

Research Article

# Knowledge, attitude and motivation toward stem cell transplantation and donation among Saudi population in Riyadh: Are Saudi people aware enough about the importance of stem cell transplantation and donation?

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## Abstract

**Objectives:** The aim of this study was to assess the knowledge, attitude and motivation toward stem cell donation among Saudi population in Riyadh, Saudi Arabia.

**Methods:** This is a cross-sectional study that was conducted at different malls in Riyadh. Selection of malls was done randomly according to the geographical distribution of Riyadh, in which sample size was calculated and distributed equally. The participants were asked to complete a questionnaire that addressed their knowledge, attitude and motivation toward stem cell transplantation and donation.

**Results:** Results of this study showed that population knowledge about stem cell transplantation and donation is considered to be low. Only (37.8%) has enough information about stem cell transplantation and donation. There is a positive correlation between level of education and participant's knowledge regarding stem cell transplantation and donation. The study revealed that 39.3% of participants have willingness for stem cell donation.

**Conclusion:** It has been found that two third of population expressed lack of knowledge about stem cell transplantation and donation. Also, only 40% of participants showed willingness for donation, and the most common reason for not donating stem cell was the lack of information about stem cell and the value of donation. While, increasing level of education was associated with better understanding of stem cell donation and its role in therapy and saving lives. Therefore, suitable campaign, advertising and counseling program for population is recommended to increase level of knowledge and motivation toward stem cell donation.

## Introduction

Stem cell transplantation is considered nowadays an important lifesaving therapy for various fatal blood diseases including cancers, certain inherited blood diseases, and some

diseases of the immune system (NHS). This type of cells differ from other cells in the body by having the ability to divide and renew themselves for long period as well as the ability to differentiate into all cells of the body (knowledge and perception). Working as a repair system within various types

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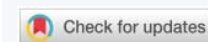
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Keywords: Stem cell transplantation; Donation; Saudi population; Knowledge; Attitude





of tissues is considered a character of stem cell by dividing to restore other cells [1].

Usually, Stem cells which known as hematopoietic stem cells originate from bone marrow and have the ability to differentiate to all blood cells types [1]. These stem cells are used in patient therapy to replace their damaged bone marrow as a result of disease like leukemia or as a result of complication due to radiation exposure and chemotherapy [2]. This kind of therapy can be done by collecting stem cells either from bone marrow, peripheral blood, or umbilical cord blood from newborns [1].

One of the main challenges that facing stem cells transplantation therapies is to find a perfect match; therefore it is important to find large number of donors. In this regard, many national and international organizations were established to satisfy the required need of stem cell transplantation. For example, the well-known international organization working in this field is the United State Bone Marrow Donor Organizations. Presence of this program in the United State leads to increase the number of blood cancer patient's transplantation by 100% per year [3]. Moreover, in Saudi Arabia, there is a recently recognized local agency called Saudi Stem Cell Donor Registry that was established in 2010 which is considered the first stem cell donors registry in Saudi Arabia and the Middle East [4]. This national registry was the extension of the previously established program in 2007 which known as Stem Cell Therapy Program at King Faisal Specialist Hospital and Research Center in Riyadh.

Few studies were conducted to assess the level of knowledge, and attitude of population toward stem cells transplantation and donation. Other studies were conducted among university students, revealed that the majority of the subjects had inadequate knowledge (69.1%) [5,6]. No available studies have been conducted among population in Saudi Arabia regarding their awareness about stem cell donation. Therefore, this study aims to evaluate the knowledge, attitude, and practice toward stem cells transplantation and donation among Saudi population.

## Objective of the study

The aim of this study was to:

- 1 Assess the knowledge, attitude and motivation toward stem cells transplantation and donation among Saudi population in Riyadh, Saudi Arabia and correlate it with their level of education.
- 2 Identify the major barriers, difficulties, and the willingness to become Stem cell donor.

## Materials and methods

### Design

This is a cross-sectional study that was conducted at

different malls in the capital city of Saudi Arabia, Riyadh. Malls were selected randomly according to the geographical distribution of Riyadh. Five Malls from Central, North, South, East and West of Riyadh were included in the study. Number of the participants was obtained equally from these malls. The included participants were anonymous, and they were asked to complete demographic data-sheet in addition to general questions that addressed their knowledge, attitude and motivation toward stem cells donation. The questionnaire was distributed in Arabic language, and then translated into English (back translation).

