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Knowledge and Attitudes of Faculty of Health Sciences Students towards Hematopoietic Stem Cell Donation

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ABSTRACT

Background: Hematopoietic stem cell transplantation is a life-saving treatment method for numerous diseases. This study aims to determine the knowledge and attitudes of Faculty of Health Sciences students in a university towards hematopoietic stem cell donation and descriptive cross-sectional design.

Materials and Methods: The study participants consisted of students studying at the Faculty of Health Sciences of a university in western Turkey. A total of 345 students were available to complete a survey. The data were collected online through the Google Form. Data were analyzed using the SPSS 25 program (IBM Corp.; Armonk, NY, USA). Moreover, the Chi-square test, independent samples t-test, and one-way ANOVA were used in this study.

Results: 25.2% were registered at "The Turkish Stem Cell Coordination Center", and 89.1% of the unregistered ones wanted to be a stem cell donor. The university students had a moderate level of knowledge about stem cell donation. While the participants were more knowledgeable about stem cell collection with the peripheral method, they had poor knowledge of stem cell collection methods from the bone marrow and stem cell donation processes. There was a significant correlation between the students' level of knowledge about hematopoietic stem cell donation and their university year, occupation, age, graduate school, and parents' educational level ($p<0.05$).

Conclusion: In this study, it was found that the university students had insufficient knowledge on hematopoietic stem cell donation and their intention to donate stem cells was high. Holding training sessions, seminars, and conferences for university students as future health professionals to raise their awareness of stem cell donation is recommended. The fact that new-generation health professionals are sensitive and educated about stem cell donation can contribute to increasing stem cell donations in society.

Keywords: Hematopoietic stem cell; Donation; Knowledge; Attitude; University students

INTRODUCTION

Stem cells are undifferentiated human cells with unique abilities that are able to constantly renew themselves, turn into many different cell types in the body and in the laboratory environment under proper circumstances, grow infinitely, and replenish damaged tissues[1]. Hematopoietic stem cell transplantation (HSCT) is a life-saving treatment method for numerous diseases[2]. HSCT can be widely used in the treatment of certain types of cancer such as leukemia and lymphoma, in blood disorders such as sickle cell anemia, and many diseases such as genetic diseases and autoimmune diseases[3]. Sources of blood stem cells are umbilical cord, peripheral blood and bone marrow[4]. Peripheral blood stem cell donation, a simpler and

less invasive method, has replaced bone marrow donation in approximately 3/4 of the cases[5]. The most difficult part in the stem cell transplantation process is finding a suitable donor. In hematopoietic stem cell transplants, many individuals must be screened to determine the compatibility between recipient and donor. Therefore, for the treatment of patients awaiting transplantation, a large number of volunteers who agree to become bone marrow or peripheral stem cell donors are needed. For this, the tissue type must be determined from the blood samples taken from volunteer donors and stored in a pool, and if there is a patient compatible with that tissue type, the donor must be contacted again and the transplantation process must be carried out, and these processes require good organization. Data (October 2022) of the World Marrow Donor Association (WMDA) indicated that there are 39.617.440 donors and 803.531 umbilical cord blood units registered in 55 member countries[6]. The "Turkish Stem Cell Coordination Center" (TURKOK) was established in 2015 to provide a large pool of volunteer unrelated stem cell donors in Turkey. According to TURKOK data, it is reported that while the number of HSC donor candidates reached 850 thousand in 2022, 15 thousand matches occurred. There are more than three thousand patients awaiting stem cell transplantation annually in Turkey; therefore, a large number of volunteer stem cell donors are needed[7]. Volunteer donors are unlikely to be found in most of developing countries due to inadequate or non-existent national donor programs[8].

In order to achieve a successful transplant, it is important for the genetic coding (DNA) of the donor is as similar as possible to the genetic coding of the patient. For HSCT, the chance of finding a suitable donor within the family varies between 25-30%. It is considered that the best donor for full human leukocyte antigen (HLA) compliance is sibling. For other patients whose family members do not match, an unrelated volunteer donor is needed[9]. Balcı et al., stated that 74% of the patients were compatible with siblings, 10% with father and 12% with mother in Turkey[10]. Young healthy donors are preferred as they give better transplantation results[11]. Another important issue is the fact that it may take several years from the time a potential donor is registered until the need for cell collection[12]. Inadequate and misinformation about hematopoietic stem cell donation (HSCD) as well as fears and concerns about this issue are among the reasons that prevent to reach the required number of donors[11,13]. The number of volunteer donors can be increased by organizing education programs and campaigns across the society. Because registering to become a HSC donor is entirely voluntary in most countries, it is critical for healthcare professionals to know the factors that drive HSC donation intentions of the society. Healthcare professionals should first develop appropriate knowledge and attitudes in order to promote HSCD. Nurses and midwives play an important role to achieve successfully the donation and transplantation process[13,14]. Turkish and Poland studies on university students have indicated that the students can pay greater interest and develop towards HSCD registration even with even short-term educational efforts[15,16].

