Effects of Targeted Education for First-Year University Students on Knowledge and Attitudes About Stem Cell Transplantation and Donation

Zühre Kaya,[1] Korcan Emre Gültekin,[2] Oğuz Kaan Demirtaş,[2] Dilşen Karadeniz,[2] Yunus Çalapkulu,[2] Özge Tap[2]

Abstract

Objectives: **Hematopoietic stem cell transplantation is a life-saving treatment, but donor numbers are lacking in Turkey and elsewhere. Increased awareness of hematopoietic stem cell transplantation among university students might help expand donation. We evaluated the effect of a brief targeted educational intervention on knowledge and attitudes about hematopoietic stem cell transplantation and donation among first-year university students in Turkey.**

Materials and Methods: **There were 301 first-year university students (median age, 18 y) who volunteered: 163 medical students (54%) and 138 law students (46%). Before and after a brief lecture about hematopoietic stem cell transplantation, students answered a 5-item yes-or-no questionnaire regarding (1) knowledge about health benefits of hematopoietic stem cell transplantation; (2) knowledge about stem cell banking and donation in Turkey; (3) knowledge about the transplantation procedure; (4) prior experience and/or willingness to donate blood; and (5) willingness to donate stem cells. Reasons for motivation to donate blood and/or stem cells were categorized. Results before and after the lecture were evaluated with univariate and multivariate analyses.**

Results: **The response rate was 100%. Significantly greater proportions of students had knowledge about hematopoietic stem cell transplantation and willingness to donate blood and stem cells after the lecture. There were no differences between medical and law students before the lecture. After the lecture, a significantly greater proportion of medical students indicated knowledge about health benefits of hematopoietic stem cell transplantation, stem cell banking and donation in Turkey, and the transplantation procedure.**

Conclusions: **Brief education about hematopoietic stem cell transplantation for university students can increase knowledge and awareness about hematopoietic stem cell transplantation and cause more positive attitudes about stem cell donation.**

Key words: *Public perspectives, Stem cell donation, Transplantation*

Introduction

Hematopoietic stem cell transplantation (HSCT) is a life-saving treatment for numerous benign and malignant conditions.[1] Only 1 in 3 patients who require HSCT have a human leukocyte antigen (HLA)-matched related donor. For other patients, the only available option is an unrelated HLA-matched donor. However, in most nonindustrialized countries, the likelihood of finding such donors is low because of insufficient or nonexistent national donor programs.[2-5] Therefore, HSCT waiting lists worldwide are expanding because the need is greater than the number of voluntary stem cell donors. The gap between need and donation is especially wide for unrelated HSCT in many developing countries.[6-11]

The main reason for the insufficient number of donors for HSCT is insufficient public awareness about the importance of HSCT. Increasing public knowledge and sensitivity about solid-organ

From the [1]Pediatric Hematology Unit, Department of Pediatrics, and the [2]Gazi-KÖK Research Groups, Medical School of Gazi University, Ankara, Turkey

Acknowledgements: *The authors declare that they have no sources of funding for this study, and they have no conflicts of interest to declare. The authors would like to express their gratitude to Prof Dr Türkiz Gürsel for her critical review of this manuscripts. They also would like to thanks Gazi-KÖK students for their great effort too.*

Corresponding author: *Zühre Kaya, MD, Pediatric Hematology Unit, Department of Pediatrics, Medical School of Gazi University, Beşevler, Ankara, Turkey, 06500*
Phone: *+90 312 202 6025* ***Fax:*** *+90 312 215 0143* ***E-mail:*** *zuhrekaya@gazi.edu.tr*

Experimental and Clinical Transplantation (2015) 1: 76-81

Copyright © Başkent University 2015
Printed in Turkey. All Rights Reserved.

DOI: 10.6002/ect.2014.0023

transplantation has accelerated donor recruitment in many countries.[12-15] However, little data are available in developing countries regarding the efficacy of public education to increase the number of stem cell donors.[16-18]

University students may play an important role in promoting donation for HSCT because greater knowledge about this procedure in the university population may increase awareness in young people about the need.[11] The purpose of this study was to evaluate the effect of targeted HSCT-related education on knowledge and attitudes in first-year university students in Turkey about HSCT and donation.

Materials and Methods

Subjects

First-year students attending the medical school or law school of Gazi University were told about the purpose of the research during classes and invited to participate. The students were from all geographic regions of Turkey. The Institutional Review Board of Gazi University Faculty of Medicine approved the study. The deans of the 2 schools gave permission for students to participate, and each participant gave informed consent. A total of 301 students (163 medical students and 138 law students) volunteered to participate.