### Inclusion/exclusion criteria

This study includes general Saudi adults who are living in Riyadh city, with age of 15 years old and above, from both gender. The study excluded Non-Saudi adults or Children less than 15 years.

### Sample size

The sample size was calculated using the Cochran formula (1977). As there was no previous study in Saudi Arabia that assessed the knowledge and attitude of the public about stem cell donation, the expected prevalence for the knowledge was estimated to be 50%. Power of the study was 80% within a 95% confidence interval. Accordingly, the calculated sample size was 384 participants. However, as this study is a cluster-based type, the sample size was powered by the average design effect (D) of 1.5, 2, and 2.5. Thus, the pre-final calculation produced sample size of 768 participants. The sample was further increased by 5% to the account of the contingency such as non-response, incompleteness of the questionnaire or recording error. Therefore the total sample was 800 participants (160 participants from each mall). The results with P value < 0.05 will be considered statistically significant.

### Data Collection methods, instruments used, measurements

A self-administered questionnaire was used as study tool. The questionnaire includes 20 items that cover the following topics: socio-demographic variables (Age, sex, education level), variables that measure the level of knowledge (knowledge about the nature of the stem cell, stem cell donation, use of the stem cell, source of the stem cells, source of information, benefits from stem cells donation), what they think about stem cells donation, what the future of stem cells in Saudi Arabia. Attitude toward donating Stem cell, reasons for not donating, willingness to donate in the future. Practices of SCD, blood donation or organ donation. The original questionnaire was in English; however it was translated into Arabic Language and then was back translated to English. The tool will be piloted and will be analyzed to measure its reliability, validity as well as consistency using a 5% sample of participants. The enrolled participants in the pilot phase of the study will be excluded in the main part of the study. Coding of the answers will be established by the investigators.



## Data management and analysis plan

SPSS software statistical program (Ver. 20, USA) was used for statistical analysis. Descriptive analysis was used for categorical variables and chi-square test was applied to identify the main factors under study by using the statistical significance. Backward logistic regression was also used to find the association between factors related to level of knowledge, attitude and practices. Results were considered Significant when  $p$  value was  $< 0.05$ .

## Ethical considerations

The study was conducted after the approval was obtained from the KAIMRC (King Abdullah International Medical Research Center) IRB committee at Riyadh. The participants were enrolled in the study after getting a verbal consent from them.

## Results

### Sociodemographic characteristics

A total of 800 participants from different malls at Riyadh, Saudi Arabia filled the questionnaire. 370 participants (46.2%) were between 21 and 30 years, 408 (51%) were female, 60% were at secondary school or below level, and 40% were at university level (Table 1).

### Level of knowledge

Findings regarding the knowledge of Saudi population table 2 showed that approximately two thirds of the respondents had limited knowledge about stem cell transplantation and donation (62.2%), and the rest (37.8%) showed good knowledge of this matter ( $p = 0.107$ ). 140 (46.4%) within the age group 21-30 years had enough knowledge, and 238 (47.8%) of female showed limited knowledge.

**Table 1:** Sociodemographic characteristics of the participants.

Variables	Characteristics	No. (%)
Age Mean ( $\pm$ SD) Range 15-65 years.		27.9 $\pm$ 9.6 years
Age group	$\leq 20$ years	193 (24.1)
	21-30 years	370 (46.2)
	$> 30$ years	237 (29.6)
Gender	Female	408 (51.0)
	Male	392 (49.0)
Education level	Secondary and below	479 (59.9)
	University	321 (40.1)

**Table 2:** Level of knowledge on nature of Stem cell.

Variables		Limited knowledge	Enough knowledge	$p$ value
		No. (%)	No. (%)	
Age group	$\leq 20$ years	134 (26.9)	59 (19.5)	0.023*
	21-30 years	230 (46.2)	140 (46.4)	
	$> 30$ years	134 (26.9)	103 (34.1)	
Gender	Female	238 (47.8)	170 (56.3)	0.020*
	Male	260 (52.2)	132 (43.7)	
Education level	Secondary & below	309 (62.0)	170 (56.3)	0.107
	University	189 (38.0)	132 (43.7)	

