An Approach to Blood and Blood Product Transfusion/Reactions

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Abstract

Objective: Transfusion of blood and blood products is life-saving in the right indication; however, it may cause serious complications that may lead to mortality. This study aimed to determine the level of knowledge of allied health personnel about blood and blood product transfusion and to raise awareness about this issue as a result. **Materials and Methods:** In our study, 191 assistant healthcare professionals serving the adult age group in Konya Training and Research Hospital were surveyed with 24 questions via the website. **Results:** The rate of correctly knowing all the symptoms related to the transfusion reaction was 31.9%, and 37.6% of the signs. After the grouping of years of service, the rate of correctly knowing transfusion symptoms and signs was similar between the groups, while the rate of knowing the right approach in case of reaction was higher in those with a service year of >20 years. The rate of recognizing the symptoms suggestive of transfusion reaction was higher in those who received transfusion training compared to those who did not receive training (39.1% - 25.3%). **Conclusion:** It was deduced that the training should be repeated at frequent intervals since it was determined that the rate of correct answers to the survey questions was high among those who have worked in the profession for a longer period and those who have received transfusion training.

Keywords

Blood and Blood Products Transfusion, Questionnaire, Transfusion Training

1. Introduction

Transfusion of blood and blood products is a common clinical practice and safe blood transfusion practice is important. Most studies have found that the majority of adverse transfusion reactions are related to preventable human errors [1]

[2] [3]. Nurses are an important aspect of the transfusion process as they are at the end of the transfusion chain. In addition to clinical experience, it is important to follow the National Transfusion Guidelines and to organize transfusion training [4] [5] [6] [7]. In terms of patient safety, practical knowledge is as important as theoretical knowledge. A questionnaire study was conducted with healthcare professionals working in the adult age group and working in the transfusion clinics in the tertiary hospital in Turkey. The education and awareness levels of our assistant health workers about blood transfusion were measured in our study.

2. Method

1256 healthcare professionals working in Konya Training and Research Hospital and serving in clinics with a patient aged > 18 years were informed about the questionnaire. Those working in ambulatory units, those with administrative duties, or those working in clinics where frequent transfusions are not available were not included in the survey. This study was conducted between 02.07.2020 and 01.09.2020 and included 191 assistant healthcare professionals. Before starting the study, the participants were informed about the study, and consent was obtained for voluntary participation. A 24-item questionnaire form was created to determine information about age, education level, gender, working time, whether or not he/she has participated in blood transfusion training programs, the clinic where he/she works, frequency of transfusion per week, whether he/she has encountered a transfusion reaction, product accuracy before starting the transfusion, cross match, patient and product blood group control, patient consent control, premedication requirement, the approach on how to preserve the product when an obstacle is encountered after the blood and blood products are introduced to the clinic, the maximum administration time of the erythrocyte suspension, the most important period for post-transfusion reactions, recognizing the symptoms and signs of the reaction, and the appropriate approach (Table 1). The questionnaire was prepared by a team comprising hematologists. While preparing the questionnaire, the current literature related to transfusion reactions was scanned and current guidelines were examined. The comprehensibility of the questionnaire and the reliability of the questions and responses were evaluated by this team. The questionnaire was delivered to the study participants using the Google forms website (http://www.google.com/forms). The questions were in the form of multiple-choice, and more than one option could be selected for some questions. Approval for the study was granted by the Local Ethics Committee (decision no: 02.07.2020/40-28) and the study has been conducted according to the Declaration of Helsinki 1975.

For statistical analysis, SPSS version 22.0 statistical package software (IBM Corp., Armonk, NY, United States) was used. Continuous variables were demonstrated as mean ± standard deviation and categorical variables as numbers and percentages. The Chi-square test was used to compare study groups in terms

Table 1. Questions asked in the survey.

1. Name, surname or nickname?

2. How old are you?

3. Gender?

4. The school you graduated from?

5. Your years of service?

6. Have you ever received transfusion training?

7. Have you ever donated blood?

8. Have you ever had blood or blood products administered to you?

9. How often do you transfuse blood and blood products in the clinic where you work?

10. The clinic you work in?

11. Do you perform a check between the patient blood group and the product blood group before the transfusion?

12. Do you check if cross match is performed?

13. Do you check the expiry date of the product?

14. Do you check if there is patient consent?

15. Do you apply premedication before transfusion?

16. How do you set the blood to the proper temperature?

17. What are the symptoms associated with a transfusion reaction? (You can tick more than one option)

18. Have you ever encountered a transfusion reaction?

19. What are the signs associated with the transfusion reaction? (You can tick more than one option)

20. Especially the first few minutes after starting the transfusion are important in terms of recognizing the signs of reaction and should it be administered more slowly during this time?