Lecture and testing

A short presentation for 15 minutes about HSCT was provided. Before and after this presentation, each participant was asked to complete a short questionnaire on knowledge and attitudes about HSCT and blood and stem cell donation. The presentation was a brief lecture given by a hematologist experienced in HSCT (ZK) and was prepared in accordance with 3 sources: the 2012 recommendations of the Blood and Marrow Transplantation Subcommittee of the Turkish Society of Hematology, the European Group for Blood and Marrow Transplantation, and the Worldwide Network of Blood and Marrow Transplantation.[7,8,19] It included a brief description of health conditions requiring stem cell transplantation and specific information about types of donors and functioning of stem cell donor banks. Donor numbers were given for HSCT and donation in Turkey. The similarities and differences between procedures for collection of blood and peripheral stem cells were described, and donation- and procedure-related complications were discussed.

The survey included 5 items that requested answers (yes or no) and some items included additional questions to expand and clarify the response (Table 1). The questions assessed (1) knowledge about the health benefits of HSCT, (2) knowledge about available information about stem cell banks and volunteer donation in Turkey, (3) knowledge about the HSCT procedure, and (4) experience and willingness about volunteering for blood and stem cell donation. A question about blood donation was included because blood donors among university students may have a more positive attitude about organ donation and transplantation.[20] When a student answered "yes" to question 4 (about prior blood donation) before the lecture or to question 5 (about willingness to donate stem cells) before or after the lecture, they were asked to explain their main reasons. Proportions of students with answers "yes" or "no" to each question were calculated, and reasons for motivation to donate were categorized.

Table 1. Questionnaire to Evaluate Knowledge and Attitudes of University Students About Hematopoietic Stem Cell Transplantation

Question 1. Is stem cell transplantation a life-saving treatment?
Yes
No
Question 2. Are you aware of stem cell donation, stem cell banking, and/or the number of voluntary stem cell donors in Turkey?
Yes
No
Question 3. Do you know anything about the stem cell collection procedure?
Yes
No
Question 4. Before the lecture: Have you ever donated blood?
Yes
No
If Yes, why/what prompted you?
After lecture: Would you like to donate blood?
Yes
No
If Yes, why?
Question 5. Would you like to donate stem cells?
Yes
No

Statistical analyses

Data were analyzed with statistical software (Statistical Package for the Social Sciences, version 15.0, SPSS Inc., Chicago, IL, USA). Descriptive statistics were generated for demographic data. Differences between proportions of answers (yes or no) were evaluated by the chi-square test. Comparison of the mean age of

medical students and law students was performed with Mann-Whitney *U* test. We used univariate and multivariate (logistic regression) analyses to estimate odds ratios for 1 standard deviation increase in the proportions of yes/no answers for each question from before to after the lecture. We calculated the 95% confidence intervals for each odds ratio. All tests were 2-tailed and statistical significance was defined by $P < .05$.

Results

All 301 students completed the questionnaire before and after the lecture (100% response). The mean age of participants was 18.4 ± 0.8 years. The 163 medical students included 103 women (63%) and 60 men (37%), and the 138 law students included 86 women (62%) and 52 men (38%). There were no differences in age or sex distribution within or between the medical and law students.

Univariate analysis showed significant differences from before to after the lecture in frequency of yes/no answers to questions 2 to 5 (Table 2). Multivariate analysis showed that responses to questions 2 to 5 after the lecture were highly significant predictors of education by the lecture (Table 2).

Before and after the lecture, most medical and law students responded that that they were aware about the life-saving potential of HSCT (question 1) (Table 3). There was no significant difference between medical and law students in yes/no proportions for question 1 before or after the lecture (Table 3).

Table 2. Responses to Questionnaire Evaluating Knowledge and Attitudes of University Students About Hematopoietic Stem Cell Transplantation*

Response	Before Lecture	After Lecture	Univariate	Multivariate	
			$P \leq$†	$P \leq$	Odds Ratio (95% Confidence Interval)
Question 1					
Yes	290 (96%)	294 (98%)	NS		
No	11 (4%)	7 (2%)			
Question 2					
Yes	10 (3%)	261 (87%)	.0001	.001	7.6 (5.5-10.3)
No	291 (97%)	40 (13%)			
Question 3					
Yes	24 (8%)	242 (80%)	.0001	.001	5.2 (4.1-6.7)
No	277 (92%)	59 (20%)			
Question 4					
Yes	34 (11%)	265 (88%)	.0001	.001	7.9 (5.9-10.6)
No	267 (89%)	36 (12%)			
Question 5					
Yes	194 (65%)	230 (76%)	.001	.02	1.3 (1.1-1.6)
No	107 (35%)	71 (24%)			

*N = 301 students. Data reported as number (%).
†NS, not significant ($P > .05$).

