



KNOWLEDGE, AWARENESS AND PERCEPTION OF STEM CELLS RESEARCH AMONGST MALAYSIAN MEDICAL STUDENTS

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ABSTRACT

Stem cell research (SCR) is still a controversial topic due to safety and efficacy of stem cell therapy and the ethical and legal concerning the use of stem cells. This study aimed to evaluate the knowledge, awareness and perception of medical students in Malaysia towards stem cells and SCR. A cross-sectional survey was carried out using online questionnaires distributed to medical students via social network and e-mail. Total scores on selected questions were used to assess the level of knowledge. The highest possible score was 20. Data were analyzed using SPSS analysis. Results showed that majority of the participants were female (56.7) and Chinese (62.4%). Most of the students were aware of stem cells, although 78% mentioned that their knowledge was not obtained from their medical studies. Most respondents were aware of umbilical cord stem cells (81.5%) as compared to 24.8% awareness of fetal stem cells. The support for the use of embryonic as well as adult stem cells had increased from the initial support of 49.7% using stem cells for research purposes to 67.5% when they were asked to view SCR as a potential therapy for diseases. Regardless of their religion background, majority of the respondents mentioned that SCR using embryonic stem cells is not an acceptable practice in their religion. Nonetheless, their view on oocyte donation for research was associated with their religion background as most of the Muslims (64.5%) were against oocyte donation. Total score of knowledge ranged from 4 to 20 (mean 12.5±3.2). No significant association was found between any demographic factors and the level of knowledge. In conclusion, results showed that medical students were aware of stem cell concept but the exposure to this topic is still limited in their medical curriculum. A moderate level of knowledge was observed. The perception towards SCR was dependent on the source of stem cells.

1.0 Introduction

Stem cell research has attracted the attention of the society including medical practitioners due to its potential to restore

normal function to a wide variety of tissues damaged in the event of disease or injury (1-3). However, stem cell research and therapy has brought out many issues that are debatable among researcher and the public. This raises the question whether sufficient information on concept and uses of stem

cells is available to the healthcare provider as well as public to increase their awareness and understanding on the topic.

Stem cell research is fairly new in Malaysia. Majority of the work until now has involved hematopoietic stem cells from bone marrow, peripheral blood and cord blood (4). HSCT was established in the Institute of Pediatrics in 1994 and in Subang Jaya Medical Center, Hospital Kuala Lumpur, and Hospital Universiti Kebangsaan Malaysia in 1999 (2). Until 2008, a total of 1382 patients were transplanted nationwide and registered with the Malaysia Blood and Marrow Transplant Registry with cumulative results that are as good as any well-known centers in the West (4). Ministry of Health formulated the National Policy for Organ, Tissue and Cell Transplantation in 2007 (4). In the following year, the National Standards for Cord Blood Banking and Transplantation, the National Guidelines for Hematopoietic Stem Cell Therapy and the National Guidelines for Stem Cell Research and Therapy were released in order to promote, guide and regulate the practice of transplantation in Malaysia (4).

There is limited information available on the awareness and perception of medical students in Malaysia on stem cells and the research related to it. No previous studies have been done to determine the amount of exposure given to the students on this very specialized topic. Therefore, the awareness and perception of our future medical personnel on stem cells still remains uncertain. Collecting information from medical students on their awareness of stem cells and their perception towards stem cell research is important for the development of stem cell research as its applications are currently highly experimented in the medical field for the treatment of many diseases (5).

2.0 Materials and methods

This descriptive cross-sectional study was conducted from June to July 2014. A questionnaire was developed comprised of three parts. 'Part 1, with 7 questions, collected demographics data consisted of the respondent's age, gender, nationality, race, religion, year in medical school, and marital status. 'Part 2 was focused on the awareness (2 questions) of stem cell as well as 6 questions testing the knowledge of the respondent's on a few basic information regarding stem cells. Part 3 had 8 questions asking the respondent's perception towards SCR. A total of 20 items in part 2 (in 6 questions) evaluated the level of knowledge amongst participants. Score '1' was set to each correct answer and score '0' was set for each wrong answer including "not sure". Thus the highest possible score for each participant was 20.

Only medical students who were fluent in English were targeted for this survey. The link of online questionnaire was e-mailed to all medical students at UCSI with the help of their

faculty administrative staff. The e-mail contained a brief description of survey study and informed consent. The link also was shared in social networks (facebook) to recruit medical students from other universities in Malaysia. Since there were no previous studies available for sample size calculation, in order to statistically analyze the data, the sample size was estimated at a minimum of 100 participants. This study was thus considered as a pilot study.

The analysis of data was conducted by using SPSS software version 20.0.

