

ORIGINAL RESEARCH

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Assessment of physicians' knowledge in transfusion medicine in eastern part of Turkey**Ali Fettah¹, Duygu Kara², Gokce Pinar Reis¹, Alev Cansu Certel¹, Soner Sertan Kara³**¹*Department of Pediatric Hematology, Erzurum Regional Training and Research Hospital, Erzurum, Turkey*²*Department of Anaesthesia, Erzurum Regional Training and Research Hospital, Erzurum, Turkey*³*Department of Pediatric Infectious Diseases, Erzurum Regional Training and Research Hospital, Erzurum, Turkey*

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Abstract

Transfusion of blood and blood components is one of the most common medical procedures in the developed world. Knowledge of physicians about blood transfusion is the most important determinant of their approach towards blood transfusion. In this study, we aimed to assess clinicians' basic knowledge regarding transfusion medicine through a questionnaire in a regional hospital. One hundred and one physicians including general practitioners, resident physicians, and specialists participated in the study. The participants were tested with a questionnaire consisting of 20 questions about transfusion medicine. Their scores were compared with regard to their departments, age and experience in medicine. The mean age of study population was 33.1 ± 6 years. Of the total, 70 (69.3%) were male and the average year in medical practice was 7.3 ± 5.8 years. Overall, 52% of the questions were correctly answered. The proportion of correct answers to the questions about basic knowledge, clinical use of blood, and transfusion reactions were as; 52.7%, 54.7%, and 47.3%, respectively. Thirty-four (33.7%) participants scored higher than 60 points, out of 100 points. The average score of total knowledge of participants about transfusion medicine was 52 ± 10 . The total knowledge scores of groups including internal departments, surgical departments, and emergency medicine were 55.7 ± 10.2 , 51.5 ± 8.3 , and 46 ± 10.3 , respectively and the differences between three groups were significant ($p=0.001$). Also, a positive correlation has been shown between age, experience in medicine and total awareness score in transfusion medicine. The study yielded low/moderate levels of knowledge about transfusion medicine and it was concluded that additional education in transfusion medicine is necessary in all specialties and at each phases of medical practice.

Keywords: Knowledge, physicians, education, transfusion medicine, blood products safety**Introduction**

Transfusion of blood and blood components is one of the most common medical practices in the developed world [1]. Adequate knowledge regarding indications, requisition, handling, storage, and transfusion of blood components is a prerequisite to ensure safe transfusion in the recipient [2]. Clinicians' knowledge about blood transfusion has been demonstrated to have a significant impact on their approach towards blood transfusion, especially the management of the patients [3]. Hence, lack of knowledge of safe transfusion practices among clinicians can lead to unfavorable consequences [2].

Despite advancing technology in transfusion medicine, infectious and noninfectious complications are still important. Additionally, increasing costs of preparation of blood components, cost-ineffectiveness of diagnostic tests, and limited resources sometimes invite unfavorable circumstances of transfusion medicine. The mainstay for reduction of blood use and transfusion reactions is to make

educational programs for clinicians [4,5]. Nevertheless, medical schools provide insufficient education about transfusion and previous studies have shown that knowledge of clinicians needs to be improved [6,7].

Various studies have been conducted to assess knowledge and practice about blood transfusion among medical students, nursing staff and clinicians [2,7-10]. In the present study, we aimed to assess the basic knowledge of clinicians regarding transfusion medicine from some aspects through a questionnaire.

Materials and Methods

The present study is a cross-sectional, descriptive study. The subjects were general practitioners, residents, and specialists employed in 14 different departments including pediatrics, anesthesia, infectious disease, general surgery, pediatric surgery, urology, orthopedics, cardiovascular surgery, thoracic surgery, neurosurgery, intensive care units, and emergency medicine in Erzurum Regional Training and Research Hospital (ERTRH), in which 4000-5000 units of packed red cells are used per year. After local ethical committee approval, 150 physicians participated and 101 (67.3%) of them completed the survey.

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The questions were designed based on Turkish National Blood and Blood Products Guideline by two Pediatric Hematology subspecialists and an Anesthesiologist serving in ETRH Transfusion Committee [11]. The questionnaire was checked in terms of validity, perceptibility, and reliability in a pilot study. The questions were designed to assess clinicians' basic knowledge in blood transfusion, clinical use of blood and blood products, and transfusion reactions. The questionnaire contained 20 questions, of which 8 were related to basic knowledge, 7 were related to usage of blood and blood products, and 5 were related to transfusion reactions. Responses were received in an uncoded questionnaire. Each correct answer was awarded with 5 points, while 0 was given for the wrong one. The possible maximum score for the questionnaire was 100.