Before the lecture, most medical and law students responded that they had no knowledge of stem cell banking, numbers of voluntary donors in Turkey, or the HSCT procedure (questions 2 and 3) (Table 3). After the lecture, the frequencies of students who had knowledge about stem cell banking, voluntary donor numbers in Turkey, and the HSCT procedure were significantly greater for medical than law students (questions 2 and 3) (Table 3).

Before the lecture, few medical and law students responded that they had donated blood in the past (question 4) (Table 3). In the students who had donated blood in the past, most students replied that

Table 3. Responses to Questionnaire Evaluating Knowledge and Attitudes of University Medical and Law Students About Hematopoietic Stem Cell Transplantation

Response	Before Lecture		$P \leq$*	After Lecture		P ≤*
	Medical Students	Law Students		Medical Medical	Law Students	
No. of students	163	138		163	138	
Question 1						
Yes	154 (95%)	132 (96%)	NS	162 (99%)	136 (99%)	NS
No	9 (5%)	6 (4%)	NS	1 (1%)	2 (1%)	NS
Question 2						
Yes	4 (2%)	6 (4%)	NS	150 (92%)	111 (80%)	.001
No	159 (98%)	132 (96%)	NS	13 (8%)	27 (20%)	.001
Question 3						
Yes	13 (8%)	11 (8%)	NS	148 (91%)	94 (68%)	.001
No	150 (92%)	127 (92%)	NS	15 (9%)	44 (32%)	.001
Question 4						
Yes	17 (10%)	17 (12%)	NS	149 (91%)	116 (84%)	.001
No	146 (90%)	121 (88%)	NS	14 (9%)	22 (16%)	.001
Question 5						
Yes	123 (76%)	71 (51%)	.001	141 (87%)	89 (65%)	.001
No	40 (24%)	67 (49%)	NS	22 (13%)	49 (35%)	.001

*Comparison of responses between medical and law students. NS, not significant ($P > .05$).

Table 4. Responses Before Lecture to Questions About Reasons That Students Donated Blood in Past or Wanted to Donate Stem Cells

Response Before Lecture	Question 4 (Blood Transfusion Donated in the Past)		Question 5 (Wanted To Donate Stem Cells)	
	Medical Students	Law Students	Medical Students	Law Students
Total No. of students who donated blood (question 4) or wanted to donate stem cells (question 5)	17	17	123	71
Motivated by information received from media sources, eg, television, radio, newspaper, and Internet	12 (70%)	10 (58%)	83 (68%)	30 (42%)
Had a relative, friend, or acquaintance who needed blood transfusion (question 4) or some type of organ transplant (question 5)	3 (18%)	4 (24%)	25 (20%)	20 (28%)
No clear reason given	2 (12%)	3 (18%)	15 (12%)	21 (30%)

they were motivated by information they had received from media sources including television, radio, newspaper, and the Internet and some students replied that they had a relative, friend, or acquaintance who had needed a blood transfusion (Table 4). After the lecture, significantly more medical than law students replied that they wished to donate blood (Table 3).

Before and after the lecture, a higher frequency of medical students than law students responded that they wanted to donate stem cells (question 5) (Table 3). In the students who responded (before the lecture) that wanted to donate stem cells, most medical students replied that they were motivated by information they had received from media sources including television, radio, newspaper, and the Internet, and some students told us that they had a relative, friend, or acquaintance who had needed some type of organ transplantation (Table 4). Before the lecture, all students who had donated blood previously expressed willingness to donate stem cells.

Discussion

The present study evaluated how HSCT-related education may affect the knowledge and attitudes of university students about stem cell donation and transplantation. The HSCT from matched-related donors has been performed for many years with good results.[1,2] Unrelated HSCT is gaining popularity worldwide because of the limited number of suitable related donors and the long waiting times for transplantation.[3-5] According to a recent activity survey by the European Group for Blood and Marrow Transplant,[8] the number of unrelated stem cell donors in Turkey does not meet the increasing demand, mainly because of difficulties recruiting volunteers. Many Turkish people are unaware of the shortage of unrelated donors for HSCT. Various strategies have been undertaken to expand donor pools in many countries, particularly for solid-organ transplantations.[12-15] Good knowledge of HSCT and stem cell donation in health care professionals can increase the numbers of unrelated donors.[11]

Numerous studies that have evaluated knowledge and attitudes among students in Turkey about organ and blood donation.[19,21-23] However, a literature search showed no such information available about donation for HSCT. In the present study, medical students were of specific interest because this group is likely to be informed about health issues in ways that are not representative of the general population.[16] The study participants were from all geographic regions of Turkey and had different levels of previous health knowledge. Therefore, these students may be representative of the younger generation in Turkey.