3.0 Results

A total of 157 respondents from 2 medical schools participated in this survey. The participants were in the age group of 18 to 29 years and were not married. Majority were female and Malaysian (Table 1)

Table 1 Demographic characteristics of the respondents

<i>Characteristic</i>	<i>Frequency (%)</i>
<i>Female</i>	89 (56.7%)
<i>Male</i>	68 (43.3%)
<i>Malaysian</i>	149 (94.9%)
<i>Non-Malaysian</i>	8 (5.1%)
<i>Malay</i>	31 (19.7%)
<i>Chinese</i>	98 (62.4%)
<i>Indian</i>	25 (15.9%)
<i>Other</i>	3 (1.9%)
<i>Muslim</i>	31 (19.7%)
<i>Christian</i>	36 (22.9%)
<i>Buddhist</i>	61 (38.8%)
<i>Hindu</i>	19 (12.1%)
<i>Other</i>	10 (6.4%)

There were more responses from the Years 1 and 2 as shown in Figure 1. Majority of them were aware of the existence of stem cells (98.7%), however, most of the participants (n=123)

Table 2 Answers on stem cell knowledge

Statement: Stem cells can be differentiated into different types of cells that can then be grown into specialized tissues like muscles or nerves			
<i>True</i>	140 (89.2%) Expected answer		
<i>False</i>	10 (6.4%)		
<i>Not sure</i>	7 (4.5%)		
Statement: Nowadays, stem cells are usually extracted from human embryos without destroying them			
<i>True</i>	76 (48.4%)		
<i>False</i>	62 (39.5%) Expected answer		
<i>Not sure</i>	19 (12.1%)		
Statement: Do adult stem cells have the same potential as embryonic stem cells?			
<i>Yes</i>	40 (25.5%)		
<i>No</i>	94 (59.5%) Expected answer		
<i>Not sure</i>	23 (14.6%)		
Which stem cells were the respondents aware:			
<i>Type</i>	Yes	No	Not sure
<i>Adult stem cells</i>	84 (53.5%)	28 (17.8%)	45 (28.7%)
<i>Embryonic stem cells</i>	123 (78.3%)	17 (10.8%)	17 (10.8%)
<i>Peripheral blood stem cells</i>	50 (31.8%)	55 (35%)	52 (33.1%)
<i>Umbilical cord stem cells</i>	128 (81.5%)	17 (10.8%)	12 (7.6%)
<i>Induced pluripotent stem cells</i>	53 (33.8%)	68 (43.3%)	36 (22.9%)
<i>Fetal stem cells</i>	39 (24.8%)	73 (46.5%)	45 (28.7%)
Which stem cell characteristics the respondents know about:			
<i>Characteristic</i>	Agree	Disagree	Not sure
<i>Can self-proliferate through cell division</i>	115 (73.2%)	6 (3.8%)	36 (22.9%)
<i>Can differentiate to specialized cells</i>	139 (88.5%)	3 (1.9%)	15 (9.6%)
<i>Can be used for treatment</i>	128 (81.5%)	11 (7.0%)	18 (11.5%)
<i>Can regenerate and repair damaged tissue</i>	123 (78.3%)	10 (6.4%)	24 (15.3%)
<i>Can give rise to certain cancers</i>	56 (35.7%)	19 (12.1%)	82 (52.2%)

said that they were not exposed to the stem cell topic during their medical studies (Figure 2).

For further evaluation of the students' general knowledge on stem cells, they were given few questions and statements to answer. Majority of participants were aware of embryonic stem

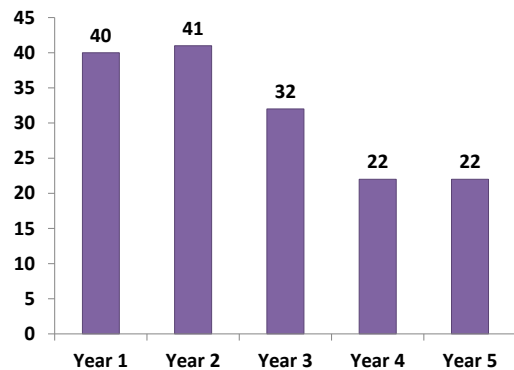
cells whilst less awareness was observed on fetal stem cells and induced pluripotent stem cells. The results from the respondents are shown in Table 2.

