KAP STUDY

Knowledge & Attitude regarding Stem Cells research and its applications among Residents of a Tertiary Care Hospital in Karachi, Pakistan

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Abstract

Objective: The importance and potential of the use of stem cells as therapeutic tools is enormous and therefore, health professionals should be expected to have thorough knowledge and a positive attitude towards their utilization in medical practice. Hence this study was carried out to report and assess the knowledge and attitude regarding stem cell in our region.

Methodology: The study was conducted amongst the residents employed at the Aga Khan University hospital, Karachi Pakistan from September-October 2022 with a sample size of 57.

Results: Amongst our survey participants, 33 (54.2%) responded with a score of 48 and above (i.e., 60% or above); 25 (40.9%) of the study participants scored between 50-60% only 3 (4.9%) had a score 40-50%

Conclusion: Our survey shows a reasonable level of knowledge of the generic principles and implications Stem cell therapy amongst the residents

Keywords: Stem cell, Head and Neck, Risk, Cell, Tissue, Therapy. (JPMA 73: S-14 [Suppl. 1]; 2023)

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Introduction

Stem cells are defined as cells that can regenerate tissues and organs by differentiating into various cell lineages.[1] Stem cells have the ability of pluripotency and the maintenance of a basal level of cellular population.[2] Stem cells are found in both embryonic and adult tissues and are generally classified based on their ability to differentiate. Totipotent stem cells can divide to form any cell in the entire organism and therefore have the greatest potential to differentiate. The classic example for a totipotent stem cell is the zygote, formed after fertilization. Pluripotent stem cells are a step down from totipotent cells, wherein they can divide to form cells found in all three germ layers but are unable to form extraembryonic structures such as embryonic stem cells. Multipotent stem cells have an even lower potential to differentiate, with differentiation restricted to specific cell lineages only such as the hematopoietic stem cell which is an example of an adult stem cell. Moreover, stem cells that can only differentiate into one specific cell lineage are called oligo-potent stem cells and stem cells that only can differentiate into one specific cell type are called unipotent stem cells.[3] Thus, stem cells have the critical ability to replenish and regenerate dying cells to maintain tissues and organ systems, due to both normal turnover or injury.[2,4] Moreover, in addition to that, stem cell therapy has also been shown to be useful in a multitude of degenerative disorders including chronic myeloid leukemia, cirrhosis, pulmonary fibrosis, heart failure, Crohn's disease, diabetes mellitus and nervous system disorders.[2] In addition to this, stem cells have also been used in the development of targeted drug therapy[2] as well as used in solid organ transplantation as a means to permit allograft survival without the use of immunosuppressive medications.[5]

Consequently, the importance and potential of the use of stem cells as therapeutic tools is enormous and therefore, health professionals should be expected to have thorough knowledge and a positive attitude towards their utilization in medical practice. Several studies have been conducted in the past investigating this parameter in multiple parts of the world. A study done in Malaysia among nursing students revealed that while these students possessed moderate knowledge regarding stem cells, they had a positive attitude towards their utilization in medicine.[6] Another study from Saudi Arabia among doctors and medical students found poor knowledge, attitude and practice regarding the use of stem cells in the management of diabetes mellitus.[7] A third study, also conducted in Saudi Arabia, revealed a lack of knowledge regarding hematopoietic stem cell transplantation among the majority of medical students surveyed, with most concerned about its long term effects.[8] A similar study was also conducted at the Mayo Medical School in Rochester, Minnesota which identified multiple knowledge gaps among medical students regarding hematopoietic stem cell donation.[9] In addition to these,

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there are other similar studies as well that report positive attitudes towards stem cells, however, with a significant knowledge gap among both medical students and physicians which may impair their ability to sufficiently educate patients regarding the risks and benefits associated with stem cell therapies.[10,11] Hence, it is imperative that the knowledge, attitude and practice regarding stem cells is assessed in Pakistan as well, a region in which no such study has yet been conducted to the best of our knowledge. Thus, this project was carried out among surgical residents at a tertiary care hospital in Karachi, Pakistan to ascertain their depth of knowledge regarding stem cells and their use in medicine. Our survey intends to further obviate the areas of sociological and economic surveys that would aid future policy makers to stratify the audience of stem cell based research and would aid them with proper dissemination of knowledge in order to tap into the resource of stem cell therapy.

Material and methods

The study was conducted amongst the residents employed at the Aga Khan University hospital, Karachi Pakistan from September-October 2022. The questionnaire was disseminated via google forms link and the form is planned to be deleted after 6 months of the study.

