



# Comparison of Knowledge Levels of Nursing Students and Clinical Nurses Related to Hemovigilance: Preliminary Work to Develop a Measurement Tool

## Hemşirelik Öğrencileri ve Klinik Hemşirelerin Hemovijilans ile İlgili Bilgi Düzeylerinin Karşılaştırılması: Ölçüm Aracı Geliştirme Ön Çalışması

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### ABSTRACT

**Objective:** In this study, it was aimed to evaluate the knowledge level of the nursing students and clinical nurses who completed the clinical practice related to hemovigilance.

**Methods:** This research was designed to be comparative and cross-sectional. The measurement tool consists of two parts in the collection of research data. The first part included the demographic variables, and the second part included the “hemovigilance information index” (HII) created by the researcher. The sample included 146 nursing students and 137 clinical nurses working in the hospital for clinical practice, who volunteered to participate in the research. Ethical permissions were obtained from ethics committee to conduct the research.

**Results:** It was concluded that there was a significant relationship between the knowledge about hemovigilance or hemovigilance nursing, thinking that he/she was competent about hemovigilance, the necessity of education related to the subject, the meaning of the term “near miss” related to hemovigilance, knowledge of the transfusion follow-up form, and having knowledge about the reactions that might occur as a result of blood transfusion, and the number of correct answers ( $p<0.05$ ).

**Conclusion:** It was concluded that the knowledge level increased as the clinical experience increased in nursing students. It was determined that clinical nurses had a high level of knowledge of hemovigilance and students were not at the desired level. In-service trainings were found to be sufficient in this regard.

### ÖZ

**Amaç:** Bu çalışmada, klinik ders uygulamasını yapmış hemşirelik öğrencilerinin ve klinik hemşirelerinin hemovijilans ile ilgili bilgi düzeylerinin değerlendirilmesi amaçlanmıştır.

**Yöntemler:** Bu araştırma karşılaştırmalı ve kesitsel olarak tasarlanmıştır. Araştırma verilerinin toplanmasında kullanılan ölçüm aracı iki bölümden oluşmaktadır. Birinci bölüm demografik değişkenleri içermektedir. İkinci bölümü ise araştırmacı tarafından oluşturulmuş “hemovijilans bilgi indeksi” (HBİ) oluşturmaktadır. Klinik uygulama için hastanede çalışan, araştırmaya katılımı gönüllü olan 146 hemşirelik öğrencisi ve 137 klinik hemşiresi ile örneklem tamamlanmıştır. Araştırmanın yapılabilmesi için etik izinler Ankara Yıldırım Beyazıt Üniversitesi Beşeri ve Sosyal Bilimler Etik Kurulu’ndan alınmıştır.

**Bulgular:** Hemovijilans ya da hemovijilans hemşireliği hakkında bilgi durumu, hemovijilans konusu hakkında yeterli olduğunu düşünme, konu ile ilgili eğitim gerekliliği, hemovijilans ile ilgili “ramak kala” teriminin anlamı, transfüzyon izlem formu hakkında bilgi durumu ve kan transfüzyonu sonucunda oluşabilecek reaksiyonlar hakkında bilgi sahibi olma durumu ile doğru sayı arasında anlamlı ilişki olduğu sonucuna ulaşılmıştır ( $p<0,05$ ).

**Sonuç:** Hemşirelik öğrencilerinde klinik deneyim arttıkça bilgi düzeyinin arttığı sonucuna varılmıştır. Klinik hemşirelerin hemovijilans ile ilgili bilgi düzeylerinin yüksek olduğu, öğrencilerde ise istenen düzeyde olmadığı belirlenmiştir. Hizmetiçi eğitimlerin bu konuda yeterli olduğu görülmüştür.

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**Anahtar Sözcükler:** Hemovijilans, hemşire, kan ve kan ürünleri, transfüzyon, hemovijilans hemşireliği

## Introduction

Since taking, storing, transporting and transfusing blood and blood products for therapeutic purposes within the scope of health care services is an important service and it should be carried out in accordance with the standards (1). In our country, the current regulations regarding the blood supply system have been made within the scope of the main directive numbered 2002/98/EC, which is also included in the closing criteria of the 28<sup>th</sup> chapter titled “Protection of the Consumer and the Health of the Consumer” (2). Establishing standardized definitions for adverse events is crucial to achieving the goal of all surveillance systems (3). In this direction, in the main directive, hemovigilance is defined as “a series of surveillance that covers the entire transfusion chain, including the follow-up after blood collection and delivery to the recipient, collecting and evaluating all kinds of undesirable and unexpected effects arising from the use of blood products, preventing these events from occurring and preventing their reoccurrence” (4).