We observed no significant differences between medical and law students in frequency of previous knowledge about stem cell banking, voluntary donation in Turkey, or the HSCT procedure (Table 3). After a brief lecture on HSCT, a significantly greater proportion of medical students were aware of stem cell banking, voluntary donation in Turkey, and the HSCT procedure (Table 3). Absorption of the targeted HSCT education by medical students is evidence that this group may help expand recruitment of young people as stem cell donors.

The present findings suggest that first-year university students can become well informed about

stem cell donation with a brief lecture. A previous study showed that knowledge about stem cell donation is strongly associated with higher level of university education.[18] Donor recruitment for HSCT may be expanded by adding lectures to the university curriculum that inform students and discuss the supply and demand issues about stem cell donors.

In numerous countries including Turkey, the main barriers to stem cell donation are social, economic, and cultural factors.[8,16,18,19,23-25] In the present study, > 60% medical students indicated that media affected their willingness to donate stem cells (Table 4). To date, media such as television, radio, and newspapers have been the primary sources of information about organ donation and transplantation[14] Media reports may positively affect public attitudes about HSCT and donation in Turkey.

Another important finding was that all students who had donated blood before the study expressed willingness to donate stem cells before the brief HSCT lecture. Previous investigators have reported that potential stem cell donors with previous blood donation history were more willing to attend a stem cell donation program than people without such history.[26,27] During the lecture, it was emphasized that being a stem cell donor for peripheral HSCT carries similar risk to blood donation during the collection period. The frequency of severe adverse events and complications for donors in HSCT is ≤ 1%.[28] This information may have helped the participants decide to possibly become stem cell donors.

The number of students in the present study was limited. In addition, the survey before and after the lecture occurred on the same day, and there was no follow-up about possible changes in the decision of participants to donate or whether the intention to donate resulted in donation. Despite these limitations, the present results suggest that brief HSCT-targeted education in first-year university students may increase knowledge and awareness of this procedure and related issues, and may encourage positive attitudes about stem cell donation. Such an effect in the university population may help expand the number of voluntary stem cell donors in the general population of youths. Targeted education may have similar effects in other communities that have insufficient information about HSCT and stem cell donation.

