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Original Article

Knowledge, attitude and practice of health education students for stem cell donation and transplantation

Yasemin Gumus Sekerci, Emine Kir Bicer

Department of Nursing, Faculty of Health Sciences, Hatay Mustafa Kemal University, Hatay, Turkey

Abstract

Aim: The aim of this study is to determine the knowledge, attitudes and practices of stem cell donation and transplantation of health education students and to investigate their relationship with sociodemographic factors.

Material and Methods: This descriptive and cross-sectional study was conducted with 419 students studying in the departments of Nursing, Physical Therapy and Rehabilitation, Emergency and Disaster Management in the fall semester of a university in 2019-2020 academic year. Data were collected by using the descriptive information form, Stem Cell Information Form, and Stem Cell Attitude Form. Data were analyzed using frequency, percentage, mean, standard deviation, independent test, One-way ANOVA, Tukey HSD test and correlation analysis.

Results: The mean age of the participants was 20.68 ± 2.18 year and 68.3% were female. The majority of the participants had clinical experience. Although 52.5% of the participants wanted to be stem cell donors, only 3.6% donated stem cells. The participants' knowledge scores for stem cell donation and transplantation were 22.31 ± 9.38 and attitude scores were 38.88 ± 4.58. Several socio-demographic factors affecting the stem cell knowledge and attitudes of the students were determined. In addition, a statistically weakly significant correlation was found between the participants' stem cell knowledge and stem cell attitudes (r = .237, p <.001).

Conclusion: In the study, it was concluded that the stem cell donation rate of the students receiving health education was low, they had moderate knowledge about stem cell donation and transplantation and they showed positive attitude.

Keywords: Health education; stem cell; transplantation

INTRODUCTION

Stem cells, which are found in the bone marrow, the peripheral circulation and the blood of the umbilical cord, are cells which can renew themselves by dividing over a long period, and which can change into various other cell lines and types (1,2). Stem cells are used for treatment in many fields such as different types of cancer, neurological disease and damage, cardiac and metabolic diseases, cartilage lesions (3), rheumatic diseases and organ failure. Also, studies have shown particular improvements in health and quality of life in this regard (4).

Stem cell transplant is the process by which stem cells are collected by aspiration with a needle from the posterior iliac bone of a person of a suitable tissue type or from the individuals themselves, and after preparation, are given to the recipient (5). In Turkey, stem cell transplant has been performed successfully, but there is a shortage of stem cell donors. The reason for this may be lack of information (6-8), negative attitudes or beliefs, prejudice, or apprehension (9).

The literature presents data from various countries, evaluating the knowledge (10,11), attitudes (6,12,13) and practices (14) of health professionals and students being educated in the field of health. It has been reported that the knowledge of stem cells of nursing students in Malaysia was at a moderate level, and their attitudes were positive (15); in Italy, two thirds of doctors had no special knowledge of stem cells (16), and in Saudi Arabia, newly qualified dentists had inadequate knowledge levels and attitudes to stem cells (7). In addition, in another study in Saudi Arabia with a sample formed from physicians and medical students, it was found that most of the participants had a moderate level of knowledge and attitudes (14). In another recent study, more than half of nurses working in a hospital in India stated that they had never heard of stem cell and umbilical cord blood banking (13).

Despite the existence of studies performed on the topic in other countries, to the best of our knowledge there are few studies in Turkey assessing the knowledge, attitudes and practices regarding stem cells of students in the field of health (17,18), and no studies were found which had

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Corresponding Author: Yasemin Gumus Sekerci, Department of Nursing, Faculty of Health Sciences, Hatay Mustafa Kemal University, Hatay, Turkey **E-mail:** y.gumus36@hotmail.com

been conducted in the last five years. Also, university students, as a group who are young, healthy, open to new knowledge and easy to reach, are an important group in society for stem cell donation. In addition, when it is thought that over time, the need for health personnel who are experts in the field of stems cells will increase, it is to be expected that students who are being trained as health workers should have basic knowledge and a positive attitude to the subject. Therefore, it is thought that with the increase in the need for donors, it will be beneficial first to determine the knowledge, attitudes and practices of students being educated in health with regard to the subject, and secondly to conduct education and courses on stem cells.

For this reason, the aim of this study was to determine the knowledge, attitudes and practices of students in the field of health to stem cell donation and transplanting, and to examine the relationship with socio-demographic factors.