The first official studies on hemovigilance started with the establishment of the blood monitoring system by the “Blood Transfusion Committees” in France in 1991. It was implemented in Canada in 1997 after the Krever report. With the establishment of SHOT (serious hazards of transfusion) in 1997 in England, notifications of hemovigilance began. With the establishment of EHN (European Haemovigilance Network) in 1998, an international analysis platform was formed. The European Blood Directive 2002/98/EC was published on 8 February 2003 (4). In this directive, on October 1, 2005, regulations regarding traceability, serious side effects, and blood institutions quality and standards were made. In 2005, many countries outside of Europe developed their national hemovigilance systems and became involved in this communication network. In 2006, a hemovigilance program was established in the USA with the AABB (American Association of Blood Banks). Since 2009, hemovigilance information exchange has been carried out at the international level with INH (International Hemovigilance Network) (5). Studies were initiated in our country in line with the “EU legislation to adapt”, and the National Hemovigilance Guide was created in 2013 and published in 2016 (2).

The aim of hemovigilance is to determine the cause of unexpected situations in blood transfusion and to prevent their reoccurrence, and as a result, to ensure safe blood transfusion (6). For this purpose, issues such as inadequate blood supply structure, insufficient blood supply, increased need, unequal distribution, weak quality systems, risks of infection transmitted by transfusion, and inappropriate use of blood products are priorities in ensuring blood transfusion safety, especially in healthcare services in developing countries (7). Hemovigilance is an important part of the quality system for blood transfusion. It includes methods for identifying errors, adverse events, and reactions, such as alert systems, complaint investigation,

traceability systems, notification systems, and application controls (6).

“Conditions related to the collection, testing, processing, storage, distribution of blood and blood products that may cause death, permanent and significant disability, hospitalization or lengthening of hospital stay in individuals as a result of transfusion of affected products”. describes serious adverse event (SAE). SAEs that occur in the patient during and after blood and blood product transfusion form the basis of the hemovigilance system and must be reported (8). These are;

- Early SAEs; Hemolysis during transfusion, non-hemolytic fever reaction, rash, erythema, urticaria, anaphylactic shock, bacterial contamination, transfusion-induced acute lung injury.
- Past SAEs; hemolysis, transfusion-associated graft versus host disease, post-transfusion purpura, ALT elevation.
- Virus, parasite or prion contamination.
- Development of alloimmunization against erythrocyte, human leukocyte antigen or platelet antigens. At the same time, undesirable events may occur in the donor (9).
- Hemovigilance is a control system that every healthcare worker responsible for transfusion of blood and blood products should know. Nurses are active members of this system. In the “National Guide to Hemovigilance” published in 2016, the roles of nurses in hemovigilance are clearly stated. These roles are;
- Every personnel with duties and responsibilities related to transfusion can make notifications about hemovigilance. The hemovigilance officers of the relevant clinics and the hospital hemovigilance nurse are responsible for making these notifications appropriately.
- He/she checks whether the forms submitted to him are filled in appropriately and completely, and reports the situation to the hemovigilance committee.
- In case of a problem with transfusion, if he/she receives information from the responsible doctor that the problem is due to non-transfusion reasons, he/she notifies the hemovigilance committee.
- The nurse or doctor working in the relevant clinic is responsible for the hemovigilance clinic. He/she is responsible for transmitting the Transfusion Monitoring Form of the patients and other data requested for the sustainability of the hemovigilance system to the Hemovigilance Nurse.
- Organizes trainings.
- Informs the hemovigilance committee about the activities (2).

## Problem Definition

Definitions are available for a better understanding of hemovigilance. These are adverse event, serious adverse event, serious uneventful transfusion error, incorrect transfusion, near miss, adverse reaction, serious adverse reaction, trace-back, donor-to-patient tracking (Look-back), recall, return, and attribution (2). Clear definitions of the concept of hemovigilance are important for both reporters and those who will analyze reports. Reporting adverse events as soon as possible is essential for quality assurance. SAEs should be reported promptly. Hemovigilance systems enable rapid assessment of serious reports by the hemovigilance task group and additional information requested shortly after reporting. The reporter sometimes needs advice on root cause analyzes and corrective and preventive measures. Health professionals in the hemovigilance committee can provide advice and assistance (10).

It is clear that hemovigilance systems and their staff can help collect and analyze the necessary data. Training of hospital transfusion committees, transfusion workers, clinicians and laboratory personnel plays an important role in controlling the hemovigilance systems of transfusion units. In summary, optimal use of the hemovigilance system, consensus, common criteria, analysis and regulatory measures are required for the periodic evaluation of hemovigilance studies. At the same time, these studies can support developments (11).

Due to the recent history of hemovigilance, there is a lack of information among healthcare professionals (12). In the healthcare field, the term hemovigilance focuses on transfusion. However, the transfusion part constitutes a part of the hemovigilance (4). Studies in the literature focused on transfusion. Studies involving all components of hemovigilance are insufficient. For this reason, it is seen that the level of knowledge of healthcare workers in studies on hemovigilance is compared with studies on transfusion (13). Studies emphasize that the knowledge levels of both nurses and nursing students about hemovigilance are insufficient (13-15). Similar results are observed in studies conducted with physician groups (16). For this reason, effective training of healthcare professionals on hemovigilance during the clinical or school period is necessary for quality systems, patient safety, and reduction of malpractices. A structured measurement tool is needed to monitor the process, to return when necessary, and to measure the success of the trainings. In this study, it was aimed to determine the knowledge levels of nursing students and clinical nurses practicing clinical courses for knowledge, skills and experience, and to create an applicable semi-structured scale. Hemovigilance is accepted as a new term in the world and in our country. For this reason, it has been seen that the literature on this subject is not sufficient. In this direction, our study question was determined as follows: "How is the knowledge level of nursing students and clinical nurses about hemovigilance and related concepts?"

