglobin level in severe chronic anemias and increasing oxygen transport to the tissues, and correcting bleeding and coagulation disorders (Muche, et al. 2023). Transfusion is a highly complex therapeutic process. Transfusion of blood and blood products can never be taken lightly; Therefore, it should be applied after careful evaluation of the clinical situation, if the ratio of potential benefit and harm is in favor of benefit. Transfusion of blood and blood products should be carried out with appropriate indications, with the principle of not harming the patient. Although blood transfusion is a widely used life-saving treatment method, it can cause potentially life-threatening adverse reactions. We can divide transfusion reactions into two groups: acute and chronic. Side effects that occur during transfusion or up to 24 hours after stopping transfusion are called acute transfusion complications. These include acute hemolytic transfusion reaction (AHTR), non-hemolytic febrile transfusion reaction (FNHTR), Transfusion-related acute lung injury (TRALI), allergic reactions, and transfusion-associated circulatory overload (TACO). If any complications occur in the patient during transfusion, it should be considered as AHTR until proven otherwise. Transfusion should be stopped immediately and re-blood typing, re-crossing, complete blood count and direct anti-globulin tests should be performed. AHTR is the most important of these and is the immune-mediated hemolysis of donor erythrocytes in the vein by antibodies in the recipient plasma because of inappropriate erythrocyte administration to the recipient. It is caused by ABO incompatible blood transfusion and unfortunately can result in death. This reaction may occur even if 5-10 ml of incompatible blood is given to the patient. The severity of clinical symptoms is proportional to the amount of blood given (Hsieh, et al. 2023). TRALI is a rare but serious adverse event that occurs during or within 6 hours of blood transfusion. TRALI is characterized by hypoxia and non-cardiogenic pulmonary edema (Yu, and Lian 2023). Side effects that occur days, weeks or years after transfusion are called chronic transfusion reactions. Chronic transfusion reactions include late hemolytic transfusion reaction, transfusion-associated

GVHD, posttransfusion purpura, immunomodulation, transfusion-transmitted infections, and hemosiderosis (Köroğlu, and Altıntaş 2018). It is reported that approximately 85% of preventable side effects are the risks related to human errors in blood transfusion processes. (Bolton-Maggs, 2017).

When the risks related to blood transfusion are taken into consideration, determination and improvement of the nurses' knowledge level plays a vital role in providing the most appropriate safety and care to the patients. Blood transfusion is a teamwork and sufficient knowledge and safe practice are very important. Midwives and nurses, who have a direct contact with the patient, are also among the most important members of this team. Healthcare professionals' lack of knowledge about blood compatibility testing, delayed blood transfusion, and failure to identify reactions related to blood transfusion are important errors related to blood transfusion (Hijji, et al. 2013).

For qualified patient care and safe blood transfusion, the knowledge level of midwives and nurses should be evaluated, sufficient training should be provided, and their knowledge should be updated (Hsieh, et al. 2018; Pavenski, et al. 2018).

The aim of the study is to evaluate the knowledge of midwives and nurses working at the Medical Faculty Hospital of Sivas Cumhuriyet University regarding blood transfusion.

Material and Methods

Sample Selection

The research is a cross-sectional study and the research population consists of 580 nurses and 15 midwives working at Medical Faculty Hospital of Sivas Cumhuriyet University were. Research data was collected between 15.12.2021-15.02.2022. In the study, a total of 534 healthcare professionals who had a professional experience of at least 1 year at Medical Faculty Hospital of Sivas Cumhuriyet University were included. While 514 (96.3%) of them were nurses, 20 (3.7%) were midwives.

Ethical Considerations

Ethics committee approval was obtained from the Non-Interventional Ethics Committee of Sivas Cumhuriyet University for the study (Decision no:2021-12/02). All the nurses and midwives read the participant information form and signed the informed consent form.