21. What do you do if you observe signs of reaction in your patient during blood transfusion?

22. Under normal conditions, in how many hours at the latest 1 unit of erythrocyte suspension should be administered to an adult patient?

23. A unit of erythrocyte suspension was received from the blood bank for transfusion, but you could not administer it due to an emergency, how do you store the erythrocyte suspension? (You can tick more than one option)

24. Which of the following is the storage temperature/location for platelet suspensions that received to the service for transfusion but could not be administered due to an emergency?

of categorical variables, and Fisher's exact test was used in cases where the number of participants was <5 in at least one of the groups. The significance threshold was defined as $P < 0.05$.

3. Results

74.8% of the participants were female and 25.1% were male. The mean age was 29 ± 7 years, and only 16.7% of them were forty years or older. It was found that 82.7% of them have a bachelor's degree and 65.4% of them have been working for less than 5 years. 51.8% of them had not received any in-service training on blood transfusion. 45.6% of them were working in a clinic that transfused blood and blood products more than once a week (Table 2). 34% of the participants were working in Intensive Care, 14% in Gynecology, 6.3% in Cardiology, 5.8% in Internal Medicine, 4.7% in General Surgery, 3.7% in Plastic Surgery/ENT/Eye, 1.6% in CVS, and 28% in other clinics. They had all raised awareness about the cross match, checking the compatibility between patient blood group and product blood group, checking the expiry date of the product, and the need for patient consent. 57.1% of them had the wrong information about the necessity of applying premedication and 13.6% of them had the wrong information about bringing the blood to the appropriate temperature. 64.4% had not encountered a transfusion reaction. Among the symptoms associated with transfusion reactions, 32.4% had back/chest pain, 27.2% had a rash, 16.2% had burning/tingling in the vascular access, 25.2% had hypotension, and 20.9% had urticaria, 10.9% redness along the vein did not know. There was no significant difference between transfusion symptoms and knowing the right approach in the reaction, gender, frequency of transfusion administration, clinic studied, and frequency of encountering transfusion reaction. However, the rate of knowing the transfusion

Table 2. Demographic data of the participating in the study (n = 191).

Characteristic	Number (%)
Age **mean ± sd** (years)	**29 ± 7**
<30	131 (68.5)
30 - 39	28 (14.6)
>40	32 (16.7)
Gender	
Female	143 (74.8)
Male	48 (25.1)
Years of service (years)	
<5	125 (65.4)
5 - 10	27 (14.1)
11 - 20	24 (12.5)
>20	15 (7.8)
Transfusion training	
Yes	92 (48.1)
No	99 (51.8)
Frequency of transfusion (week)	
<1	104 (54.4)
1 - 10	70 (36.6)
>10	17 (8.9)

signs were found to be higher in men (54.2% - 32.2%) ($P = 0.007$). The rate of recognizing the symptoms was higher in those who received transfusion training than in those who did not (39.1% - 25.3%) ($P = 0.04$) (Table 3).

The rate of knowing all the symptoms correctly was 31.9%, and the rate of knowing all the symptoms correctly was 37.6%. When the years of service are grouped as 0 - 5, 6 - 10, 11 - 20, or >20 years, no significant difference was found between the rates of correct knowledge of transfusion symptoms and signs. 91.1% of them knew that especially the first 15 minutes after starting the transfusion is important in terms of recognizing the signs of a reaction and that it should be administered more slowly during this period. The rate of knowing the proper delivery rate and storage conditions of blood and blood product was 67.5% for erythrocyte suspension and 59.2% for platelet suspension. 38.7% of them knew the appropriate approach when they observed signs of reaction during a blood transfusion. There was no significant difference between the groups in terms of recognizing symptoms and signs and approaching the reaction when grouped as 20 - 29, 30 - 39, or ≥40 years of age. The rate of knowing the right approach in case of reaction was 32% for those with 0 - 5 years of service, 48.1% for those with 6 - 10 years, 41.7% for those with 11 - 20 years, and 60% for those with >20 years. ($P = 0.02$) (Table 4).

4. Discussion

Transfusion of inappropriate blood and blood products can be prevented by careful attention of nurses, who are in the last step of the transfusion chain [8]. It was found in our study that all of the participants in the survey checked the patient's blood group and the product blood group before transfusion, paid attention to whether cross-match was performed and whether it was appropriate, and

Table 3. Recognizing the symptoms and signs related to the transfusion reaction with the status of receiving transfusion education and the correct approach to the reaction.