## Method

### Research Type

In this study, a comparative, cross-sectional study was conducted in order to evaluate the knowledge levels of nursing students and clinical nurses about hemovigilance who practiced clinical courses.

### Universe Sample Selection

The population of the research consisted of all nursing students studying at a state university in Ankara and all clinical nurses working in a public hospital. In the study, 146 nursing students and 137 clinical nurses who agreed to participate in the study on a voluntary basis were included in the study without choosing a sample.

### Data collection Tool

**Demographic Data Form:** The data form created by the researchers was used. In this form; age, gender, presence of smart device, duration of daily use of smart device, monthly internet usage quota, channels related to occupation, information status about hemovigilance, where this information was obtained, and the importance of having sufficient level of knowledge about hemovigilance and getting training on this subject were recorded. In the form, nursing students were asked what grade they were in, and nurses were asked in which clinic they worked.

**Hemovigilance Information Index (HBI):** It was created by the researchers in line with the literature. Seven of the questions (1, 2, 12, 13, 15, 17, 20) were asked to measure attitude. The remaining questions were directed to the students in order to measure the level of knowledge. The answers to these questions, which we directed to determine the level of knowledge, were evaluated.

**Obtaining expert opinion/content validity index (CVI):** Items created for the HBI were examined by a total of 10 experts in the field of nursing. CVI values of the expressions for the created knowledge index were found to be between 0.80 and 1.00, and the average CVI value was found to be 0.92. In line with expert opinions; some of the items that were not understood, had similar meanings, contained more than one judgment and were stated not to measure attitude were corrected, and some items were removed completely. The form took its final form after the expert opinions.

### Application

Data collection tools were applied at the end of a suitable course determined according to the students' curriculum and it took approximately 20 minutes to collect the data for each form. It was applied to the nurses in a face-to-face manner during working hours after obtaining the institutional permissions. It took about 10 minutes to fill out the questionnaire.

### Ethical Aspects of Research

In order to conduct the research, permission was obtained from the institution where the study was conducted and the research

was approved by the Ankara Yıldırım Beyazıt University Ethics Committee (29.05.2019/decision no: 51). Data were collected in accordance with the Declaration of Helsinki. Participants were informed about the purpose of the research, its content and the way the data were collected. Participants were given confidence that their participation in the study was voluntary, their information would be kept confidential, and that they could withdraw from the study at any time.

### Evaluation of Data

The IBM SPSS Statistics 22.0 (IBM Corp. Released 2014. IBM SPSS Statistics for Windows, Version 22.0. Armonk, NY: IBM Corp.) was used to evaluate the data. Non-parametric tests were used in statistical analysis since the data did not fit the normal distribution. Percentage, frequency, mean, Kruskal-Wallis H, Mann-Whitney U, t-test and chi-square statistical analyzes were used to evaluate the data. The results were evaluated within the 95% confidence interval. Statistical significance level was accepted as  $p < 0.05$ .

### Results

The ages of the nurses participating in the study ranged from 20-54, with an average of  $32.17 \pm 8.43$ . The demographic data of the individuals belonging to the study are given in Table 1. Women in both groups constituted the majority of the participants in the study. Of the students 32.19% were first year students, and 43.06% of the nurses worked in internal medicine units. Most of the participants in both groups used smart devices for 2-4 hours, and the database they used mostly for professional research was Google scholar. While the monthly internet usage quota of the students was 4-6 gb (Giga bytes), the nurses used 10 gb and above. Nurses had more knowledge about hemovigilance or hemovigilance nursing, while students accessed this information from the internet, nurses obtained from in-service training. Both groups stated that the students did not have sufficient knowledge about hemovigilance and that education on this subject was important. The correct numbers of clinical nurses and student nurses regarding hemovigilance are given in Table 2.

Looking at the nursing students, it was determined that there was a significant difference between the class variable and the number of correct answers. It was determined as a result of statistical tests that this difference was due to the fact that the correct numbers of 1st year students were lower than those of 3<sup>rd</sup> and 4<sup>th</sup> grade students. It was concluded that there was a significant relationship between the knowledge of hemovigilance or hemovigilance nursing, thinking that he/she had sufficient knowledge about hemovigilance, the need for education on the subject, the meaning of the term “near miss” about hemovigilance, the state of knowledge about the transfusion follow-up form, and the late and early reactions that might occur as a result of blood transfusion, and the number of correct answers ( $p < 0.05$ ).