Blood Transfusion Questionnaire

The questionnaire used for data collection was prepared by reviewing the related studies and theses (Şahin, 2006; Güleryüz, and Dal 2015; Karadoğan, 2015; Altuntaş, 2019; Ulusal Hemovijilans Rehberi 2016; Yıldızbaş, and Barın 2019). The survey questions were presented to expert opinion for review. The two nurses presented for her opinion work as specialist nurses. "Questionnaire for the Determination of Knowledge Level about the Transfusion of Blood and Blood Products" consists of 5 sections and 34 questions. The first section of the questionnaire includes 9 open-ended questions including personal information such as age, gender, educational status, clinic, duration of working, status of participating in in-service training programs for blood transfusion, and previous transfusion practices. The second section includes 9 questions on knowledge about pre-transfusion, the third section includes 7 questions about blood transfusion process, the fourth section includes 6 questions about blood and blood products, and the fifth section includes 3 questions about blood transfusion reaction (Güneş, et al. 2008). Each of the twenty-five questions in the second, third, fourth, and fifth sections gets four points and the evaluation is made out of a total of one hundred points.

Statistical Analysis

Data of the study were uploaded in SPSS (ver. 22.0) program. Chi-square tests were used in 2x2 and multi-span layouts for the data assessment, and the data were expressed as the number of individuals (n) and percentage (%) in tables. Significance level was accepted as 0.05. When evaluating the scores obtained from the survey, 85 points were determined as the cut-off point, and scores of 86 and above indicate having "good transfusion skills".

Results

Of the subjects participating in the study, 514 (96.3%) were nurse and 20 (3.7%) were midwives. Mean age of the participants was 30.28±7.60 (18-55) years. Mean duration of professional working of the participants was 8.19±7.74 (1-35) years. Of the participants, 248 (46.4%) were working at internal units and 286 (53.6%) were working at surgery units. Table 1 shows the demographic data of the participants.

The participants were asked a total of 25 questions about level of knowledge about pre- transfusion (n: 9. 36%), the level of knowledge about the transfusion process (n: 7. 28%), about blood and blood products (n: 6. 24%) and transfusion reactions (n: 3. 12%) and each of which got 4 points. Figure 1 shows distribution of the questions in the questionnaire. Table 2, table 3, table 4, table 5 shows the questions in the questionnaire as well as number and percentage related to true and false answers. Questions of transfusion knowledge assessment questionnaire and answer rates (Table 2, Table 3, Table 4, Table 5).

The evaluation of the correct answers given to the questions in the questionnaire is made out of 100 points. Total mean score of the participants was 88.77±7.50 (48-100). The participants were divided into two subgroups based on their points. The first group included the individuals having a score between 0 and 85 and the second group included the individuals having a score between 86 and 100 (group I; n=148, 27.7% group II; n=386, 72.3%). When the groups were compared according to gender, it was found that the mean score was higher in women compared to men. This difference was statistically significant (X2=5.42, p=0.019).

Table 1. Demographic data of the participants

Characteristics	n (%)/Mean ± SD
Age (years)	30.28±7.60
Gender	
Female	389 (72.8%)
Male	145 (27.2%)
Educational level	
Diploma in Nursing	250 (46.8%)
Associate degree in Nursing	42 (7.9%)
Bachelor's degree in Nursing	205 (38.4%)
Master's degree in Nursing	37 (6.9%)
Department	
Internal units	248 (46.4%)
Surgical units	286 (53.6%)
Working experience	
<5 years	263 (49.3%)
>6 years	271 (50.7%)
Previous training related to blood transfusion	
Yes	492 (92.1%)
No	42 (7.9%)
Blood transfusion reaction experience	
Yes	108 (20.2%)
No	426 (79.8%)