## Knowledge about stem cell donation

The majority (40%) of the respondents reported that information about stem cell donation was obtained from Internet. The remaining participants reported that they obtained information from other sources such as television programs, friends, social media, magazine, and journals (28.5%, 27.7%, 27.6%, 17.5%, and 11.5%, respectively). No significant differences were found in the sources of information between respondents with enough or limited knowledge about stem cell donation (Tables 3,4).

### Perception on the source of stem cells

It has been revealed that the majority of the respondents (56.6%) believed that spinal cord is the source of stem cells. Others believed that either umbilical cord, blood, bone, or brain is the source of stem cells (21.6%, 18.5%, 15.9% and 10.3% respectively). No significant differences were found in the perception of the respondents on the source of stem cells between those with enough knowledge and limited knowledge except for those who thought that brain is the source of stem cells ( $p = 0.296$ ) (Table 3).

**Table 3:** Source of knowledge (Yes answer) on Stem Cell donation among the participants.

Sources of knowledge	Limited knowledge No. (%)	Enough knowledge No. (%)	$p$ value
knowledge on stem cell donation			
Internet	68 (13.7)	79 (26.2)	0.000
Social media	42 (8.4)	58 (19.2)	0.001
magazine	25 (5.0)	35 (11.6)	0.001
Journals	18 (3.6)	24 (7.9)	0.008
friends	51 (10.2)	53 (17.5)	0.003
Television programs	55 (11.0)	53 (17.5)	0.009
Perception on the source of Stem Cells			
Brain is the source	30 (6.0)	13 (4.3)	0.296
Spinal cord is the source	107 (21.5)	106 (35.1)	0.001
Umbilical cord is the source	37 (7.4)	43 (14.2)	0.002
Blood is the source	31 (6.2)	37 (12.3)	0.003
Bone is the source	25 (5.0)	33 (10.9)	0.002
information related to stem cell donation			
Saudi stem cell donor registry knowledge	37 (7.4)	51 (16.9)	0.000
registered for Stem cell donation	2 (0.4)	4 (1.3)	0.142
Willing to donate	182 (36.5)	132 (43.7)	0.044
Willing to donate organ	198 (39.8)	146 (48.3)	0.017
Donated blood	202 (40.6)	130 (43.0)	0.489
Reasons for unregistered on stem cell donation			
Health issues is the Reason	29 (5.8)	42 (13.9)	0.001
Side effect	75 (15.1)	68 (22.5)	0.008
Religion	10 (2.0)	11 (3.6)	0.161
Not knowing the place	88 (17.7)	72 (23.8)	0.034
Don't know that it's possible to donate	340 (68.3)	136 (45.0)	0.000
Other reasons	8 (1.6)	13 (4.3)	0.021



**Table 4:** Factors associated with knowledge regarding stem cell donation.

Factors	Poor knowledge	Good knowledge	Univariate model			Multivariate Model		
	No. (%)	No. (%)	OR	95% C.I	p value	AOR	95% C.I	p value
Age group								
≤ 20 years	134 (26.9)	59 (19.5)	1		0.024*	1		0.039*
21-30 years	230 (46.2)	140 (46.4)	1.38	0.95- 2.00		1.31	0.90 - 1.91	
> 30 years	134 (26.9)	103 (34.1)	1.75	1.17 – 2.60		1.69	1.13 - 2.54	
Gender								
Female	238 (47.8)	170 (56.3)	1			1		
Male	260 (52.2)	132 (43.7)	1.41	1.056 - 1.88	0.020*	1.40	1.05 - 1.88	0.024*
Education level								
Secondary and below	309 (62.0)	170 (56.3)	1					
University	189 (38.0)	132 (43.7)	1.27	0.95- 1.70	0.108	1.21	0.90 - 1.63	0.210
Knowledge on Saudi SCDR								
No	496 (99.6)	298 (98.7)	1					
Yes	2 (0.4)	4 (1.3)	2.53	1.61 – 3.97	0.001*	2.91	0.52 - 16.28	0.224
Fear of donation side effects)								
No	423 (84.9)	234 (77.5)	1					
Yes	75 (15.1)	68 (22.5)	1.64	1.14 – 2.36	0.008*	1.51	1.04 - 2.19	0.030*

OR: Odds Ratio; AOR: Adjusted Odds Ratio. \*Significant p value  
 SCDR: Stem Cell Donation Registry. <sup>a</sup>considering those responding with 50% and more on correct answers of knowledge.