Data analysis was performed using the Statistical package for the Social Sciences version 18.0 (Chicago, IL, USA). The results are reported as mean $\pm$ standard deviation. Categorical variables were compared using a chi-square test, while the Fischers' exact test was used to compare the percentages between groups. Comparisons between groups were performed using the Kruskal-Wallis one-way analysis of variance (ANOVA), and *t*-test. The correlations between knowledge score and age, medical experience were calculated using the Pearson test. Statistical significance was set as at 0.05.

Results

One hundred and one physicians including general practitioners, resident physicians, and specialists participated in the study. The mean age of study population was 33.1 ± 6 years within a range of 24-61 years. Of the total, 70 (69.3%) were male and 31 (30.7%) were female. The average year in medical practice was 7.3 ± 5.8 with the range of 1-37 years. Of the total, 15 (14.9%) were general practitioner, 20 (19.8%) were resident physician, and 66 (61.7%) were specialist. The doctors were grouped into three groups according to their department categories; internal departments (ID), surgical departments (SD), and emergency medicine (EM). Among them, 37 (36.6%) were in ID, 45 (44.6%) were in SD, and 19 (18.8%) were in EM.

Overall, 52% of the questions were correctly answered. The questions gathering information about basic knowledge, clinical use of blood, and transfusion reactions were correctly answered by 52.7%, 54.7%, and 47.3% of responders, respectively. Thirty-four (33.7%) participants scored higher than 60 points out of 100 points. The average score of total knowledge of participants about transfusion medicine was 52 ± 10 with a range of 20-70 points. The possible maximum score for total knowledge was 100. The average basic knowledge score of participants was found 21.1 ± 4 (range 10-30). The possible maximum score for basic knowledge was 40. The possible maximum score of physicians' awareness in clinical use of blood and blood components was 35 and the average score was 19.1 ± 5.3

(range 5-30). The mean knowledge score of transfusion reactions was 11.8 ± 4 (range 0-20). The possible maximum score for transfusion reactions was 25 points.

The total knowledge scores of ID, SD, and EM groups were 55.7 ± 10.2 (range 20-70), 51.5 ± 8.3 (range 30-65), and 46 ± 10.3 (range 25-65), respectively. The differences between each three groups were significant ($p=0.001$). After two-way comparison, the results indicated that the participants in ID group had higher knowledge scores than participants in SD ($p=0.02$) and EM ($p=0.002$) groups. Also, the participants in SD group had higher knowledge scores than EM group ($p=0.02$). The scores of basic knowledge did not show any significant difference between all the three groups ($p=0.2$). However, the scores of knowledge regarding clinical use of blood and blood components and transfusion reactions were significantly different between all three physicians groups ($p=0.0001$, $p=0.05$, respectively). The knowledge score underwent two-way comparison in the clinical use of blood and blood components showed that participants in ID and SD groups had higher scores than participants in EM group ($p=0.0001$, $p=0.0001$, respectively), while the participants in ID group had higher scores than participants in SD group ($p=0.04$). The results of two-way comparison of transfusion reactions indicated that participants in ID group had higher scores than participants in EM group ($p=0.02$). However, there was no significant difference between ID and SD or between SD and EM groups. In detail, analysis among the departments showed that pediatrics, infectious disease, pediatric surgery, and internal medicine departments had higher scores than other departments. Orthopedics, dermatology, thoracic surgery, and emergency medicine departments had the lowest scores. Table 1 represents the scores of participants regarding knowledge in transfusion medicine according to their departments.

Additionally, the physicians' knowledge scores were compared with each other according to their medical degrees. The average total scores of general practitioners, resident physicians, and specialists in basic knowledge were 21 ± 3.4 (range 15-25), 21.7 ± 4.1 (range 10-25), and 20.9 ± 4.2 (range 10-30), respectively ($p=0.8$). The mean score about clinical use of blood and blood components were 14 ± 5 (range 5-25), 20.2 ± 4.7 (range 5-25), and 20 ± 4.9 (range 10-30), respectively ($p=0.001$). The result of two-way comparison indicated that resident physicians and specialist had higher scores than general practitioners ($p=0.001$, 0.0001 , respectively). The mean score in transfusion reactions was 10 ± 5.3 (range 0-15), 11.2 ± 3.9 (range 5-15), and 12.4 ± 3.5 (range 0-20), respectively ($p=0.04$). Two-way comparison results indicated that specialists had higher scores than general practitioners ($p=0.03$). However, the difference between specialists and resident or between residents and general practitioners was not significant ($p=0.2$, $p=0.4$, respectively). The average total knowledge scores of general practitioners, resident

physicians, and specialists were 45 ± 11.2 (range 25-65), 53.2 ± 8.7 (range 30-65), and 53.2 ± 9.5 (range 20-70), respectively ($p=0.01$). Two-way comparison has showed that specialists and residents had higher scores than general

practitioners ($p=0.004$, $p=0.02$). However, there was no significant difference between specialists and residents ($p=0.9$).