Sample size was calculated by using WHO sample size calculator. By considering means of knowledge and attitude, the highest sample size calculated was by using mean of knowledge as 2.05 ± 0.47[10], a relative precision of 0.06 and a confidence level 95%. The required sample size was 57. Consecutive Non-probability sampling technique was used. All residents at the Aga Khan University Hospital, Karachi, Pakistan were included and those who do not give consent to participate in this study were excluded. A self-structured questionnaire was distributed amongst the residents of the Aga Khan University. After collection of demographic data, the structured questionnaire evaluated the over-all perspective of the residents based on a total of 30 questions. The questionnaire was categorized into Basic knowledge (10 questions), knowledge of potential application of stem cells (4 questions), knowledge of existing therapeutic applications of stem cells (4 questions); knowledge of potential research avenues on stem cells (2 questions) and lastly Attitude on stem cells (10 questions) as shown in Table 1 and 2.

A 5-point Likert-scale was employed to assess the knowledge and attitude sections of the questionnaire: "strongly agree" (4); "agree" (3); "neutral" (2), "disagree" (1) and "strongly disagree" (0). The coding of the responses will be based on the accuracy of the knowledge statements and the positivity of the attitude statements. Reverse coding was applied to the questions with the false assertion i.e. Questions 5,6,9,10,15 and 16.

A total knowledge questions of 20 as included in the study questionnaire was scored from zero to 80 and an attitude score was calculated off of 10 questions ranging from zero to 40.

Statistical Analysis: Data was collected from google forms

Table-1: Questionnaire

Q #	Questions	Q #	Questions
1	I am familiar with different types of stem cells such as adult and embryonic stem cells	11	Stem cells can be used to study early human development (true)
2	I am familiar with sources of stem cells	12	Stem cells can be used to understand pathophysiology and analyses disease mechanisms by modelling disease in a culture dish outside the human body (true)
3	I am familiar with the three germ layers (i.e., endoderm, mesoderm and ectoderm), and organs and tissues generated from each layer	13	Stem cells can be used to test and screen new drug candidates and toxins to figure out their potential side effects (true)
4	Self-renewing is the ability of a stem cell to produce more stem cells with identical characteristics as the "parent" cell (true)	14	Stem cells can be used to replace or restore tissues that have been damaged by disease or injury, such as diabetes, heart attacks, Parkinson disease, skin burns, or spinal cord injuries (true)
5	Adult stem cells are pluripotent cells that have the potential to make all cell types of the body (false)	15	There is a wide range of conditions or diseases for which stem cell therapies have been proven to be safe and effective such as osteoarthritis and multiple sclerosis (false)
6	Bone marrow is the only source for adult stem cells (false)	16	- Bone marrow derived stem cells can spontaneously regenerate into different cell types such as hepatocytes and neural cells without manipulation in the lab (false)
7	Stem cells can differentiate into many cell types within a germ layer (true)	17	I am confident with my ability to answer patients' questions regarding therapeutic uses of stem cells
8	Embryonic stem cells are derived from leftover blastocysts after in vitro fertilization (true)	18	If the balance is skewed between differentiation and self-renewing properties of stem cells, it may result in tumor formation (true)
9	Embryonic stem cells are derived from umbilical cord after childbirth (false)	19	I would be comfortable giving an explanation of induced pluripotent stem cells (iPSCs)
10	Embryonic stem cells are derived from trophoblast of blastocysts (false)	20	Adult cells can be "reprogrammed" genetically to assume stem cell-like state (true)

Table-1: Attitude Based Questions

Q #	Questions
1	I am interested in expanding my knowledge about stem cells
2	I would consider a well-structured program or training of continuing medical education focusing on stem cell science
3	I am willing to use stem cells as therapies in my practice
4	Regulations are needed to control the use of stem cells as therapies
5	Doctors should discourage patients from trying unproven stem cell therapies
6	Government should spend money to support stem cell research
7	Transitional process of taking stem cell therapy from the laboratory through clinical trials should be encouraged
8	People should consider donation of bone marrow for a public bank
9	People should consider donation of umbilical cord blood of their babies for a public bank
10	I am willing to pay money for preserving the umbilical cord blood of my baby in a private bank for later use if a therapeutic need arises

and a conversion from excel sheet to SPSS was done. Data entry and analysis were performed using IBM Statistical Package for Social Sciences (SPSS) Version 21.0. Categorical variables such as age (below or above 30) gender, year of residency, specialty of residency and source of knowledge are presented as proportions and frequencies. A knowledge and attitude scores of 60% and above were considered as good outcomes.