MATERIAL and METHODS

Type of Research

This research was a descriptive cross-sectional study, conducted between October 11 and November 25, 2019.

Study Population and Sample

The population of the study consisted of the students registered for the fall semester of the academic year 2019-2020 in the Nursing Department (n=548), Physiotherapy and Rehabilitation (PR) (n=410) and Emergency Assistance and Disaster Management Departments (EADM) (n=239) of a university (N=1197). The following formula was used to determine the sample of the study (19):

$$n = \frac{N.z^2.\sigma^2}{(N-1).H^2 + z^2.\sigma^2}$$

where N is the size of the population, n is the sample size, Z is the theoretical value equivalent to a given significance level α, σ is the standard deviation value, and H is the standard error value. From this formula, the size of the sample which is necessary for α = 0.05, z = 1.96, σ = 0.5 and H = 0.05 is 291 people. The participants were stratified with proportional selection according to their departments. The proportion of students from each department was determined according to the numbers in the population (nursing=133, PR=100 and EADM=58).

The researchers went to the classes and explained the aim and scope of the study, and then handed out data collection forms at random to those who wished to take part in the research. Later the forms were checked as to whether they had been completed in a suitable way. The forms of six students were not included in the evaluation because they were completed inaccurately, and the analysis was made using data from 419 (nursing=191, PR=144, EADM=84) students. At the end of the study, the number of students reached by departments kept the sample rate.

Data Collection Instruments

Descriptive Information Form: This form, prepared by the researchers according to the literature (6,10,14,17,18) had 31 questions on the students' sociodemographic characteristics (age, gender, marital status, student characteristics, employment status, place of birth, parents' education and employment status, and family's place of residence and income level) and characteristics relating to stem cell donation and transplanting (donating blood, organs and stem cells, intention to donate stem cells, factors encouraging or hindering that intention, acquisition of knowledge or desire to acquire knowledge of stem cells, from whom and from where that knowledge was obtained, persons in the family receiving stems cell treatment, waiting for donation, or donating).

Stem Cell Knowledge Form: This form was developed by the researchers in line with the literature (6, 7-14,17,18), with the aim of evaluating the participants' attitudes to stem cell donation and transplanting. On the form, there were 20 questions, answered with the choices "correct", "incorrect" or "don't know", scoring 2,1 or 0 points respectively (20) with items 4, 9 and 12 scored in reverse, so that the total score ranges between 0 and 40. The scores obtained were divided into three levels: a score of <50% showed inadequate knowledge, 50-75% showed a moderate level of knowledge, and >75% showed adequate knowledge (20). A score of less than 20 in this study was determined to show inadequate knowledge, 20-30 moderate knowledge, and over 30 adequate knowledge. The Cronbach's alpha coefficient was 0.86 in the present study.

Stem Cell Attitude Form: This form was developed by the researchers in line with the relevant literature (6,7,9,12,15, 17,18,21) and its aim was to assess the attitudes of the participants to stem cell donation and transplanting. It consisted of 15 items. The form contained statements evaluating positive and negative attitudes, each of which was to be answered with the choices "I agree", "I am undecided", or "I disagree", scoring 3, 2 or 1 point respectively (21). Possible scores ranged from 15 to 45. Attitudes calculated in this study were divided into three: negative attitude (15-24), neutral attitude (25-34), and positive attitude (35-45). The Cronbach's alpha coefficient was 0.82 in the present study.

Expert View

In determining the content validity of the draft of the stem cell knowledge and stem cell attitude forms, the views were sought of experts in the field: a hematologist, a nursing expert in charge of the bone marrow unit, two nursing experts in charge of the hematology service, and a bone marrow transplantation coordination doctor and biologist. The experts assessed the statements based on the criteria of clarity, fluency, appropriate use of language, the writing of the statements and comprehensibility. The experts were asked to score each statement from 1 to 4: quite suitable = 1, suitable = 2, small changes needed =3, and large changes needed = 4. Small changes were made to some of the statements in accordance with the views of the experts, and two items which were not appropriate to the content of the study were removed from the data collection forms.