Table 1. Knowledge scores of participants according to their departments.

Knowledge	Departments of Physicians	Physicians		
		n	Knowledge Score*	p
Basic	Internal Departments	37	21.6 ± 4.2 (10-30)	0.2
	Surgical Departments	45	20.3 ± 4 (10-25)	
	Emergency Medicine	19	21.8 ± 3.4 (15-25)	
	Total	107	20.8 ± 4.1 (10-30)	
Clinical aspect of blood use	Internal Departments	37	21.5 ± 4.7 (5-30)	0.0001
	Surgical Departments	45	19.3 ± 4.7 (10-25)	
	Emergency Medicine	19	14.2 ± 4.5 (5-25)	
	Total	107	18.8 ± 5.4 (5-25)	
Transfusion reactions	Internal Departments	37	12.7 ± 3.5 (0-15)	0.05
	Surgical Departments	45	11.8 ± 3.5 (5-20)	
	Emergency Medicine	19	10 ± 5.2 (0-15)	
	Total	107	11.5 ± 4.1 (0-20)	
Total	Internal Departments	37	55.7 ± 10.2 (20-70)	0.001
	Surgical Departments	45	51.5 ± 8.3 (30-65)	
	Emergency Medicine	19	46 ± 10.3 (25-65)	
	Total	107	51.1 ± 10.3 (20-70)	

The knowledge scores were also grouped according to the age groups and medical experience duration of physicians (Table 2 and Table 3). This analysis showed a positive correlation between age and total awareness score in

transfusion medicine ($r=0.324$, $p=0.001$). Also, a positive correlation was shown between medical experience duration of physicians and total knowledge scores ($r=0.314$, $p=0.001$).

Table 2. Knowledge scores of participants in different age groups.

Knowledge	Age groups	n	Knowledge Score*	P
Basic	24-29	31	21.4 ± 3.9 (10-25)	0.5
	30-34	27	20.1 ± 3.2 (15-25)	
	35-39	30	21.3 ± 4.9 (10-25)	
	>40	13	21.5 ± 3.7 (15-30)	
	Total	101	21 ± 4 (10-30)	
Clinical aspect of blood use	24-29	31	16.9 ± 5.4 (5-25)	0.01
	30-34	27	19 ± 5 (10-25)	
	35-39	30	20.8 ± 5.1 (10-30)	
	>40	13	20.7 ± 4.5 (15-25)	
	Total	101	19.1 ± 5.3 (5-30)	
Transfusion reactions	24-29	31	10.3 ± 4.6 (0-15)	0.002
	30-34	27	12.5 ± 2.9 (5-15)	
	35-39	30	11.3 ± 3.9 (0-15)	
	>40	13	15 ± 2.1 (10-20)	
	Total	101	11.8 ± 4 (0-20)	
Total	24-29	31	48.7 ± 10.8 (25-65)	0.04
	30-34	27	51.8 ± 7.7 (30-65)	
	35-39	30	53.3 ± 11.3 (20-70)	
	>40	13	57.3 ± 5.9 (50-70)	
	Total	101	52 ± 10 (20-70)	

Table 3. Knowledge scores of participants according to years in practice

Knowledge	Practicing years	Physicians		
		n	Knowledge Score*	p
Basic	1-5	47	21.2 ± 3.7 (10-25)	0.6
	6-10	31	20.4 ± 4.1 (10-25)	
	11-15	15	22 ± 5.2 (10-30)	
	>16	8	20.6 ± 3.2 (15-25)	
	Total	101	21.0 ± 4 (10-30)	
Clinical aspect of blood use	1-5	47	18 ± 5.4 (5-25)	0.1
	6-10	31	19.3 ± 4.7 (5-25)	
	11-15	15	21 ± 5.7 (10-30)	
	>16	8	21.2 ± 4.4 (15-25)	
	Total	101	19.1 ± 5.3 (5-30)	
Transfusion reactions	1-5	47	11.1 ± 4.2 (0-15)	0.05
	6-10	31	11.6 ± 3.9 (0-15)	
	11-15	15	12.6 ± 3.2 (5-15)	
	>16	8	15 ± 2.6 (10-20)	
	Total	101	11.8 ± 4 (0-20)	
Total	1-5	47	40.3 ± 9.7 (25-65)	0.05
	6-10	31	51.2 ± 10.3 (20-65)	
	11-15	15	55.6 ± 10.9 (30-70)	
	>16	8	56.8 ± 5.9 (50-65)	
	Total	101	52 ± 10 (20-70)	