The results for the opinion of the respondents towards stem cell research done on adult stem cells, ESCs, and umbilical cord

Table 3 Application of different sources of stem cells from different points of view

Question: As part of the medical profession, is it acceptable to conduct research on human embryos that are a few days old for the future of medicine if the Malaysian policy allows this			
	Agree	78 (49.7%)	
	Disagree	64 (40.8%)	
	Not sure	15 (9.6%)	
Question: Stem cells from the following different sources for research on treatments for diseases such as Parkinson's, Alzheimer's, cancer, diabetes or heart diseases are acceptable			
Source:	Agree	Disagree	Not sure
Embryonic stem cells	106 (67.5%)	30 (19.1%)	21 (13.4%)
Adults stem cells	116 (73.9%)	25 (15.9%)	16 (10.2%)
Question: From a religious stand point, do you think that research using human stem cells is ethical or unethical?			
Source:	Unethical	Ethical	Not sure
Embryonic stem cells	82 (52.9%)	47 (30%)	28 (17.2%)
Adult stem cells	80 (52.2%)	48 (30%)	29 (17.8%)

stem cells showed that research using umbilical cord blood had the most support (89.2%), while using embryos for research obtained the least amount of votes (38.9%) (Table 3).

**Fig. 1:** The number of respondents from each Year in medical school

Results tabulated in Table 3 suggested that the support for the use of embryonic as well as adult stem cells had increased from the initial support of 49.7% (using stem cells for research purposes) to 67.5% when they were asked to view stem cell research as a potential therapy for diseases.

Figure 3 shows the breakdown of religious point of view of participants on embryonic stem cell research.

To study the perception of the respondents towards oocyte donation for research purposes, they were given a question to ask if they agreed to the idea of egg or oocyte donation for stem cell research. Responses are summarized in table 4.

Table 4 Opinion of an embryo and its origin for research

Statement: "Research with stem cells from human embryos is acceptable if its origin is..."		
Embryos left over from IVF treatments and will not be implanted in patients.		
<i>Agree</i>	<i>Disagree</i>	<i>Not sure</i>
104 (66.2%)	30 (19.1%)	23 (14.6%)
Hybrid embryos created specifically for SCR, and destroyed after stem cell extraction.		
<i>Agree</i>	<i>Disagree</i>	<i>Not sure</i>
78 (49.7%)	29 (18.5%)	50 (31.8%)

Results showed that Muslims participants were the largest group amongst those against oocyte donation (64.5%), followed by the Christians (Figure 4).

Total score of knowledge ranged from 4 to 20 (mean 12.5 ± 3.2). Even male participants have higher level of knowledge (mean 13.43 ± 3.1) compared to female participants (11.79 ± 3.1) but the difference was not significant. There was no association between level of knowledge/awareness and demographic characteristics including gender, race, religion, Year in medical school, and university. Also religion did not have a significant effect on the respondent's perception of stem cell research ($p > 0.05$).

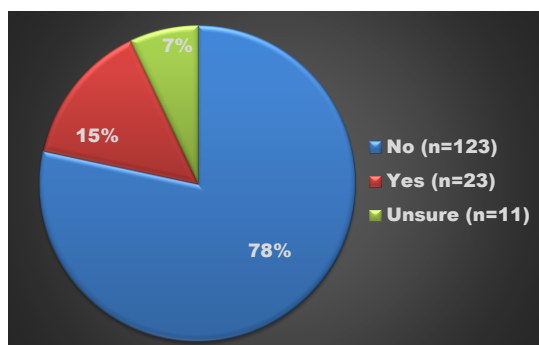


Fig. 2: The exposure to stem cells during medical studies

4.0 Discussion

The results showed that majority of the respondents were aware of the existence of stem cells (98.7%) which correlated to the awareness study done in Germany (6). However, results from this survey indicated that there was no association between stem cell awareness with gender, nationality, race, religion or year of the respondents in medical school. Majority of the participants (78%) said that they were not exposed to the topic of stem cells during their studies. This suggested that the respondents' knowledge regarding stem cells were obtained from information gathered on their own, and not from their medical syllabus. In a similar study in Pakistan on medical students and doctors, 80% of the respondents said that they had heard of embryonic stem cell research through the media, 15% obtained information from friends and family and only 5% learnt about through a medical course (7).

Basic knowledge on stem cells was rather inconclusive as although 89.2% answered correctly regarding stem cell differentiation, only 59.5% answered correctly on the potential of adult and embryonic stem cells, and even lower number of respondents (39.5%) answered correctly for the destruction of embryos during the stem cell extraction. A previous stem cell survey which was carried out in Australia concluded that

majority of those aware of stem cell research were found to know very little or nothing about the topic (8). The umbilical cord stem cells had the highest votes for awareness and support amongst the other types of stem cells (81.5%). This finding is similar to surveys conducted in Canada, US, EU, and Australia where majority of all countries showed greater support for cord-blood stem cell research (8). A possible explanation for this was because the umbilical cord stem cells had been very well commercialized by the media and cord-blood banking industries over the past few years.