Pilot Application

After the stem cell and attitude forms were revised in accordance with the experts' views, they were applied to 30 students selected at random: 10 from nursing, 10 from PR, and 10 from EADM (22). The response rate of the students taking part in the pilot application to each question on the form was 100%, and as a result no changes were made to the form. Results obtained from the pilot application were determined as Cronbach alpha 0.90 for the stem cell knowledge questions and Cronbach alpha 0.84 for the attitude questions, and it was found that both forms had a high level of reliability.

Data Analysis

The program SPSS 22.0 (IBM Corporation, New York, USA) was used to analyze data. Data determined by kurtosis-skewness values to conform to normal distribution were evaluated using frequency, percentage, mean, standard deviation, independent t test, one-way ANOVA, Tukey HSD test and correlation analysis. Statistical significance was taken as $p<0.05$.

Ethical Considerations

This study was approved by the Social and Human Sciences Research and Publication Ethics Committee of a university (Date/Number=2019/8). Also, permission was obtained from the institution where the study was to be conducted. Before commencing the study, the aims and content of the study were explained to all participants, and their written consent was obtained. The work was conducted in accordance with the principles of the Declaration of Helsinki.

RESULTS

In this study, 419 data collection forms from the sample selected from among nursing, PR and EADM university students were examined. Table 1 shows the socio-demographic characteristics of the participants. The mean age of the students was 20.68 ± 2.18 year and 68.3% were female. Students were from nursing (45.6%), PR (34.4%) and EADM (20%). The majority of the participants (70.2%) had clinical experience.

Table 2 shows the students' thoughts and practices regarding stem cell donation and transplanting. It was found that 37% of the participants had donated blood and 1.4% organs. Although 52.5% of the participants wanted to be stem cell donors, only 3.6% donated stem cells. The majority of students (60.9%) considering making stem cells reported that life saving responsibility is an encouraging factor to become a stem cell donor. Factors preventing being a stem cell donor were lack of information (25.6%), family reason (11.1%), worry and fear about the procedure (10.5%), and health situation (5.1%); respectively. Also, 42.7% of the participants had received information on stems cell donation and transplanting. Most of these (29.6%) stated that they had received the information from television, social media or the internet.

Table 1. Participants' Descriptive Characteristics (n=419).

Age (year)	**X ± SS 20.68±2.18**	
	n	**%**
Gender		
Female	286	68.3
Male	133	31.7
Marital status		
Married	9	2.1
Single	410	97.9
Department		
Nursing	191	45.6
PR	144	34.4
EADM	84	20.0
Grade		
1. Grade	123	29.4
2. Grade	123	29.4
3. Grade	75	17.8
4. Grade	98	23.4
Clinical experience (hospital practice)		
Yes	294	70.2
No	125	29.8
Employment status		
Working	22	5.3
No working	397	94.7
Mother's educational status		
≤ 8 year	323	77.1
> 9 year	96	22.9
Father's educational status		
≤ 8 year	283	67.5
> 9 year	136	32.5
Mother's employment status		
Working	56	13.4
Housewife	363	86.6
Father's employment status		
Working	273	65.2
No working	146	34.8
The family's residential area		
Province	178	42.5
District	146	34.8
Town / settlement	91	21.7
Other	4	1.0
Family income status		
Minimum wage and below	107	25.5
Above minimum wage	312	74.5
Total	**419**	**100.0**

*Multiple options are marked.

Stem Cell Information Scores

Figure 1 shows the categorical distribution of the participants' stem cell knowledge scores. It was found that 37.9% of the participants had inadequate knowledge, 43.7% had moderate knowledge, and 18.4% had adequate knowledge (Figure 1). Higher stem cell knowledge scores were obtained by female students compared to male students, by final year students compared to first year students, by those with clinical experience compared to those without it, by those considering stems cell donation compared to those not considering it, and by those who had received information on stem cells compared to those who had not (Table 3, $p<0.05$).