When the clinical nurses were examined, it was determined that there was a significant difference between the units they worked in and the number of correct answers. It was determined as a result of statistical tests that this difference was due to the fact that the

correct number of emergency service workers was higher than surgical units and intensive care clinics. It was concluded that there was a significant relationship between the state of having information about hemovigilance or hemovigilance nursing, thinking that he/she was competent about hemovigilance, self-sufficiency about blood transfusion, the meaning of the term “near miss” about hemovigilance, knowledge about the transfusion follow-up form, and late and early reactions that might occur as a result of blood transfusion, and the number of correct answers ( $p < 0.05$ ).

### Discussion

Individuals who agreed to participate in our study were examined in two groups as nursing students and clinical nurses. Nursing students made up 51.59% of the sample, while clinical nurses made up 48.41% of the sample. Students participating in the study covered all classes, while nurses included internal medicine units (43.06%), surgical units (30.66%), intensive care units (13.87%) and emergency services (12.41%). In the study conducted by Jimenez-Marco et al. on hemovigilance with nurses, they reported that they worked in surgery (27.27%), internal medicine (22.04%), emergency service (16.8%), blood bank (11.85%) and intensive care (11.29%) clinics (17). In another study on hemovigilance nursing by Gün et al., the nurses were reported to work in intensive care unit (35.0%), emergency room (6.9%), internal medicine clinic (6.9%), pediatrics clinic (7.6%), gynecology clinic (6.3%), general surgery clinic (5.8%) and laboratory (7.9%) (13).

Nursing students' knowledge levels were evaluated on the basis of the number of correct numbers and it was found that there were minimum 0 and maximum 13 correct answers and the mean knowledge level was  $4.00 \pm 3.72$ . It was found that the number of correct answers regarding the knowledge level of the clinical nurses was at least 2 and the maximum was 13, and the average of correct answers was  $10.36 \pm 2.00$ . It was determined that there was a high difference in the averages of the correct answers of nurses compared to nursing students. This difference led us to conclude that in-service training in the hospital was effective, while nursing students were lacking in training on this subject. It was determined that 64.23% of the nurses within the scope of the study received hemovigilance training in in-service training.

In a study on hemovigilance, the knowledge level of 135 health personnel was evaluated out of 24 points, and it was reported that all participants got  $16.30 \pm 3.16$  points. They concluded that the highest score among the groups belonged to nurses and the lowest score belonged to nursing students (14). In another study, they reported that the scores of the group they worked with (nurse, doctor, other health worker) varied between 1 and 19 (out of 20) and their average was  $9.7 \pm 4.2$ . In the same study, they found that the mean knowledge of nurses was  $10.0 \pm 4.2$  (13). In another study on blood transfusion with midwives in a maternity hospital, the rate of correct answers was found to be between 5% and 98%, depending on the questions (18). In the study conducted by Shamshirian et al. (15) with nursing students, the results of the study indicated that only 25.9% of nursing

**Table 1.** Comparison of demographic data distributions of nursing students and clinical nurses

| Variables  | Groups                 | Nursing student |                | Clinical nurse |                |
|--|------------------------|-----------------|----------------|----------------|----------------|
|  |                        | Sample (n=146)  | Percentage (%) | Sample (n=137) | Percentage (%) |
| Gender   | Female                 | 131             | 89.73          | 119            | 86.86          |
|  | Male                   | 15              | 10.27          | 18             | 13.14          |
| Grade  | 1 <sup>st</sup> grade  | 47              | 32.19          | -              | -              |
|  | 2 <sup>nd</sup> grade  | 40              | 27.40          | -              | -              |
|  | 3 <sup>rd</sup> grade  | 35              | 23.97          | -              | -              |
|  | 4 <sup>th</sup> grade  | 24              | 16.44          | -              | -              |
| Working unit   | Surgery unit           | -               | -              | 42             | 30.66          |
|  | Internal medicine unit | -               | -              | 59             | 43.06          |
|  | Intensive care unit    | -               | -              | 19             | 13.87          |
|  | Emergency room         | -               | -              | 17             | 12.41          |
| Daily smart device usage   | 0-2 hours              | 9               | 6.16           | 31             | 22.63          |
|  | 2-4 hours              | 46              | 31.51          | 41             | 29.92          |
|  | 4-6 hours              | 41              | 28.08          | 29             | 21.17          |
|  | 6-8 hours              | 34              | 23.29          | 25             | 18.25          |
|  | 8-10 hours             | 11              | 7.53           | 11             | 8.03           |
|  | 10 hours or above      | 5               | 3.42           | 0              | 0              |
| Monthly internet usage quota   | 0-2 gb                 | 6               | 4.11           | 12             | 8.76           |
|  | 2-4 gb                 | 30              | 20.55          | 12             | 8.76           |
|  | 4-6 gb                 | 33              | 22.60          | 30             | 21.90          |
|  | 6-8 gb                 | 29              | 19.86          | 17             | 12.41          |
|  | 8-10 gb                | 18              | 12.33          | 30             | 21.90          |
|  | 10 gb or above         | 30              | 20.55          | 36             | 26.27          |
| Occupational research database   | Google Scholar         | 72              | 49.32          | 82             | 59.85          |
|  | Youtube Videos         | 15              | 10.27          | 37             | 27.00          |
|  | Pubmed-Medline         | 8               | 5.48           | 20             | 14.60          |
|  | Any Website            | 51              | 34.93          | 46             | 33.58          |
|  | Other                  | 0               | 0              | 17             | 12.41          |
| Do you know about hemovigilance or hemovigilance nursing?                        | Yes                    | 28              | 19.18          | 131            | 95.62          |
|  | No                     | 118             | 80.82          | 6              | 4.38           |
| Where did you get this information?  | Internet               | 19              | 13.01          | 30             | 21.90          |
|  | Undergraduate courses  | 8               | 5.48           | 50             | 36.50          |
|  | TV                     | 0               | 0              | 2              | 1.46           |
|  | Friend shares          | 0               | 0              | 12             | 8.76           |
|  | In-service training    | 0               | 0              | 88             | 64.23          |
|  | Other                  | 6               | 4.11           | 4              | 2.92           |
| Do you think you have enough knowledge about hemovigilance?                      | Yes                    | 3               | 2.05           | 75             | 54.74          |
|  | No                     | 143             | 97.95          | 62             | 45.26          |
| Do you think it is necessary and important to receive training on hemovigilance? | Yes                    | 127             | 86.99          | 132            | 96.35          |
|  | No                     | 19              | 13.01          | 5              | 3.65           |