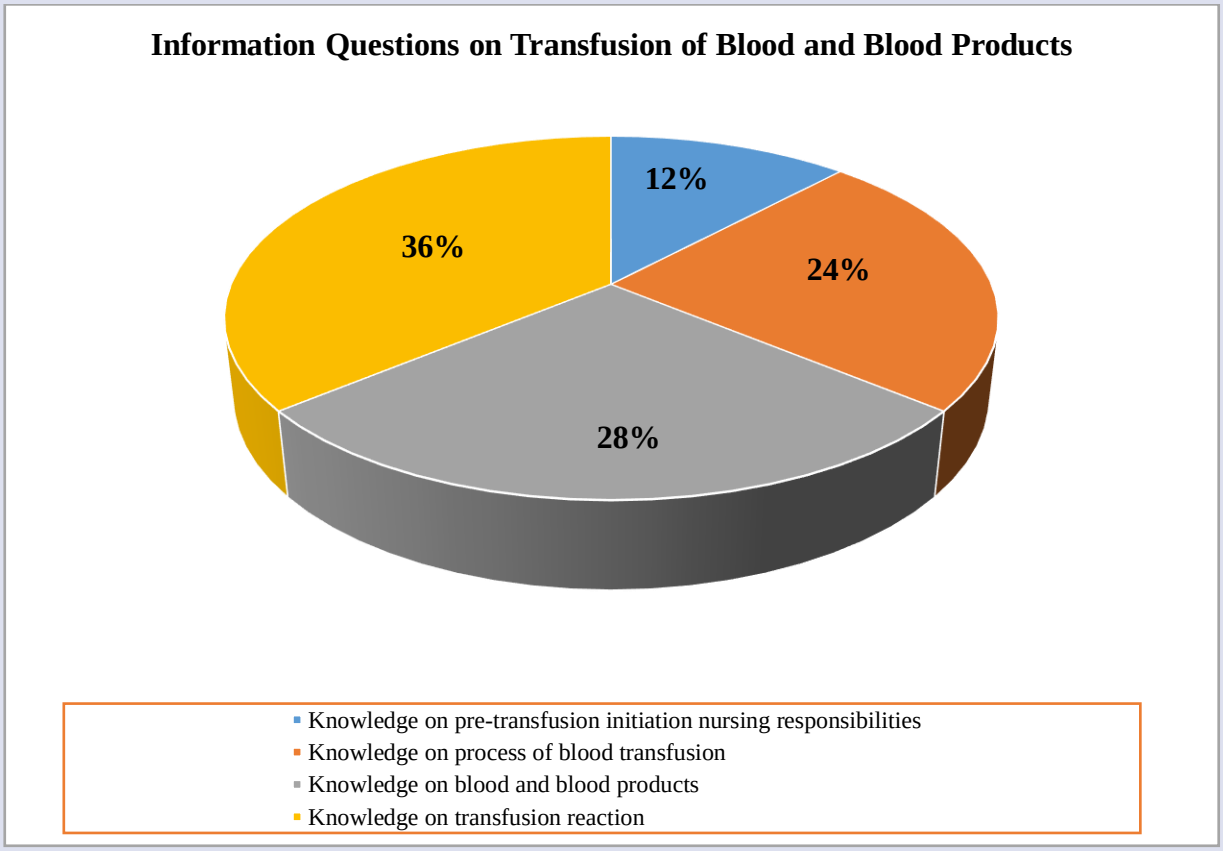

Figure 1. Information questions on transfusion of blood and blood products

Table 2. Knowledge on pre-transfusion initiation nursing responsibilities

	True n (%)	False n (%)
Knowledge on pre-transfusion initiation nursing responsibilities		
✓ The consent of the patient should be taken before the transfusion of blood and blood products and the consent should be seen by the related nurse/midwife before starting transfusion.	529 (99.1)	5 (0.9%)
✓ There should be a doctor order for transfusion of blood and blood products.	531 (99.4%)	4 (0.6%)
✓ The period of transfusion should be specified in the order.	497 (93.1%)	37 (6.9%)
✓ When there is only one nurse on night-shift, the nurse can initiate the blood transfusion by making the necessary checks.	479 (89.7%)	55 (10.3%)
✓ Checks to be made before the transfusion of blood and blood products are performed by two healthcare professionals in the treatment room/desk (If the other healthcare professional is busy and checks cannot be conducted at bedside)	394 (73.8%)	140 (26.2%
✓ Checks to be made before the transfusion of blood and blood products should be done by two healthcare professionals at the same time, at the bedside.	521 (97.6%)	13 (2.4%)
✓ In the checks to be made before the transfusion of blood and blood products, it needs absolutely to look at the armband while performing the identity check of the patient.	527 (98.7%)	7 (1.3%)
✓ In order to prevent hemolysis of erythrocytes, the most suitable wide-lumen branule for the vascular structure of the patient should be preferred.	526 (98.5%)	8 (1.5%)
✓ Blood and blood products should be used within 30 minutes after removed from the blood bank cabinet.	479 (89.7%)	55 (10.3%)