Results

Demographics

Participants in the electronic survey included 61 consenting residents currently employed. Out of a total of 61 participants, 36 (59%) of the respondents were female whereas 25 (41%) were male as depicted in Figure 1. Considering the age distribution, 47 (77%) were above 30 years of age whereas 14 (23%) were below 30 years. The residency level showed a distribution of 14 (23%) year-I residents, 14 (23%) year-II residents, 9 (14.8%) year-III residents, 17 (29.5%) year-IV residents and a collective 7 (9.9%) of year V residents amongst the respondents as shown figure 2. The responding specialties were 51 (85%) of the respondents from the department of surgery with major contributions from General surgery were 18 (29.5%), Otolaryngology Head and Neck Surgery were 12 (21.3%) and Ophthalmology were 4 (6.6%). Only 9 (14.75%) of the participants were from non-surgical specialties and Ob/Gyn.

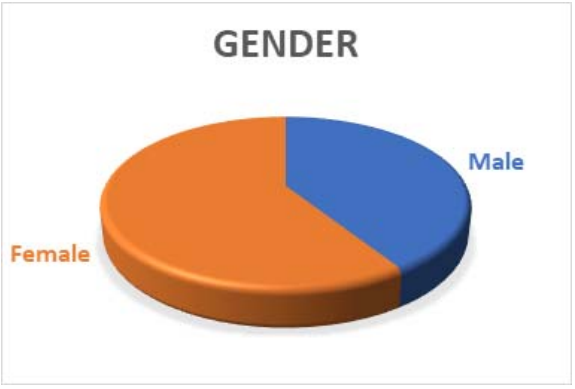

Figure-1: Gender Distribution

Knowledge of Stem Cell Research and Applications

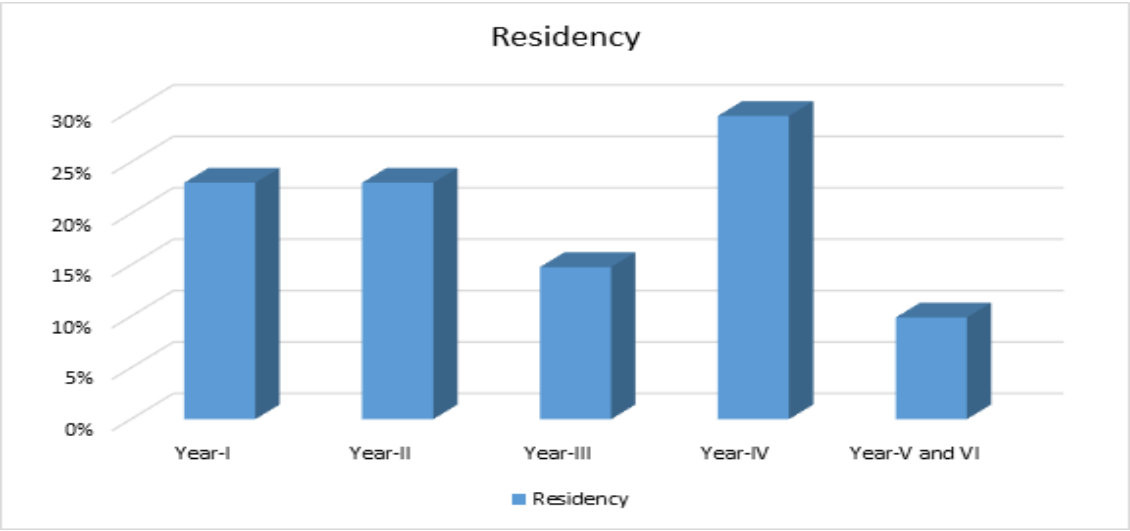

Figure-2: Year of Residency

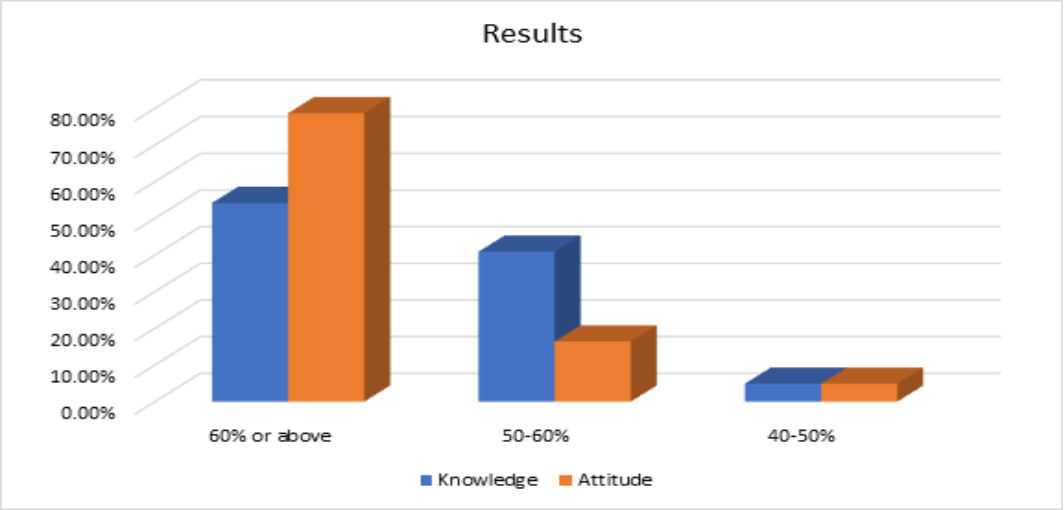

Figure-3: Gradation of Responses in Knowledge and Attitude based answers

The Questionnaire was categorized as basic knowledge of Stem cells and subcategories of Knowledge on potential applications, therapeutic Implications and Research avenues of Stem cell therapy. Amongst our survey participants, 33 (54.2%) responded with a score of 48 and above (i.e. 60% or above); 25 (40.9%) of the study participants scored between 50-60% only 3 (4.9%) had a score 40-50% and none scored below the 40% mark as depicted in Figure 3

Attitude of Residents regarding Stem Cell therapy and Research

The survey evaluated the attitude of the respondents based on 10 different questions and based on the Likert scoring a total out of 40 was calculated. The study showed 48 (78.6%) individuals with a Positive attitude towards stem cell research and applications with a cumulative score of 60% and above. 10 (16.3%) individuals scored between 50-60%; the remaining 3 (4.9%) individuals scored between 40-50% and none scored below 40% as depicted in Figure 3.

Sources of Knowledge of Stem Cells Research and applications

Our survey showed Internet 40 (65.6%) and Books 38 (63.9%) being the major contributors for sources of the knowledge of Stem cells. In the ancillary sources, the sources opted were lectures by 20(32.8%) of the respondents, media by 12(19.7%), medical Journals and articles by 11(18%) and Workshops by 7(13.1%). The least opted options were panel discussions and Medical conferences.

Discussion

The knowledge of stem cells is essentially derivative in medical professionals unless a particular application of the technology is in day-to-day use. The developing nations are primarily focusing on the agenda of health care for all and there is a significant landscape of emerging technology that can essentially fall through the cracks. In a study by the survey showed a major area of potential knowledge gap and highlighted the implications of nurturing the newer technological minds. This study focusing two key areas pertaining to stem cells therapy i.e., Knowledge both of basic principles and of the applications and the attitude towards the technology.