Health students' awareness of stem cell donation is important to fulfill their professional responsibilities as future healthcare professionals. Since health students are sensitive and educated about stem cell donation, it is thought that further studies should be conducted on this subject, since it will contribute to the increase in stem cell donation in the society. The aim of this study is to examine the knowledge and attitudes of university students about stem cell donation.

The research questions are determined as follows:

- What are the knowledge levels of university students about hematopoietic stem cell donation?
- What are the attitudes of university students towards hematopoietic stem cell donation?

MATERIALS AND METHODS

Design and Participants

This study was a descriptive cross-sectional design. The population of the study consisted of midwifery/nursing students who were studying at the Faculty of Health Sciences of a university in western Turkey (N=1050). No sample selection was made, all students who agreed to participate in

study were included to study. The sample size was calculated as N=282, using the sample method with finite population, at confidence interval of 95% and margin of error of 5%. A total of 345 students who agreed to participate in the study were included in the sample. Those who did not agree to participate in the study and filled in incomplete data were not included in the study. Participation in the research was voluntary, and care was taken to protect student confidentiality in reporting the findings. Participants did not receive any payment or reward for completing the survey.

Instruments

The study was conducted between October 2020 and June 2021. The data were collected using a questionnaire, prepared by the researchers upon the literature review, online[1,8,11-16]. Data collection process lasted for 10-15 minutes. It consists of 3 parts and includes the informed consent section at the beginning.

Part 1 includes 8 questions about socio-demographic characteristics of the participants such as age, gender, department, university year, graduated school, place of residence, and educational levels of parents.

Part 2 includes questions about the participants' views on HSCD. There are nine questions about the students' awareness of stem cells, presence of those who need stem cell in their circle, and whether or not they are registered at HSCD.

Part 3 includes questions about the level of knowledge about stem cell donation.

The stem cell donation knowledge level measurement tool was developed by Çiçek and Dinç in 2020 to measure the knowledge of university students on stem cell donation. Twenty questions were asked about stem cell knowledge level and consists of four parts. These parts are general information about stem cell (3 items), peripheral method (4 items), bone marrow method (5 items), and stem cell donation (8 items). The respondent gets "1 point" for correct response and "0 point" for incorrect response and I have no idea. Total score ranges between 0 and 20 points. The reliability study of this assessment tool was applied on 345 people. Item analysis was performed with ITEMAN (Item and Test Analysis program, Version 4.3). In the analyses, the reliability (Cronbach's alpha) was calculated as 0.722 and the average difficulty of the test was 0.635 and the discrimination power was 0.376.

Ethical considerations

Approval from the Ethics Committee of Çanakkale Onsekiz Mart University Graduate Education Institute (Decision No: 2020/101 number: 3) and institutional permission from the Faculty of Health Sciences (Date 8.10.2020, no: 78179085- E 2000156482) were obtained for the study. Online written consent was obtained from students. Our research was carried out in accordance with the Declaration of Helsinki of the World Medical Association

Data analysis

Data were analyzed by using SPSS 25 program (IBM Corp.; Armonk, NY, USA). The normality test was used to test whether or not the variables were normally distributed. Kolmogorov-Smirnov test, and kurtosis-skewness coefficient values. Number and percentage values were used in descriptive analyses. Comparisons made between qualitative groups were assessed through the chi-square test. One-way analysis of variance (ANOVA) test and independent T test were used to compare the descriptive characteristics of the participants with their level of knowledge on stem cell. The value of $p< 0.05$ was regarded as statistically significant.

RESULTS

It was found that 38.6% of the participants were the second-year students, 71.9% midwifery students, 56.5% were Anatolian High School graduates, 54.8% of their mothers and 35% of their fathers were primary school graduates, and 83.2% of them resided in the province/district (Table 1).