**Table 2.** Evaluation of knowledge attitudes of nursing students and clinical nurses

|                        | The average of correct answers | The number of correct answers min-max |
|------------------------|--------------------------------|---------------------------------------|
| <b>Nursing student</b> | 4.00±3.72                      | 0-13                                  |
| <b>Clinical nurse</b>  | 10.36±2.00                     | 2-13                                  |

Min: Minimum, max: Maximum

students had knowledge and awareness about blood transfusion. In another study, care standards for hemovigilance were evaluated instead of knowledge level, and as a result, neonatal clinics reported that the compliance rate of nurses working in neonatal intensive care units was 56% (19).

It was determined that there was a statistically significant difference between the classes and knowledge levels of nursing students ( $p=0.049$ ). As a result of the statistics, it was determined that the difference was due to the fact that the knowledge levels of the 3rd and 4th grade students were higher than the other grades. In our study, it was found that there was a statistically significant difference between the unit where the clinical nurses worked and their level of knowledge ( $p=0.030$ ). As a result of the statistics, it was determined that the knowledge levels of the nurses working in the intensive care unit were higher than the other units. In the study of Gün et al. (13), it was found that there was no significant difference between the clinics where the nurses worked and the level of knowledge of hemovigilance. In a study conducted with a group of physicians, they reported that those working in the anesthesia department received high scores following those working in internal medicine clinic (16). In a study by Rudrappan, it was found that there was no relationship between the clinical experience of the nurses and their knowledge and practices (20). We think that the fact that students take more active roles in the clinic with the following years has a positive effect on their level of knowledge. In the findings, the distribution of in-service training according to the units was examined. As a result, it was determined that only 36.84% ( $n=7$ ) of the nurses working in the intensive care unit participated in in-service training. It was determined that more than half of the nurses working in other clinics participated in hemovigilance training. It was thought that the result was due to the low rate of participation in in-service training on hemovigilance.

In our study, it was concluded that there was a significant difference in both groups between those who answered “yes” to the question and those who answered “no” to the question “Do you have information about hemovigilance or hemovigilance nursing?”. The percentage of those who answered this question was 19.18% among nursing students and 95.62% among clinical nurses. According to research sources, it was determined that nursing students obtained the most information about hemovigilance from the internet environment, and clinical nurses obtained the most from in-service training. In a study, 55.55% of the doctors and 9.09% of the nurses who participated in the study reported that they knew the term hemovigilance (21). In a study by Aneke et al., they reported that the majority of the participants were not aware of the transplant units or committees for hemovigilance (22). In the literature, when the nurses were questioned whether they participated in training programs such as in-service training and seminars related to hemovigilance, they stated that they answered “yes” at low rates such as 9.24% and 10% (23, 24). In the study of Jimenez-Marco et al. (17), 76.03% of the nurses stated that they did not receive any formal training on transfusion before starting to work at the workplace, and 83.75% of the nurses did not receive in-service training during their work in their hospitals. Unlike the literature, the clinical

nurses participating in our study received in-service training on the subject as 64.23%. In our study, the insufficient knowledge of nursing students on this subject makes us think that it is not included in the core curriculum followed in undergraduate nursing programs in our country. Considering that student nurses use the most internet resources for hemovigilance information, it is thought that they can obtain insufficient, incomplete and incorrect information from the internet.