Table 3. Knowledge on process of blood transfusion

	True n (%)	False n (%)
Knowledge on process of blood transfusion		
✓ Which one is true about safe blood transfusion?	526 (98.5%)	8 (1.5%)
• Vital signs should be measured before starting transfusion, hourly during the transfusion, and at the end of the transfusion.		
• Vital signs should be measured before starting transfusion and at the end of the transfusion.		
• Vital signs should be measured half-hourly during transfusion		
• Vital signs should be measured before starting transfusion, 15 minutes after starting transfusion, half-hourly during the transfusion, and at the end of the transfusion.		
✓ Which one of the following can be administered via the same IV route during the infusion of blood products?	503 (94.2%)	31 (5.8%)
• 5% Dextrose solution		
• Ringer lactate solution		
• 0.9% NaCl solution		
• 10% NaCl solution		
✓ In case more than one product is administered to a patient, the products to be inserted to the patient should be separately requested from the blood center.	517 (96.8%)	17 (3.2%)
✓ Transfusion of one unit of erythrocyte suspension should be completed within maximum 4 hours.	486 (91%)	48 (9%)
✓ After the blood transfusion is started, the blood should be administered slowly for the first 15 minutes, then at the rate ordered by the doctor since the first 15-minute period is crucial in terms of early recognition of transfusion reaction symptoms in the patient.	509 (95.3%)	25 (4.7%)
✓ All the records related to the transfusion process should be clear, legible, and understandable.	528 (98.1%)	6 (1.1%)
✓ There is an instruction used for transfusion of blood and blood products at the hospital.	494 (92.5%)	40 (7.5%)

Table 4. Knowledge on blood and blood products

	True n (%)	False n (%)
Knowledge on blood and blood products		
✓ Which one of following blood products should Cross-Match be applied to? • Erythrocyte Suspension • Apheresis platelet • Pooled Platelet • TDP	505 (94.6%)	29 (5.4%)
✓ One unit of blood was received from the blood bank for transfusion to your patient. However, your patient needed an urgent CT scan and the blood transfusion will be delayed for an hour, how do you store the blood during this time? • In the service refrigerator • In the dark part of the room • I'll send it back to the blood bank refrigerator. • I dispose of the blood properly.	369 (69.1%)	165 (30.9%)
✓ Which method is suitable for warming the blood? • By warming it under the armpit • Waiting it in warm water • Warming it by using a special heater that is present at the blood bank • Warming it on the heater core	472 (88.4%)	62 (11.6%)
✓ For which circumstances is it not recommended to warm the blood? • When the patient is operated • Presence of cold agglutinin disease • In massive transfusion • In exchange transfusion in newborns	179 (33.5%)	355 (66.5%)
✓ Which one of the following is wrong about platelets? • Platelets should never be placed in the refrigerator. • Cross-Match should be done before transfusion. • Infusion should be administered within 30 minutes. • It should be thoroughly agitated before use.	263 (50.7%)	271 (49.3%)
✓ Since the platelet suspension should be agitated horizontally with a device called agitator, it should be immediately administered to the patient.	502 (94%)	32 (6%)