Table 1: Sociodemographic characteristics of the students (N=345)

Characteristics		n	%
Gender	Male	18	5.2
	Female	327	94.8
Age	20 <	200	57.9
	20 >	145	42.1
Year of study	1	46	13.3
	2	133	38,6
	3	75	21.7
	4	91	26.4
Program	Midwifery	248	71.9
	Nursing	97	28.1
Graduated School	High school	32	9.3
	Health high school	93	27.0
	Anatolian high school	195	56.5
	Other	25	7.2
Mother's education level	Illiterate	19	5.5
	Primary school	189	54.8
	Secondary school	56	16.2
	High school	57	16.5
	University	24	7.0
Father's education level	Primary school	130	37.6
	Secondary school	73	21.2
	High school	88	25.5
	University	54	15.7
Residence	Village	58	16.8
	Town	147	42.6
	City	140	40.6

Moreover, 2.6% of the participants had relatives in need of stem cells in their circle, 25.2% were registered in the national stem cell database, 89.1% intended to be an HSC donor, and 97.1% would feel positive emotions (such as saving lives) due to the thought of being an HCS donor, 42.3% of the students had heard of TURKOK and 95.4% wanted to receive training on stem cells. As sources of information on stem cells, 64.3% obtained information from courses at school, 59.1% from the media, and 34.2% from healthcare professionals (Table 2).

Table 2: The participants' attitudes towards stem cell donation (N=345)

Variables		n	%
Do they have any registration of being an HSC donor?	Yes	87	25.2
	No	258	74.8
Was there anyone around who needed stem cells?	Yes	9	2.6
	No	336	97.4
Intention to be registered as an HSC donor (n=258)	Yes	230	89.1
	No	28	10.9
Feeling positive emotions from being an HCS donor	Yes	335	97.1
	No	10	2.9
The status of knowing TURKOK	Yes	146	42.3
	No	199	57.7
HSC information sources*	Courses at school	222	64.3
	Media	204	59.1
	Healthcare professionals	118	34.2
	Seminar/conference vs	22	6.4
	The red crescent	9	2.6
Would you like to receive training on stem cell donation?	Yes	329	95.4
	No	16	4.6

* More than one answer was given

When the socio-demographic characteristics of the students and their registration for HSCD were compared, it was determined that there was a statistically significant difference between age groups (p<0.001), university year (p<0.001), the graduated school (p<0.014), and mother's educational level (p<0.039) (p<0.05) (Table 3).

Table 3: Comparison of participants' HCSD registration with their sociodemographic data

Sosyodemographic data		Registered (N=87)		Non registered (N=258)		P
		n	%	n	%	
Gender	Female	81	24.8	246	75.2	0.286
	Male	6	33.3	12	66.7	
Age	20 <	30	15.0	170	85.0	<0.001
	20 >	57	39.3	88	60.7	
Year of study	1	1	2.2	45	97.8	<0.001
	2	10	7.5	123	92.5	
	3	40	53.3	35	46.7	
	4	36	39.6	55	60.4	
Program	Midwifery	61	24.6	187	75.4	0.671
	Nursing	26	26.8	71	73.2	
Graduated School	High school	4	12.5	28	87.5	0.014
	Health high school	34	36.6	59	63.4	
	Anatolian high school	42	21.5	153	78.5	
	Other	7	28.0	18	72.0	
Mother's education level	Illiterate	4	21.1	15	78.9	0.039
	Primary school	60	31.7	129	68.3	
	Secondary school	11	19.6	45	80.4	
	High school	9	15.8	48	84.2	
	University	3	12.5	21	87.5	
Father's education level	Primary school	1	14.3	6	85.7	0.214
	Secondary school	34	27.6	89	72.4	
	High school	24	32.9	49	67.1	
	University	19	21.6	69	78.4	
Residence	Village	14	24.1	44	75.9	0.889
	Town	39	26.5	108	73.5	
	City	34	24.3	106	75.7	

The students had a moderate level of knowledge about stem cell (57,8%, total score 10.97±4.28). When the judgments about the level of knowledge about stem cell were examined, it was observed that they gave more true answers in the questions about general information about stem cell and information about stem cell collection by peripheral method (blood, apheresis). They had an insufficient level of knowledge on methods of stem cell collection from bone marrow and stem cell donation processes. The students' knowledge levels on stem cell were examined (Table 4).

Table 4: The participants' knowledge levels about stem cell donation

Knowledge levels about stem cell donation	Correct response (%)*
General Information About Stem Cell	67.8
Stem Cell Collection by Peripheral Method (Blood, apheresis)	61.46
Stem Cell Collection from Bone Marrow	45.96
Stem Cell Donation Procedures	56.37
Total	57,8
X̄±ss	10,97±4,28 (Min=0, Max 20)

*Row percentage

When some descriptive characteristics of the participants and their stem cell knowledge levels were compared, a statistically significant correlation was found between the students' grade levels (p<0.001), program (p<0.009), age groups (p<0.001), the school they graduated from (p<0.001), the educational level of their mothers and fathers (p<0.015; p<0.004, respectively), place of residence (p<0.001), previous HSCD registration (p<0.001) and their level of knowledge about stem cell. No significant correlation was determined between the students' levels of knowledge about stem cell in terms of their gender (p>0.05) (Table 5).