Table 2. The Participants' Thoughts and Practices regarding Stem Cell Donation and Transplanting (n=419)

Variables	n	%
Donate blood		
Yes	155	37.0
No	264	63.0
Donating organs		
Yes	6	1.4
No	413	98.6
Donating stem cells		
Yes	15	3.6
No	404	96.4
Thinking about donating stem cell		
Yes	220	52.5
No	199	47.5
Encouraging factors for donation*		
Life saving responsibility	134	60.9
Required for family / friends	17	7.7
Donation of family / friends	14	6.4
Other (Faculty encouragement, empathy)	17	7.7
Unanswered	38	17.3
Barrier factors for donation**		
Lack of information	51	25.6
Health situation	10	5.1
Worry and fear about the procedure	21	10.5
Other (family reasons)	22	11.1
Unanswered	100	47.7
Receiving information about stem cell donation		
Yes	179	42.7
No	240	57.3
The place(s) where information about stem cell donation was received***		
Lessons	50	25.2
Scientific studies	39	19.6
Television, social media or the internet	51	25.6
Other (Hospitals, family health centers, conferences, seminars, brochures)	59	29.6
Source of information*		
Doctor	84	46.9
Nurse	64	35.8
Other (religious official, all)	22	12.3
Unanswered	9	5.0
Wanting to information about stem cell donation		
Yes	348	83.1
No	71	16.9
The presence of a person receiving stem cell therapy in family or friends		
Yes	15	3.6
No	404	96.4
The presence of a person waiting for a stem cell donation in the family or friends		
Yes	3	0.7
No	416	99.3
The presence of a person donating stem cells in the family or friends		
Yes	29	6.9
No	390	93.1
Total	**419**	**100.0**

* Students who thought to donate stem cells (n = 220) were evaluated.
** Students who did not intend to donate stem cells (n = 199) were evaluated and multiple options are marked.
*** Students who received information about stem cell donation (n = 179) were evaluated and multiple options are marked

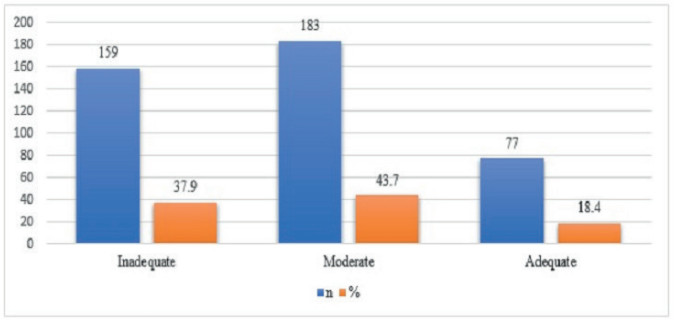

Figure 1. Category of stem cell knowledge score among participants

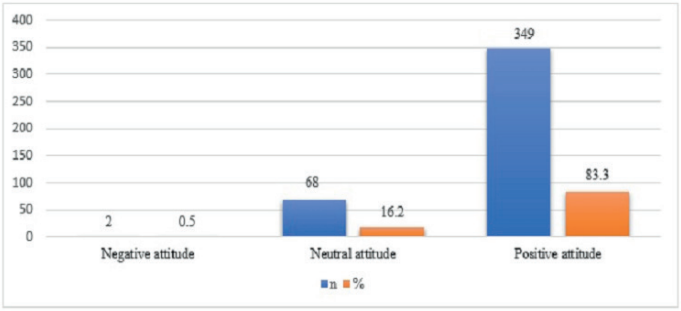

Figure 2. Category of stem cell attitude score among participants

Table 3. Comparison of Stem Cell Information and Attitude Scores with Independent Variables (n=419)

Variables	Knowledge score		Attitude score	
	t / F	p	t / F	p
Gender	2.516	0.012	2.676	0.008
Grade	6.282*	<0.001	2.700*	0.045
Clinical experience	4.193	<0.001	0.386	0.699
Employment status	1.290	0.198	1.116	0.908
Mother's educational status	0.500	0.618	0.811	0.419
Father's educational status	1.094	0.279	0.230	0.819
Mother's employment status	0.920	0.358	0.550	0.291
Father's employment status	0.256	0.798	1.946	0.052
The family's residential area	0.502*	0.734	2.229*	0.065
Family income status	1.170	0.243	2.120	0.035
Donate blood	0.253	2.312	0.598	0.550
Thinking about donating stem cell	2.044	0.042	6.265	<0.001
Receiving information about stem cell donation	7.089	<0.001	5.198	<0.001
Wanting to information about stem cell donation	0.779	0.436	4.135	<0.001

*The F value; t= Independent t test; F= One-way ANOVA

Stem Cell Attitude Scores

Figure 2 shows the categorical distribution of participants' stem cell attitude scores. It shows that 0.5% of the participants had a negative attitude to stem cell donation and transplanting, 16.2% had a neutral attitude, and

83.3% had a positive attitude (Figure 2). Also, it was found that higher stem cell attitude scores were obtained by female students compared to males, by final year students compared to first year students, by those who had an income higher than the minimum wage compared with those who did not, by those considering stem cell donation compared to those not considering it, by those who had received information on stem cells compared to those who had not, and by those who wanted information on stem cells compared with those who did not (Table 3, $p<0.05$).