In comparison with a Jordanian study, our survey population was shown to have low/moderate knowledge in 45.8% of the respondents whereas their population showed it to be 51.3%. The differences between their study population and the present cohort were that a more stringent cut-off was employed in the present study of 60% and above to categorize good knowledge as compared to 50% in the study carried out by kheirallah et al.[10]. However, our results fell short of an Italian study which reported good knowledge in 59% of their medical professionals.[12]

In terms of attitude, our survey had generic attitude-based questions not delving into the deeper aspects of sociological and economical aspects of the technology. Our study population showed a good attitude in 78.6% of the participants whereas in a study conducted by kheirallah et al. the authors reported 66.8% amongst their study cohort.[10] Their study further evaluated the

hesitations of their physicians in counselling of patients whereas since our study mainly comprised of residents, such questions were not included in the survey. The survey included 2 questions particularly referring to umbilical cord blood-based research and applications which showed negative responses in 9.8% and 21.3% of the participants respectively. There have been variable responses to various categories in attitude-based questions as these opinions are largely associated with sociological and economic norms of the loco-regional population. In a publication by Frati et al., a larger subset of their study cohort was in favor of umbilical blood-based research and the applications of these stem cells.[12] A key aspect of this emerging technology are the safeguards associated with procedural implications.[13] Our survey failed to address the response of the cohort on these issues.

To our knowledge, this is the largest survey in the medical community in an underdeveloped nation where the resource-stricken environment dampens the potential of such emerging technology. The survey mainly focused on reporting frequencies and shed light on the overall knowledge and the attitude of the medical professionals working in a single institution. As the survey was disseminated in the entire hospital and was an at will survey, the data showed a large predominance of surgical residents and included a small minority of other specialties thus limiting our ability to test a well-balanced cohort. Further survey needs to be conducted after exposing residents to seminars and research material pertaining to stem cell research.

An aim should be made to encourage medical doctors from all frames of references to hone their skills and harness such untapped potential in new generation technology

Conclusion

Our survey shows a reasonable level of knowledge of the generic principles and implications Stem cell therapy amongst the residents; however, further surveys addressing the deeper understanding of both the sociological implications and the economic factors governing the issue are to be undertaken.

Disclaimer: None to declare.

Conflict of Interest: None to declare.

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