Training	Symptom (%)		P-value	Sign (%)		P-value	Approach (%)		P-value
	Wrong	Right		Wrong	Right		Wrong	Right	
No	57.7	32.3	0.11	54.6	35.4	0.48	74.7	25.3	0.04
Yes	56.5	43.5		59.8	40.2		60.9	39.1	

Table 4. Recognizing the symptoms and signs related to the transfusion reaction according to the years of service and the correct approach to the reaction.

Years of service	Symptom (%)		P-value	Sign (%)		P-value	Approach (%)		P-value
	Wrong	Right		Wrong	Right		Wrong	Right	
0 - 5	70.4	29.6		61.6	38.4		68	32	
6 - 10	63	37	0.29	74.1	25.9	0.78	51.9	48.1	0.02
11 - 20	70.8	29.2		54.2	45.8		58.3	41.7	
>20	53.3	46.7		60	40		40	60	

controlled the expiration date of the product and the requirement for patient consent. It is very important that the blood and blood products are at the appropriate temperature before the transfusion and the method to be applied for this is also very important, and in studies conducted on this subject, the rate of correct answers to the related question has been found low [9] [10]. However, this rate was better in our study. When the participants in our study were grouped as <30, 30 - 40, and >40 years of age, no difference was observed in recognizing and approaching the symptoms and signs of transfusion reaction. In a survey study involving 546 nurses in 2018, when grouped as 20 - 24, 25 - 29, and >30 years, no difference was observed between the groups in terms of knowledge about transfusion, similar to our study. In this study, the transfusion knowledge of the employees in the hematology-oncology and intensive care unit, where transfusion is frequently applied, was determined better [11]. In our study, when the responses of the participants were evaluated in terms of the clinics they worked in and the weekly transfusion frequency, no difference was observed between the groups. This may be due to the small and unequal number of participants in the units.

Blood transfusion reactions may be mortal. Therefore, it should be ensured that the healthcare personnel administering the transfusion have all kinds of knowledge and equipment regarding the reactions [12]. The symptoms of the reaction must be noticed, especially 15 minutes after the start of the transfusion, and it should be administered more slowly during this time [8] [13] [14]. In our study, 91.1% of those who participated in the survey knew that this time was important after starting the transfusion and that it should be administered more slowly during this time.

Signs that may occur depending on the type of reaction may also be different, and practitioners need to recognize them. Common signs include fever, chills, nausea, vomiting, tachycardia, respiratory distress, low back pain, chest pain, urticaria, redness and burning along the blood supply vein, hypotension, and hematuria [15]. It was reported in a study that 26.19% of nurses answered the reaction symptoms correctly [16]. In another study, 39% of the participants gave correct answers about the reactions, and it was found that those with more experience in the profession knew better about the reactions [10]. In another survey study, in which 279 nurses who had experience working in a transfusion unit for 5 years participated, the authors reported that more than half (58%) of the participants had insufficient knowledge about transfusion-related complications [17]. Similarly, in our study, the rate of knowing all the symptoms correctly was 31.9% and 37.6% of the signs. The rate of recognizing symptoms was higher in those who received transfusion training compared to those who did not.

When signs of a reaction are observed, it is important to stop the transfusion, keep the intravenous line open with 0.9% NaCl, and notify the physician [18]. 38.7% of the participants in our study knew the appropriate approach similar to the study reported in Malaysia [9], and this rate was found to be higher in those

with more experience in the profession. In a study conducted in India, they reported that the survey score was better in those with 1 - 5 years of service when the years of service were grouped as <1, 1 - 5, and >5 years. This situation is explained in the study as it may cause the theoretical knowledge to be forgotten since experienced nurses are kept under supervision and management [11]. In a different survey study in which 171 nurses participated, it was emphasized that although they had a good education and received in-service training, the experience was important [19]. Our study supports the importance of years of service, frequency of transfusions, and the importance of following the National Guidelines, training in transfusion, and clinical experience.

5. Limitation of the Study

The most important limitation is that we were not able to provide enough participants in our study because we were in the period of the Covid-19 pandemic. In addition, our hospital served as a pandemic hospital shortly after, and the clinics where the participants worked changed. Therefore, the post-training questionnaire could not be repeated. It would have been better if it had been an observational study.

6. Conclusion

Nurses need to have sufficient knowledge about control and consent, and recognize the transfusion reaction and approach before blood transfusion. We have concluded that to increase the safety in practice, it would be appropriate to give regular training to the practitioners and that those with high years of service and those with good education should work together, take responsibility for increasing the level of knowledge of the assistant health workers individually, and to repeat the information measurements at frequent intervals. The combination of clinical experience and theoretical knowledge is important.

Conflicts of Interest

The author declares no conflicts of interest regarding the publication of this paper.

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