Correlation between Stem Cell Knowledge and Attitude Scores

Table 4 shows the participants' mean scores on stem cell knowledge and attitude, and the correlation between them. Participants' stem cell knowledge scores were found to be 22.31 ± 9.38, and their attitude scores 38.88 ± 4.58. A weak positive correlation was found between the students' stem cell knowledge scores and their attitude scores ($r=0.237$, $p<0.001$) (Table 4).

Table 4. Correlation between Stem Cell Knowledge and Attitude Scores (n=419)

	Mean ± SD	Min.- Max.	Median	r p value*
Knowledge score	22.31±9.38	0-39	23	r = 0.237
Attitude score	38.88±4.58	23-45	40	p < 0.001

*Pearson Correlation

DISCUSSION

The use of stem cell transplantation treatment to prolong a person's life and to increase their quality of life is increasing rapidly (23). For this reason, the knowledge, attitude and practices regarding stem cell donation and transplanting of nursing, PR and EADM students, who are the health personnel of the future, were determined, and an examination was made of the correlation between certain variables.

The rate of blood, organ and stem cell donation by the students in this study receiving health education was low. It is reported in studies conducted with students that the rates of organ (24-27) and stem cell donation are low. Particularly when it is thought that students receiving health education will be the people who create awareness in society, and will inform and guide society, it is seen that their participation in stem cell donation is inadequate. The explanation of this is that students have a lack of knowledge of stem cells, they do not know how transplantation is performed (17), they think they have no need of stem cell transplant, and they are affected by other cultural factors (11), such as negative family attitudes or reminders of death. Therefore, it is thought that determining the factors which barrier stem cell donation and eliminating these factors will increase rates of stem cell donation.

It is important to determine the factors which encourage or barrier stem cell donation in order to increase the donation rate. Most of the students in the study stated that the responsibility to save lives was enough to become a stem cell donor, and the factors which they mentioned as barrier stem cell donation were, in order, lack of knowledge, worry or fear concerning the process, and a poor state of health. In the literature, factors encouraging organ donation are stated to be the intention to save life (5) and to restore sick individuals to health (29, 30), while factors seen to barrier organ donation are reported to be a disruption of the integrity of the body (5), not trusting members of the health team, a lack of information, and religious objections (30, 31). In this way, it is thought that in order to remove the factors which hinder the donation and transplanting of both organs and stem cells, deficiencies in knowledge must be eliminated by means of instruction programs or courses. Health professionals should plan education content and discussions so as to remove factors barrier stem cell transplants and to increase motivating factors.

Knowledge of Stem Cell

Inadequate knowledge of stem cell donation is daily causing an increase in the number of people waiting for stems cells. It was found in this study that the students' knowledge of stem cell donation and transplanting was at a moderate level. In studies conducted in various parts of the world, the knowledge of stem cells among students or other health professional groups was reported to be inadequate (7-8,27) or moderate (14,15). In a study by Peter et al. (2017) to determine the level of knowledge among nursing students of umbilical cord stem cell banking, it was found that only 1% of the students had a good knowledge of stem cell banking (10). In this regard, it is thought that activities in universities to provide correct information will help to increase and incentivize stem cell donation. Also, it is predicted that providing information based on scientific data will increase the rate of stem cell donation. In addition, it is thought that the effect of the media should also be considered, as news and media campaigns can affect society.

It was found in this study that the stem cell knowledge scores of female students were higher than those of male students. Shaban (2018) found higher stem cell knowledge scores among female nursing students, as did Alhadlaq et al. (2019) among female dental students, but in other studies in Egypt (8) and India (32), no correlation was found between gender and stem cell knowledge scores. Therefore, it may be said that gender is not a variable which affects stem cell knowledge scores, and that it is difficult to generalize. Both in the present study and in that of Shaban (2018), it may also be that the majority of females in the samples (20) increased the stem cell knowledge score in favor of females.