Table 5. Knowledge on transfusion reaction

	True n (%)	False n (%)
Knowledge on transfusion reaction		
✓ You observed signs of reaction in your patient during blood transfusion, what do you do? • I immediately inform the doctor and stop the blood transfusion. • I lower the blood transfusion rate slightly. In case the reaction symptoms persist despite this, I administer 0.9% NaCl by interrupting the transfusion. • I immediately stop the blood transfusion and administer 0.9% NaCl via another vascular access. Then, I inform the doctor. • I immediately stop blood transfusion. I inform the doctor. I administer 0.9% NaCl and keep the vascular access open. I inform the blood center and Hemovigilance unit. If the product developing the reaction is Erythrocyte Suspension/Whole Blood, I send the administered product and the blood sample of the patient taken in EDTA tube to the blood center by filling in the forms for Transfusion Reactions.	492 (92.1%)	42 (7.9%)
✓ Which one of the following is/are symptoms of a blood transfusion reaction? • Tachycardia • Fever • Dyspnea • All	493 (92.3%)	41 (7.7%)
✓ If any complication develops during blood transfusion, the blood center and hemovigilance department is informed.	530 (99.3%)	4 (0.7%)

Table 6. Comparison of Groups I and II in terms of gender, in-service training, and professional experience

	Group I (Score 0-85)	Group II (Score 86-100)	Total	P
Gender				
Female	97 (24.9%)	292 (75.1%)	389	0.019*
Male	51 (35.2%)	94 (64.8%)	145	
In-service transfusion training				
Received	134 (26.2%)	378 (73.8%)	512	0.001*
Did not receive	14 (63.6%)	8 (36.4%)	22	
Transfusion experience				
Yes	128 (26%)	364 (74%)	492	0.003*
No	20 (47.6%)	22 (52.4%)	42	
Transfusion reaction experience				
Yes	18 (16.7%)	90 (83.3%)	108	0.004*
No	130 (30.5%)	296 (69.5%)	426	

** p<0.05, statistically significant*

When the participants, who received in-service transfusion training, were compared with the group that did not receive transfusion training, the group received training (n:512, 95.88%) had a higher mean score than the other group (n:22 4.12%). This difference was statistically significant (X2=14.77, p=0.001).

When the participants were compared according to their previous transfusion experiences, those having transfusion experience (n:492, 92.13%) had a higher mean score than those did not (n:42 7.87%) (X2=9.01, p=0.003).

When comparing the groups in terms of the transfusion reaction, those having transfusion reaction experience (n:108 20.23%) had a higher mean score compared to those who did not (n:426, 79.77%) (X2=8.24, p=0.004). Table 6 compares the data of Groups I and II according to gender, in-service training, transfusion experience, and transfusion reaction experience.

The participants were evaluated in 4 categories according to their educational status; vocational school of health (n:250 46.8%), associate's degree (n:42 7.9%), undergraduate (n:205 38.4) %, and postgraduate (n:37 6.9%). No statistically significant difference was determined between those graduated from vocational school of health and those having associate's degree in terms of level of knowledge about transfusion. However, a statistically significant difference was observed between those graduated from vocational school of health and having a bachelor's degree (p=0.004) and those having a postgraduate degree (p=0.005).

Discussion

Blood transfusion is a life-saving, but a high-risk procedure in various medical conditions. Even a smallest mistake to be made before or during blood transfusion may increase mortality and morbidity. Before the transfusion, the compatibility of the blood group of the patient and the blood product should be examined and the identity controls should be done since the most common cause of acute hemolytic transfusion reaction, which is one of the transfusion complications with a highest mortality rate, is the ABO-incompatible blood transfusion. Thus, the nurses should have sufficient knowledge and skills regarding blood transfusion. In order to ensure patient safety and to minimize the risks related to blood transfusion, sufficient level of training on transfusion is required (Freixo, el al. 2017).

In the present study, the knowledge levels of midwives and nurses, who were working at the related hospital and agreed to participate in the study, were investigated in terms of blood products, transfusion process, and transfusion complications, and their socio-demographic characteristics such as gender, educational status, and working duration were examined. A statistically significant difference was found between the groups in terms of gender. It was observed that women had higher level of knowledge about transfusion.

It was observed that the rate of correct answers increased as the education level of the participants increased. This shows that education level has an important role in knowledge and skill regarding transfusion.