The question “Do you think you have enough knowledge about the subject?” was directed to the participants of the study. It was found that the knowledge levels of the group who answered “yes” to the questions “I know what “near miss” means from hemovigilance terms” and “I have information about the transfusion monitoring form” were statistically significantly different in both groups ( $p<0.05$ ). It was determined that the knowledge level of the group who answered “yes” was higher. In line with this result, it is thought that the group who thinks that they are inadequate on the subject can increase their awareness on this issue. At the same time, with this result, it has been determined that individuals can correctly identify their deficiencies in terms of knowledge and are aware of these deficiencies. In a study where nurses were asked a different question, “Do you think the reactions are dangerous?” 70% of the nurses answered “yes” to the question (25). In the study of Jimenez-Marco et al., it was found that nurses who received transfusion training felt that they had a better level of knowledge than those who did not receive training (17). It was found that the level of knowledge of the nurses who answered “yes” to the statement “I don’t see myself enough about blood transfusion.” was lower than the others. In line with the literature, this result suggests that the knowledge level of nurses affects their self-confidence in practice.

In our study, it was questioned whether education about hemovigilance was necessary. Of the students 86.99% and 96.35% of the nurses thought that education was necessary and important. At the same time, it was found that there was a significant difference between the knowledge levels of nursing students who answered “yes” to this question and those who answered “no” ( $p= 0.004$ ). There was no significant difference in the nurses. In a study conducted with midwives, their knowledge of blood transfusion was questioned, and 99.2% of midwives reported that education was necessary (18). In another study, 63% of nurses reported that they had participated in a blood bank training program before (20). In the studies in the literature, the activities of the education on the level of knowledge were evaluated by making a pre- and post-education evaluation, and they found that the trainings were positively effective (13, 26). Raising awareness about hemovigilance through in-service training will lead to improved reporting of transfusion reactions (23). Most of the graduates have a positive attitude towards transfusion reaction reporting, but their knowledge of the hemovigilance program is low and the reporting procedure is less in recent graduates (24). Reporting and data collection should not be the sole purpose of the hemovigilance system, and the use of hemovigilance data sources in practice may be beneficial to increase transfusion safety (17).

**Table 3.** Statistics of nursing students and clinical nurses' mean of various variables and correct answers

| Variables  | Groups                 | Nursing student<br>The average of correct answers   | Clinical nurse<br>The average of correct answers |
|--|------------------------|---|--|
| Gender   | Female                 | 3.58±3.22   | 10.38±1.81                                       |
|  | Male                   | 4.47±4.10<br>Z: -0.738; p= 0.460                    | 10.22±3.04<br>t: 0.307; p=0.759                  |
| Grade  | 1 <sup>st</sup> grade  | 2.68±2.87   | -  |
|  | 2 <sup>nd</sup> grade  | 3.88±3.24   |  |
|  | 3 <sup>rd</sup> grade  | 4.51±3.74   |  |
|  | 4 <sup>th</sup> grade  | 4.04±3.31<br><b>x<sup>2</sup>: 7.818; p= 0.049</b>  |  |
| Working unit   | Surgery unit           | -   | 9.95±1.82  |
|  | Internal medicine unit |   | 10.73±1.78                                       |
|  | Intensive care unit    |   | 9.53±2.97  |
|  | Emergency room         |   | 11.00±1.37<br><b>F: 3.068; p=0.030</b>           |
| Daily smart device usage                                     | 0-2 hours              | 2.89±3.86   | 10.94±1.61                                       |
|  | 2-4 hours              | 3.28±2.86   | 10.34±2.25                                       |
|  | 4-6 hours              | 4.10±3.82   | 10.00±2.17                                       |
|  | 6-8 hours              | 3.94±3.22   | 10.16±1.67                                       |
|  | 8-10 hours             | 3.54±3.30   | 10.18±2.18                                       |
|  | 10 hours or above      | 3.60±3.44<br>x <sup>2</sup> : 1.506; p= 0.912       | -<br>x <sup>2</sup> : 4.456; p= 0.348            |
| Monthly internet usage quota                                 | 0-2 gb                 | 3.17±3.60   | 10.17±1.80                                       |
|  | 2-4 gb                 | 3.80±3.20   | 10.67±1.15                                       |
|  | 4-6 gb                 | 4.10±3.28   | 9.93±2.35  |
|  | 6-8 gb                 | 4.72±3.57   | 10.58±1.62                                       |
|  | 8-10 gb                | 2.11±2.30   | 10.50±2.11                                       |
|  | 10 gb or above         | 3.10±3.45<br>x <sup>2</sup> : 9.222; p= 0.101       | 10.44±2.09<br>x <sup>2</sup> : 1.917; p= 0.860   |
| Do you know about hemovigilance or hemovigilance nursing?    | Yes                    | 7.82±2.60   | 10.67±1.56                                       |
|  | No                     | 2.69±2.64<br><b>Z: -6.594; p= 0.000</b>             | 6.82±2.99<br><b>Z: -4.154; p= 0.000</b>          |
| Do you think you have enough knowledge about the subject?    | Yes                    | 9.00±1.73   | 10.89±1.48                                       |
|  | No                     | 3.56±3.25<br><b>Z: -2.433; p= 0.015</b>             | 9.71±2.34<br><b>t: 3.598; p= 0.000</b>           |
| Is training required on the subject?                         | Yes                    | 3.95±3.35   | 10.38±1.90                                       |
|  | No                     | 1.79±2.39<br><b>Z: -2.904; p= 0.004</b>             | 9.80±4.15<br>Z: -0.310; p=0.756                  |
| I do not consider myself sufficient about blood transfusion. | Yes                    | 3.87±3.27   | 9.70±2.36  |
|  | No                     | 3.90±3.52   | 10.75±1.73                                       |
|  | Not sure               | 3.13±3.28<br>x <sup>2</sup> : 2.152; p= 0.341       | 10.21±1.97<br><b>F: 3.575; p= 0.031</b>          |
| I know what it means to miss the hemovigilance terms.        | Yes                    | 6.71±3.69   | 10.86±1.65                                       |
|  | No                     | 4.87±3.66   | 9.79±2.46  |
|  | Not sure               | 2.35±2.81<br><b>x<sup>2</sup>: 17.892; p= 0.000</b> | 9.68±1.94<br><b>F: 5.676; p= 0.004</b>           |