### Information related to stem cell donation

Several questions within the questionnaire were used to assess the participant’s information related to stem cell donation.

Only six (1.7%) of the respondents registered for stem cell donation (Four with enough knowledge, and two with limited knowledge, *p* value = 0.142).

88 (24.3%) of the respondents had a knowledge about Saudi stem cell donor registry (*p* = 0.142), 83.6% donated blood during their life (*p* = 0.489), 88.1% showed willingness to donate organ (*p* = 0.017), while 80.2% showed willingness to donate stem cell in the future (*p* = 0.044).

### Reasons for unregistered on stem cell donation

For those who did not show willingness to donate stem cells in future, the majority (476 participants) don’t know that it is possible to donate, 143 of the respondents expressed fear of donation side effects which prevent them from donating, 160 don’t know where to donate, 71 considered health issues the cause for rejecting donation, 21 reported that religion is the reason, and 21 reported other reasons for that. No significant differences were found in the opinions regarding the causes which prevent the participants from donating between those with enough knowledge and limited knowledge except for those who referred the reason for religion (Table 3).

### Discussion

Emerging of Stem cell therapy has been recognized recently as a promise to treat several types of life-threatening diseases, such as cancer, and immune system diseases [6]. However, only few number of population (either general or specifically students at different medical colleges) have an idea about stem cell donation.

Relevant literatures revealed that few studies have been conducted to evaluate medical students -but not general population-awareness toward stem cell donation at different universities worldwide.

A study that was conducted at King Saud Bin Abdul-Aziz University for health sciences, Riyadh, Saudi Arabia, measured the knowledge and attitude of nursing students toward stem cell therapy, the finding revealed that 62.3% of the students had fair knowledge [7].

Another study showed that majority of nursing students at University Sains Malaysia, Malaysia had moderate knowledge about stem cell donation (81%) [8].

In addition to these results among nursing students, one study revealed that 70% of the students at college of Dentistry at Bengaluru, India had a good attitude toward stem cell, even their knowledge was insufficient (Mamatha B, Rekha R, et al. 2015).

Alongside with knowledge and attitude toward stem cell, knowledge and behaviors Regarding the Bone Marrow Registry was evaluated by conducting a study among College and Medical Students in Rhode Island (Medical students, Pharmacy students, Hard sciences, Humanities, and Graduate students), results of this study revealed that half of the respondents had the willingness to join this registry [9].

Another study that measured Willingness to Donate Bone Marrow among African Americans and Caucasians showed that 769 of the respondents out of 851 are aware that transplantation saves lives, and 273 of the respondents would be willing to become a donor [10].

In this study, which is considered unique among all studies since we evaluated knowledge and attitude of





general population at Riyadh, Saudi Arabia, toward stem cell donation. It has been found that majority of the participants had not enough information about stem cell transplantation and donation (62.2%), which could be attributed to the low educational level, since 60% of the respondents were at secondary school level or below. This result was opposite to what had been measured in different medical colleges and among Dentists at different countries who had a good background according to the nature of their presence at medical colleges.

Respondents who had either good knowledge or poor knowledge addressed that Internet, Social Media, Television program, and Friends were the major resources from where they get their background, these resources are considered unreliable and could not be correct always.

Due to their dependence on these unreliable resources, majority of the respondents thought that the source of stem cell is something other than spinal cord (Umbilical cord, blood, bone, and brain), while about third of them (35.1%) thought that spinal cord is the source of stem cell. More educational effort should be implemented by arranging for suitable campaign, advertising and counseling program for population is recommended to increase level of knowledge and motivation toward stem cell donation [9].

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