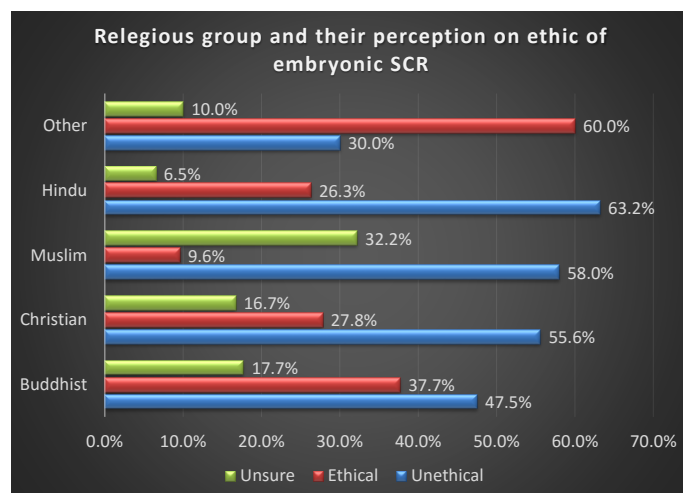


Fig. 3: The religious groups and their perception on ethicality of embryonic SCR

When comparing the knowledge between students of different Years in medical studies, findings found no significant relationship between knowledge and Year in medical school which is in agree with the results from other research in Pakistan (7).

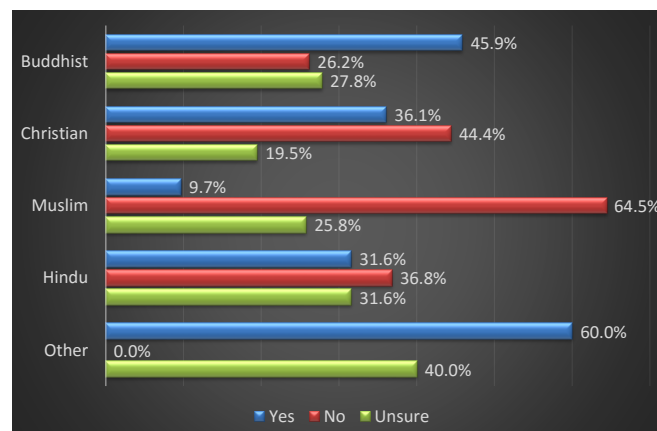


Fig.4: Opinion on oocyte donation according to their religious groups

When looking from a religious point of view, 51% of the respondents in this survey felt that it was unethical to conduct

embryonic stem cell research. However, results from this study indicated that religion did not play a role in the respondents' perception of SCR. These findings did not correspond to a previous public survey conducted in the US which suggested that there was a role of religion in the opinion of stem cells, as the Protestants (Christian) were more likely to disagree on stem cell research. The insignificant result obtained from this study could be because majority of the sample population were Buddhist, and there was insufficient sampling data from those in other religious groups. When correlating religion to the respondent's opinion on oocyte donation, results showed that religion does play a role in the perception towards oocyte donation for research purposes. The findings of this study correlated to the stem cell study done in Pakistan (2009) with majority of the respondents being Muslim (7). On the contrary, an Australian survey in showed strongest objection from the Christian community for the use of embryos in research²⁸. The differences in these findings between countries could be because this study as well as the study in Pakistan did not have sufficient data from different religious groups. It has been reported that those with similar religion tend to have similar views on embryonic stem cell research (9-11).

On the origin of the embryos used for research, the respondents seemed to prefer embryos that were left-over from IVF treatments than hybrid embryos created solely for the use of research. These results correlated to a public survey conducted in US (12).

5.0 Conclusion

The level of stem cell awareness amongst medical students did not depend on their education background. The students were aware of stem cells despite the lack of exposure from their medical curriculum itself. The umbilical cord stem cells had the highest number of awareness possibly due to public commercial resources and stem cell banking services. The results indicated that although there was a high level of awareness towards stem cells, there was a poor level of general knowledge on the topic. Nonetheless, despite low level of knowledge on SCR, there was high level of perception. Although no correlation was identified between religion and perception towards SCR, it was found that religion did play a part in the respondent's view on oocyte donation for research purposes.

The survey also showed that majority of the students were interested to learn more about stem cells research, which suggested that perhaps this topic could be added to their syllabus so that they obtain proper information instead of gaining their knowledge from commercial resources. Future studies should involve a larger sample population perhaps involve all medical universities in Malaysia in order to obtain a more generalized conclusion on the views on our future

medical professionals.

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