Table 5. Sociodemografic characteristics of the participants and their stem cell knowledge levels were compared

Characteristics	n	X̄±ss	F/t	p	difference
Gender					
Female	327	10,99±4,28	0,267	0,792	
Male	18	10,72±4,20			
Year of study					
1	46	9,26±4,40		<0,001*	a<c,d
2	133	10,00±4,37	10,847		b<c,d
3	75	11,85±3,59			
4	91	12,56±3,94			
Program					
Midwifery	248	11,36±4,18	2,629	0,009*	
Nursing	97	10,00±4,39			
Graduated School					
High school	32	8,00±4,98	10,245	<0,001*	a<c,d
Health high school	93	12,53±3,63			b>a,c,d
Anatolian high school	195	10,80±4,14			
Other	25	10,44±4,45			
Mother's education level					
Illiterate	19	9,05±5,08	3,149	0,015**	b>a,c,e
Primary school	189	11,56±4,03			
Secondary school	56	10,16±3,94			
High school	57	11,14±4,45			
University	24	9,50±5,08			
Father's education level					
Primary school	130	10,63±4,37	4,539	0,004**	b>a,d
Secondary school	73	12,08±3,96			c>d
High school	88	11,48±4,13			
University	54	9,51±4,28			
Residence					
Village	58	9,13±4,32	4,394	<0,001**	a<b,d
Town	147	11,53±4,36			
City	140	11,16±3,98			
HSCD registration					
Yes	87	12,58±3,28	4,021	<0,001**	
No	258	10,45±4,45			

X̄: Mean (±SD = standard deviation), *Independent t test, ** one-way ANOVA. Age X̄ = 20,5 ± 2,2. (p<0.05)

DISCUSSION

This study was aimed to determine the knowledge and attitudes of university students about stem cell donation. In Turkey, TURKOK was established in 2015 to meet national and international demands for unrelated HCS, and provides coordination between stem cell transplant centers by creating a database of volunteer stem cell donors and recipients awaiting for stem cell transplant. The Turkish Red Crescent incorporates volunteer stem cell donors. While the number of patients transplanted from TURKOK donors was 28 in 2015, it was 192 in 2016 and exceeded over 4 thousand in 2022 (first 9 months). The number of stem cell transplants is increasing, but it is still not enough to meet the need. It has been reported that an average of 3 thousand patients awaiting transplantation per year.[7] In the present study, the number of the students who were registered for HCSD was 25.2%, which was lower than the rate of university students registered in different countries. The rate of students enrolled in the stem cell donor database was 43% in a study conducted with medical students in the USA, 32.7% in the Rhode Island study, and 41.6% in a study conducted with university students in Poland[2,12,18]. In a study conducted with medical students in Saudi Arabia, the rate of students enrolled in the stem cell database was 9%, which was lower than the value determined in the present study[11]. These different results may be caused by differences in study size and population.

It was determined that the students who were aged 20 and over and third and fourth students were mostly registered in the TURKOK database. The present study revealed that those who graduated from health vocational high school were mostly registered. Furthermore, the enrollment rate of the students with literate and primary school graduate mothers was higher. In their study, Hazzazi et al., reported that mostly the medical students who were aged 23-25 years and those who were 4th and 5th –year medical students were registered in the stem cell database[11]. In their study, Narayanan et al., reported no difference between being registered in the stem cell database, and some socio-demographic characteristics (gender, age, race, and university year)[2].

Results of the present study indicated that 91.9% of the participants wanted to be an HCS donor and 97.1% had positive feelings for HSCD. In their study examining the opinions of blood donors about stem cell donation in Malaysia, Ting et al., found that 87.1% of the donors reported a positive intention about stem cell donation[19]. In the study conducted by Vatansever Yıldız with donors who applied for blood donation in Turkey, 29.9% of the participants had donated stem cells before[20]. In a study, Gümüş Şekerci reported that 52.5% of the nursing students intended to be a stem cell donor, but only 3.6% donated their stem cells[21]. As can be seen from findings of the present study and literature results, it is quite remarkable that the rate of stem cell donors is low. Although individuals have higher intentions to donate stem cells, the reasons for the low rate of stem cell sampling need to be investigated and further related studies should be conducted.