The fact that 95.9% of the participants received in-service training about transfusion is important in terms of determining the sufficiency of this training. In addition, the group receiving in-service training on transfusion had a significantly higher and statistically significant level of knowledge on transfusion. Most of the nurses and midwives working at the hospital had sufficient knowledge about transfusion, which was compatible with the literature (Davis, et al. 2012).

Correct bed-side identification of the patients for whom transfusion is planned is important to avoid new malpractices and to determine the previous malpractices (Robinson, et al. 2018). The most important reason of wrong transfusions that may result in morbidity and mortality in the patients is the insufficient identification of the patient before transfusion. In correct transfusion, nurses are of vital importance. Bed-side check is the final chance to avoid wrong transfusion (Eichbaum, et al. 2014). In the present study, it was determined that rate of correct answers was 93.28% in questions about pre-transfusion nursing responsibilities and the nurses and midwives had sufficient level of knowledge on pre-transfusion.

Blood warming procedure is one of the most important steps in transfusion. Increasing temperature is related to hemolysis, and this causes fever, coagulopathy, and renal failure and it sometimes results in death (Bediako, et al. 2021). Correct answer was taken for the question about the blood warming method at a rate of 88.4%. however, rate of correct answer was 33.5% for the question about conditions the blood warming is necessary. Nurses should receive training about this issue.

Close follow-up for the first 15 minutes is vital for the early detection of blood transfusion reactions (Savage, 2016). The rate of correct answers given to the questions for the transfusion process such as the transfusion, rate vascular access for transfusion, monitoring of the vital findings, drugs and fluids that can be administered simultaneously, and recording the transfusion data was 95.2%. It was observed that the nurses and midwives working at the related hospital were competent in this regard.

Blood transfusion is one of the most common and risky procedures at the hospitals. Thus, complications related to blood transfusion should be known by all the nurses and midwives. In similar studies from India and Iran, the level of knowledge on how to manage acute hemolytic transfusion reactions (AHTR) was reported to be 80.1% (Piri, et al. 2009; Dubey, et al. 2013). A study conducted in Malaysia reported that the participants had a moderate level (55%) of knowledge about interventions to minimize transfusion reaction, a moderate level (64.4%) of knowledge about AHTR symptoms and findings and a high level (80.1%) of knowledge to manage AHTR (Mohd Noor, 2021). In the present study, the rate of correct answers received for the questions about identifying and managing the transfusion reactions was 94.5%. Most of the nurses had a high level of knowledge about identifying the transfusion reactions and interventions. However, more detailed questionnaires should be conducted about the transfusion reactions in order determine clearly the knowledge level on this issue.

The rate of correct answers to the questions evaluating knowledge levels on blood and blood products was 71.71%. The nurses and midwives working at the related hospital had a high level of knowledge about blood products. In general, it can be asserted that the nurses and midwives working at the related hospital had good transfusion skills in parallel to their educational background, previous in-service transfusion training and their transfusion and reaction experiences.

Unlike the results of many studies conducted in our country, in our study it was determined that most of the nurses performed blood transfusion in accordance with the blood transfusion application steps. In the study conducted by Encan and Akın, it was stated that nurses have insufficient knowledge about blood and blood products (Encan, and Akın 2019). Barın and Polat's study showed that the majority of nurses correctly applied the application steps in blood transfusion (Barın, and Polat 2023).

Limitations

The limitation of this study is that it was conducted with nurses and midwives working at Sivas Cumhuriyet University Medical Faculty Hospital in Sivas.

Conclusion

As a result of our study, we found that the nurses and midwives in our hospital have sufficient knowledge about blood products, transfusion and transfusion reactions. Blood transfusion is a complicated and dynamic process and it is very important that the transfusion is performed by experienced nurses. For this reason, routine evaluations should be made to provide good practices in blood transfusion besides regular in-service education for the development of knowledge and skills of the nurses. More in-service training should be given to nurses regarding blood products, storage conditions of blood products, transfusion process and transfusion complications. Consequently, further studies are required to determine the blood transfusion knowledge-skills of the nurses and the effect of training on it.

Conflict of interest

The authors declare that they have no conflict of interest.

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