It was found in this study that in comparison with first year students, those studying in their final year and those with clinical experience had higher stem cell knowledge scores.

It was found in this study that compared with first year students, students in their final year and those with clinical experience had higher stem cell knowledge scores. In a study by Yılmaz and Demirağ (2019) on the effect of medical education on the knowledge, thoughts and attitudes regarding organ donation and transplanting in medical faculty students, it was reported that as the education level rose, the rate of receiving education on organ donation and organ transplanting increased, and those receiving the education saw themselves as more adequate in terms of knowledge. However, it was stated that this increase was not at the expected level (27). As in this study, an increase in clinical experience was expected along with an increase in year of study. However, in a study by Leng et al. (2016), no correlation was found between clinical experience and the state of stem cell knowledge (9). Similarly, in a study by Almoshori (2018), no difference was reported between medical doctors and medical students in terms of stem cell knowledge (14). These results suggest that education on stem cells should be reviewed.

Attitude to Stem Cell

It was determined in this study that the students had a positive attitude to stem cell donation and transplanting. Even though the knowledge concerning stem cell donation and transplanting of most of the students in the study was found to be at a moderate level, the students generally had a positive attitude concerning stem cells. In a study by Azzazy and Mohamed (2016) examining the effect of education on knowledge and attitudes concerning stem cell treatment in nursing students, it was reported that the students showed a positive attitude to stem cell treatment in both the pre-test and the post-test (6). In a recent study in Saudi Arabia on the knowledge and attitudes concerning stem cells among new graduates of dentistry schools, most of the dentists stated that the use of stem cells was not in accordance with ethical and religious principles (7).

Despite the positive attitude of the students towards stem cell donation, low donation rate is another important finding of the study. Similar results were obtained in different studies for organ donation (33,34). In psychology, this situation is defined as attitude-behavior mismatch, and it is thought that determining only the attitude is not enough to explain the behavior. The important thing is to identify the obstacles perceived by the individual in stem cell donation. In the literature, factors seen as barrier in organ donation are reported to be a disruption of the integrity of the body (5), not trusting members of the health team, a lack of information, and religious objections (30,31) and other cultural factors (11). Therefore, it is thought that determining the factors which barrier stem cell donation and eliminating these factors will increase rates of stem cell donation.

In this study, no correlation was found between the students' attitudes to stem cells and sociodemographic variables of clinical experience, high school, employment status, and parents' education, family's place of residence or blood donation status. In a descriptive and cross-sectional study by Ordin et al. (2018) evaluating student attitudes to organ donation, it was reported that students' age and class levels did not affect attitude (25). The results obtained in this study and in the literature suggest that attitudes towards stem cells are affected not so much by sociodemographic characteristics as by cultural differences and the meaning attached to life. Also, this result may have arisen from differences in the data collection instruments used in studies of stem cells. Therefore, it is recommended that future studies relating to stem cell transplanting should take into account students' cultural characteristics.

Correlation between Knowledge and Attitude

A weak positive correlation was determined between the students' stem cell knowledge scores and their attitude scores. Similarly, weak (9) or moderate (10) correlations have been reported between stem cell knowledge and attitude in studies performed with university students. In a study by Patyal et al. (2018) to evaluate stem cell knowledge and attitude in nursing students, a weak positive correlation was found between knowledge and attitude scores (13). The weak correlation between stem cell knowledge and attitude may be explained by the effects on individuals of religious, cultural and social factors.

LIMITATIONS

Although the size of the sample group was adequate, it only represented one faculty. Therefore, the study cannot be generalized. The studies should be carried out in different sample groups in the future to eliminate this limitation.

CONCLUSION

It was concluded in the study that the students receiving health education had a low rate of stem cell donation, they had a moderate level of knowledge of stem cell donation and transplanting, and they showed a positive attitude to it. Accordingly, in order to increase stem cell donation, education programs should be created taking account of students' religious, cultural and social surroundings. More place should be given to students on responsibility projects, after graduation they should be directed to new fields of specialization.

Competing interests: The authors declare that they have no competing interest.

Financial Disclosure: There are no financial supports.

Ethical approval: This study was approved by the Hatay Mustafa Kemal University Social and Human Sciences Research and Publication Ethics Committee. (Meeting date: 8 November 2019, Meeting No. 13, Decision No. 8). Also, permission was obtained from the institution where the study was to be conducted.

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