In the present study, it was found that the participants had moderate levels of knowledge about stem cells. When the judgments including the level of knowledge about stem cell were examined, it was observed that they gave more correct answers in the questions about general information about stem cell and information about stem cell collection by peripheral method. They had an insufficient level of knowledge on methods of stem cell collection from bone marrow and stem cell donation processes. In a study conducted with medical students in Saudi Arabia, it was reported that the level of donor eligibility knowledge was 37.4% and the level of knowledge about the donation process was 23.6%. The fact that HCS subjects were not sufficiently included in the curriculum was shown as a justification[11]. A study among nursing students in Malaysia revealed similar results to findings of the present study[22]. Other studies have reported that midwifery and nursing students had insufficient level of knowledge about stem cells and their knowledge level should be elevated[23,24]. These results show that this subject should be involved more in the curriculum.

When the descriptive characteristics of the students and their level of knowledge about stem cell were compared, it was determined that as their grade level increased, their level of knowledge about stem cells increased, the knowledge level of the midwifery students was higher than the knowledge level of the nursing students, those over the age of 20 were more knowledgeable than those in the lower age group, and level of knowledge about stem cells was higher in health high school graduates compared to other school graduates and in those who had previously donated their stem cells. It was determined that the stem cell knowledge levels of the donors were higher ($p<0.001$). In addition, according to their educational level, it was found that those with primary school graduate mothers and secondary school graduate fathers had higher scores ($p<0.05$). The higher level of knowledge of midwifery students in the present study may be associated with the fact that stem cell and cord blood bank subjects are included more in the courses. Different results are seen in the literature. Contrary to the present study, in the study by Gümüş Şekerci with students receiving health education, any correlation was not found between the educational status of the parents, the profession of the parents, the place of residence, and stem cell knowledge and attitudes of the participants[21]. In the study conducted by Hreńczuk et al., with university students, they determined that female students, those studying in the field of health and those living in the city center had a higher level of knowledge about hematopoietic stem cell transplantation and there was no correlation between age and knowledge level[12]. In their study with medical students, Narayanan et al., reported no significant correlation between gender, age, race, educational level and levels of knowledge about stem cell[2]. Almaeen et al., reported no significant correlation between age, gender, university type, university year, marital status, and stem cell knowledge and attitude scores in their study conducted with medical and dentistry students[8]. The reason why these results were different from findings of the present study may be the difference of the study groups and the content of the questions measuring the level of knowledge.

Stem cell transplantation has been performed successfully for patients in need in health centers in Turkey; however, unrelated (allogeneic) HSCT donation is not at the desired level, which may be associated with lack of knowledge, anxiety, attitude and belief[24-26].

Limitations

This study included only midwifery and nursing students studying at the faculty of health sciences in Çanakkale. The study cannot be generalized to all university students. More valuable results can be obtained by including students from other universities. Additionally, figuring out midwifery/nursing students' knowledge of HSCT is important for curriculum revision, as well.

CONCLUSION

In this study, examining the knowledge and attitudes of Faculty of Health Sciences students in a university about stem cell donation, it was observed that socio-demographic characteristics were correlated with HSC knowledge levels (age, university year, graduated high school, place of residence, educational level of mothers and fathers, status of participating in a scientific program on stem cells before) and the students had moderate levels of knowledge about HSC. It has been found that students have many knowledge gaps that can lead to increased potential donor populations. Only ¼ of the students were registered in the TURKOK database. However, a vast majority of students had positive feelings about HSCD. Encouraging students with positive emotions about HSCD will increase voluntary HSCD registration rates and thus provide hope for thousands of people waiting for a match every year. In order to effectively fulfill the consultancy role, which is among the essential roles of the nursing and midwifery profession, they should have sufficient knowledge and equipment on current and constantly developing issues. Nurses and midwives can raise awareness in society and contribute to increasing donation rates with their advisory roles. In the light of these results, it can be recommended to add courses and topics on stem cell to the midwifery and nursing curriculum, conduct scientific activities such as conferences and

seminars, assess the knowledge, attitudes and behaviors of students about stem cells with different tools, determine the associated factors, and to make nurses and midwives prepared for employment in new fields of work such as stem cell and cord blood bank. However, further studies are needed to explore HSCT knowledge in the community. In addition, it is thought that including this issue by health professionals in public service announcements, the internet and social media will be useful in increasing the awareness of the society. The results of this study may also provide important implications for health authorities in Turkey.

CONFLICT OF INTERESTS

The authors have no funding or conflicts of interest to disclose.

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