**Table 3.** Continued

| Variables  | Groups   | Nursing student                        | Clinical nurse                  |
|--|----------|--|---------------------------------|
|  |          | The average of correct answers         | The average of correct answers  |
| I have information about the transfusion follow-up form.   | Yes      | 4.88±3.27                              | 10.48±1.84                      |
|  | No       | 3.77±3.46                              | -                               |
|  | Not sure | 1.83±2.37                              | 8.38±3.29                       |
|  |          | <b>x<sup>2</sup>: 30.743; p= 0.000</b> | <b>Z: -1.970; p= 0.049</b>      |
| I know what are the early and delayed reactions that may occur as a result of blood transfusion. | Yes      | 4.73±3.41                              | 10.41±1.97                      |
|  | No       | 3.23±3.14                              | 8.00±5.20                       |
|  | Not sure | 2.40±2.75                              | 10.41±1.44                      |
|  |          | <b>x<sup>2</sup>: 17.753; p= 0.000</b> | x <sup>2</sup> : 0.985; p=0.611 |

Z: Mann-Whitney U, F: One-way ANOVA, t: Independent groups t-test, x<sup>2</sup>: Kruskal-Wallis H

### Study Limitations

The groups compared in our study were studied as a single center in their own universe. The universe was accepted as a sample and all individuals who voluntarily agreed to participate in the habituation were included in the study. Therefore, power analysis was not performed. The results could be generalized to the sample group.

### Conclusion

It was determined that clinical nurses had a high level of knowledge about hemovigilance, while students were not at the desired level. It was concluded that as the clinical experience of nursing students increased, the level of knowledge increased. The database in which both groups made researches was determined as any website after Google Scholar. Due to the low level of hemovigilance knowledge of nursing students, necessary studies can be done to include this subject in the nursing education curriculum. It is recommended to support nurses with continuous training after graduation in terms of the directly proportional development of behavior, attitude and clinical skills. It is thought that in-service trainings are functional in this regard, and that their awareness and knowledge about hemovigilance will increase by working integrated with the clinic and including nursing students in in-service training. The applicability of the HII is found to be effective, but it is recommended to update it in terms of measurement and evaluation and develop a fully structured scale in similar groups.

### Ethics

**Ethics Committee Approval:** In order to conduct the research, permission was obtained from the institution where the study was conducted and the research was approved by the Ankara Yıldırım Beyazıt University Ethics Committee (29.05.2019/ decision no: 51).

**Informed Consent:** Data were collected in accordance with the Declaration of Helsinki. Participants were informed about the purpose of the research, its content and the way the data were collected.

**Peer-review:** Externally peer reviewed.

### Authorship Contributions

Concept: A.K., E.T., Design: A.K., E.T., Data Collection or Processing: A.K., E.T., Analysis or Interpretation: A.K., E.T., Literature Search: A.K., E.T., Writing: A.K., E.T.

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### References

1. Transfüzyon öncesi uygunluk testleri. In: Uluhan R, Berkem R, Emekdaş G, Bayık M, editors. Temel Kurs kitabı. 1st ed. İstanbul, Şan Ofset. 2010:76-84.
2. T.C. Sağlık Bakanlığı. Ulusal Hemovijilans Rehberi. 2016:6.
3. Whitaker BI, Belov A, Anderson SA. Progress in US hemovigilance: can we still learn from others?. *Transfusion* 2019;59:433-6.
4. European Union. Directive 2002/98/EC of the European Parliament and of the Council of 27 January 2003 setting standards of quality and safety for the collection, testing, processing, storage and distribution of human blood and blood components and amending Directive 2001/83/EC. *Official Journal of the European Union* 2003;33:30.
5. Atilla E, Arslan Ö. Hemovijilans. *Türkiye Klinikleri Hematology-Special Topics* 2013;6:7-15.
6. De Vries RRP, Faber JC, Strengers PFW, Board of the International Haemovigilance Network. Haemovigilance: an effective tool for improving transfusion practice. *Vox Sanguinis* 2011;100:60-7.
7. Chew E, Benjamin RJ, McDonald CP, Wiersum-Osselton JC, Wood EM, International Society of Blood Transfusion Working Parties on Transfusion-Transmitted Infectious Diseases (Bacterial subgroup) and Haemovigilance. International survey on definitions and current practices in prevention, diagnosis, management and reporting of transfusion-transmitted bacterial infections. *ISBT Science Series* 2015;10:31-40.
8. T.C. Erciyes Üniversitesi Sağlık Uygulama ve Araştırma Merkezi. Hemovijilans Kapsamında Kan ve Kan Ürünlerinin Transfüzyon Endikasyonları ve Transfüzyon Reaksiyonlarına Yaklaşım Kılavuzu. Temmuz 2017.