References

1. Appelbaum FR. Hematopoietic-cell transplantation at 50. *N Engl J Med*. 2007;357(15):1472-1475.
2. Hurley CK, Baxter Lowe LA, Logan B, et al. National Marrow Donor Program HLA-matching guidelines for unrelated marrow transplants. *Biol Blood Marrow Transplant*. 2003;9(10):610-615.
3. Dehn J, Arora M, Spellman S, et al. Unrelated donor hematopoietic cell transplantation: factors associated with a better HLA match. *Biol Blood Marrow Transplant*. 2008;14(12):1334-1340.
4. MacMillan ML, Davies SM, Nelson GO, et al. Twenty years of unrelated donor bone marrow transplantation for pediatric acute leukemia facilitated by the National Marrow Donor Program. *Biol Blood Marrow Transplant*. 2008:14(suppl 9);16-22.
5. Karanes C, Nelson GO, Chitphakdithai P, et al. Twenty years of unrelated donor hematopoietic cell transplantation for adult recipients facilitated by the National Marrow Donor Program. *Biol Blood Marrow Transplant*. 2008;14(suppl 9):8-15.
6. Ballen KK, King RJ, Chitphakdithai P, et al. The National Marrow Donor Program 20 years of unrelated donor hematopoietic cell transplantation. *Biol Blood Marrow Transplant*. 2008;14(suppl 9):2-7.
7. Gratwohl A, Baldomero H, Aljurf M, et al. Hematopoietic stem cell transplantation: a global perspective. *JAMA*. 2010;303(16):1617-1624.
8. Passweg JR, Baldomero H, Gratwohl A, et al. The EBMT activity survey: 1990-2010. *Bone Marrow Transplant*. 2012;47(7):906-923.
9. Yoshimi A, Suzuki R, Atsuta Y, et al. Hematopoietic SCT activity in Asia: a report from the Asia-Pacific Blood and Marrow Transplantation Group. *Bone Marrow Transplant*. 2010;45(12):1682-1691.
10. Ahmed SO, Ghavamzadeh A, Zaidi SZ, et al. Trends of hematopoietic stem cell transplantation in the Eastern Mediterranean region, 1984-2007. *Biol Blood Marrow Transplant*. 2011;17(9):1352-1361.
11. Denzen EM, Majhail NS, Stickney Ferguson S, et al. Hematopoietic cell transplantation in 2020: summary of year 2 recommendations of the National Marrow Donor Program's System Capacity Initiative. *Biol Blood Marrow Transplant*. 2013;19(1):4-11.
12. Siminoff LA, Gordon N, Hewlett J, Arnold RM. Factors influencing families' consent for donation of solid organs for transplantation. *JAMA*. 2001;286(1):71-77.
13. Konaka S, Kato O, Ashikari J, Fukushima N. Modification of the education system for organ procurement coordinators in Japan after the revision of the Japanese Organ Transplantation Act. *Transplant Proc*. 2012;44(4):851-854.
14. Harbaugh C, Afana M, Burdick S, et al. Portrayal of organ donation and transplantation on American primetime television. *Clin Transplant*. 2011;25(4):E375-E380. doi: 10.1111/j.1399-0012.2011.01427.x.
15. Bapat U, Kedlaya PG, Gokulnath. Organ donation, awareness, attitudes and beliefs among post graduate medical students. *Saudi J Kidney Dis Transpl*. 2010;21(1):174-180.
16. Studts JL, Ruberg JL, McGuffin SA, Roetzer LM. Decisions to register for the National Marrow Donor Program: rational vs emotional appeals. *Bone Marrow Transplant*. 2010;45(3):422-428.
17. Switzer GE, Dew MA, Stukas AA, Goycoolea JM, Hegland J, Simmons RG. Factors associated with attrition from a national bone marrow registry. *Bone Marrow Transplant*. 1999;24(3):313-319.
18. Onitilo AA, Lin YH, Okonofua EC, Afrin LB, Ariail J, Tilley BC. Race, education, and knowledge of bone marrow registry: indicators of willingness to donate bone marrow among African Americans and Caucasians. *Transplant Proc*. 2004; 36(10):3212-3219.
19. Blood and Marrow Transplantation Subcommittee. Nonrelative donor Hematopoietic Stem Cell Workshop Report. *Turkish Society of Hematology Web site*. http://www.thd.org.tr/1/haberler/462/akraba-disi-hematopoetik-kok-hucre-verici-sorunlari-calistay-raporu. Accessed April 8, 2014.
20. Chen JX, Zhang TM, Lim FL, et al. Current knowledge and attitudes about organ donation and transplantation among Chinese university students. *Transplant Proc*. 2006;38(9):2761-2765.

21. Eser B, Kurnaz F, Kaynar L, et al. Are university students a favorable target group for blood donation campaigns? *Turk J Hematol.* 2010; 27(4):275-281.
22. Goz F, Goz M, Erkan M. Knowledge and attitudes of medical, nursing, dentistry and health technician students towards organ donation: a pilot study. *J Clin Nurs*. 2006;15(11):1371-1375.
23. Uskun E, Ozturk M. Attitudes of Islamic religious officials toward organ transplant and donation. *Clin Transplant*. 2013;27(1):E37-E41. doi: 10.1111/ctr.12058.
24. Schmidt AH, Solloch UV, Baier D, et al. Criteria for initiation and evaluation of minority donor programs and application to the example of donors of Turkish descent in Germany. *Bone Marrow Transplant*. 2009;44(7):405-412.
25. Kollman C, Weis T, Switzer GE, et al. Non-HLA barriers to unrelated donor stem cell transplantation. B*one Marrow Transplant*. 2001;27(6):581-587.
26. Sarason IG, Sarason BR, Slitcher SJ, Beatty PG, Meyer DM, Bolgiano DC. Increasing participation of blood donors in a bone-marrow registry. *Health Psychol.* 1993;12(4):272-276.
27. Beatty PG, Atcher C, Hess E, Meyer DM, Slitchter SJ. Recruiting blood donors into a local bone marrow registry. *Transfusion.* 1989;29(9):778-782.
28. Navarro WH, Switzer GE, Pulsipher M. National marrow donor program session: donor issues. *Biol Blood Marrow Transplant*. 2013;19(suppl 1):S15-S19.