Discussion

Transfusion medicine practice is based on human interventions. Blood transfusion comprised of a chain, which starts with the preparation of blood components, continues with the storage in blood banks, and ends with usage in the treatment centers. Unfortunately, human errors stand as important risk factors for blood transfusion therapy [12]. Therefore, adequate knowledge and prevention methods regarding indications, requisition, handling, storage, and transfusion of blood components is vital to ensure safe transfusion. Previous studies have shown that lack of knowledge about blood transfusion among health care personnel remained a potential threat to patient safety [2]. In our study, approximately half of the physicians had awareness about transfusion medicine and nearly one third of the participants scored high points (above 60). Training physicians plays a pivotal role in the management of transfusion and its complications. In the literature, there are similar studies. Gharehbaghian et al. [3] reported that specialist in the study population had lower level of knowledge regarding transfusion medicine than expected and improvement in physicians' knowledge led to a decrease in unnecessary transfusion and improves blood sufficiency for patients. In an another study, Arinsburg et al. [10] reported that additional education is needed and in all specialists and the authors focused on establishing the baseline knowledge about transfusion medicine for all physicians from medical students to attending clinicians in practice for more than 30 years. Also, Kasrian et al. [13] reported that resident physicians had lack of knowledge among blood transfusion and the authors highlighted the need for establishment of specific transfusion medicine training programs in medical schools. Similar to our study, Salem-schatz et al. [14] reported that only about one-third of physicians had enough knowledge about correct use of blood and blood products. Our study and other published studies concluded that education in transfusion medicine is very important. It should cover each phase of medical practice, from medical studentship to subspecialty.

In the present study, internal department's participants scored higher scores than surgical departments. Conversely, in the study conducted by O'Brien et al [15], the authors reported that general surgery scored highest score and the score between primary care and surgery departments was not significantly different. On the other hand, in our study, it was shown that, the physicians' knowledge about transfusion medicine was positively correlated with age and duration of experience in medicine. In contrast to our study, Gharehbaghian et al. [2] and Arinsburg et al. [10] reported a negative correlation between experience in medicine and knowledge scores in transfusion medicine. Differently, Kasrian et al. [13] showed any correlation between knowledge scores and experience in medicine. The result of age correlation in our

study may be related with periodical educations in our hospital.

The findings of our study can be used to guide transfusion medicine education in our center and in others. The low scores such as in transfusion reactions help to guide topic areas for development of transfusion medicine education. In general, surgical and emergency medicine departments had lower scores than internal departments. This showed us that the following education programs should be intensified especially in surgical and emergency medicine departments. Also, in this study, general practitioners had similar scores in basic knowledge compared with specialist and residents. But, specialist and residents had higher scores in clinical use of blood and blood components and transfusion reaction than general practitioners. This could be due to experiencing more complicated cases by specialist and residents. And also it showed insufficiency or failing of transfusion medicine education and practice in medical schools, which needs to be planned to be improved. Add to this, periodical and proper education and practice programs for transfusion medicine must be maintained for each phases of medical practice and degrees. In the study Mitchell et al. [16], they surveyed medical faculty, blood bank directors, and laboratory technologists and found that additional transfusion medicine training was necessary for physicians in all levels of medical training. Educational interventions including one-to-one discussions, conferences, and prospective audits have been shown to be effective [17]. Also, computer based education modules could be included [18]. The effects of these interventions may be short-lived, so rotations through the blood bank should be encouraged for specialties such as adult and pediatric hematology and anesthesiology. A combination of strategies is likely most effective especially if employed on recurring basis [10].

In conclusion, our study, which is the first study of physician's knowledge assessment in English literature in Turkey, demonstrated that additional transfusion medicine education is needed in all specialties and at all phases of medical training and degrees. Periodical conferences about transfusion medicine that was designed by hospital transfusion committee and one-to-one interventions to solve problems in each department may be useful to increase abilities in the management of transfusion medicine. By this way, appropriate blood usage and safety of recipients could be maintained.

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