9. T.C. Sağlık Bakanlığı. Ulusal kan ve kan ürünleri rehberi. Türkiye Kan Merkezleri ve Transfüzyon Derneği, Çesa Basım Hizmetleri 2011;1-329.
10. Steinsvåg CT, Espinosa A, Flesland Ø. Eight years with haemovigilance in Norway. What have we learnt?. *Transfusion and Apheresis Science* 2013;49:548-52.
11. Reesink HW, Panzer S, Gonzalez CA, Lena N, Muntaabski P, Gimbatti S, et al. Haemovigilance for the optimal use of blood products in the hospital. *Vox sanguinis* 2010;3:278-93.
12. Bouchrim SAA, Haddad A, Assi TB, Oriol P, Guyotat D, Bois C, et al. Residents' knowledge in transfusion medicine and educational programs: A pilot study. *Transfusion Clinique et Biologique* 2020;27:18-24.
13. Gün R, Öz S, Altındış S, Uyutan Y, Köroğlu M, Altındış M. Hemovijilans hemşireliği ve transfüzyon güvenliğine katkısı. *Türk Hij Den Biyol Derg* 2019;76:405-14.
14. Jafari E, Koohestani S, Ghaziizade M. Knowledge among health care workers about hemovigilance in hospitals of Kerman in 2018. *Scientific Journal of Iran Blood Transfus Organ* 2019;16:280-8.
15. Shamshirian A, Alirahimi Z, Ghorbanpour A, Motamen S, Maadi N, Zamani P, et al. Knowledge and Awareness of Nursing Students on Blood Transfusion. *International Journal of Medical Investigation* 2017;6:129-34.
16. Philip J, Kumar S, Chatterjee T, Mallhi RS. Knowledge of transfusion medicine among resident doctors in clinical specialties: a cross-sectional study from a tertiary care centre. *Indian Journal of Hematology and Blood Transfusion* 2015;31:374-7.
17. Jimenez-Marco T, Clemente-Marin G, Girona-Llobera E, Sedeño M, Muncunill J. A lesson to learn from Hemovigilance: The impact of nurses' transfusion practice on mistransfusion. *Transfusion and Apheresis Science* 2012;47:49-55.
18. Grolleau N, Lietard C, Lebdiri B, Le CN. Evaluation of midwives transfusion knowledge in Brittany public and private maternities, 2014. *Transfusion clinique et biologique: journal de la Societe francaise de transfusion sanguine* 2015;22(3):318-25.
19. Tajalli S, Nourian M, Rassouli M, Baghestani AR. Clinical assessment of nursing care regarding hemovigilance in neonatal wards and neonatal intensive care units in selected hospitals affiliated to Shahid Beheshti University of Medical Sciences (2013-2014). *Iranian Red Crescent Medical Journal* 2015;17.
20. Rudrappan RB. Evaluating the knowledge and practices of nurses and paramedics in blood transfusion services—A survey in the states of Tamil Nadu and Pondicherry, India. *Journal of education and health promotion* 2019;8.
21. Sireesha N, Reddy KP, Sravani J, Rani S, Rathinavelu M. Assessment of Healthcare Professional Awareness towards Haemovigilance (HvPI) Programme of India in South India. *IOSR Journal of Pharmacy and Biological Sciences* 2015;10:13-7.
22. Aneke JC, Ezeama N, Okocha CE, Onyeyili AN, Onah CE, Ibeh NC, et al. Knowledge, attitude and practice of haemovigilance among healthcare professionals in a Nigerian Tertiary Hospital. *The Egyptian Journal of Haematology* 2017;42:108.
23. Shivgunde PP, Besekar SM, Bhojwani KM, Bhojwani DG. Knowledge, attitude and practice of haemovigilance amongst healthcare professionals in Nashik, Maharashtra, India. *International Journal of Basic & Clinical Pharmacology* 2018;7:986.
24. HimaBindu K, Sudha J. Knowledge, attitude, perception of Hemovigilance among post-graduates in tertiary care hospital, King George Hospital, Visakhapatnam, Andhra Pradesh. *IOSR Journal of Dental and Medical Sciences* 2020;19:28-31.
25. Roshi, Tandon VR. Knowledge, attitude and practices about hemovigilance among practitioners: a cross-sectional study. *International journal of basic and clinical pharmacology* 2019;8:2553-6.
26. Mirzaee MS, Karimi M. The Assessment of the Effect of the Haemovigilance Education by the Conceptual Map on the Knowledge of Nursing Students. *Pajouhan Scientific Journal* 2018;17:51-6.