

# Assessment of Stem Cell Therapy Awareness and Attitude in Community at the City of Riyadh, Saudi Arabia

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## Abstract

Broadly, stem cell therapy becomes a famous and promising medical strategy for some challenging diseases. Nevertheless, literature shows mild to moderate level of knowledge and attitude toward stem cell therapy even among medical practitioners. **Objectives:** This study aimed to assess the awareness of community, and health care workers toward stem cell therapy, in the City of Riyadh, KSA. **Methods:** A cross-sectional study to assess the level of knowledge and attitude of community, and health care workers. The study was carried out using an electronic questionnaire sent to candidates, consisted of demographic information, stem cell knowledge, application, safety, and clinical attitude statements. Descriptive statistics was computed. Categorical data were presented as numbers (frequencies) and percentages, question responses with were compared across groups with chi-square tests in SPSS version 23, P values less than 0.05 were considered as statistically significant. **Results:** The study reported a low/moderate level of knowledge and neutral attitude toward stem cell application of health care workers in the Riyadh region. 51% of health care workers were willing to advocate for this therapy if they got consulted. Likewise, the public reported a low/moderate level of knowledge at (57%). Luckily, most of the participants having a positive attitude regarding their approach toward the therapy. **Conclusion:** The study may suggest the need for awareness's campaign to enhance the level of attitude toward stem cells therapy for both healthcare workers and the public. Behavioral, social, cultural, and religion are the main determine the attitude of stem cell therapy into the current medical.

**Keywords:** Stem cell therapy; Awareness; Attituded; Public; Healthcare workers

**Abbreviations:** MS: Multiple Sclerosis; IRB: Institutional Review Board; CMA: Canadian Medical Association; CFPC: College of Family Physicians of Canada; FDA: Food and Drug Authority

## Introduction

Stem cells are special cells with distinctive features of giving rise to all body types to repair damaged tissues and regenerate new cells. Thus, they became widely recognized for stem cell therapies offering hopes for patients suffering from degenerative diseases that cannot be treated by conventional medicine. [1] Several studies reported the use of different types of stem cells in treating different conditions including stroke, type I diabetes, multiple sclerosis, and spinal cord injury. [2-4] Accordingly, stem cell clinics have become a rapidly evolving industry, especially in countries where few regulations are applied, becoming the latest hope for desperate patients who would travel seeking to get better when conventional approaches fail and all other hopes vanish. [5] However, this becomes an ethical issue due to the large financial costs involved, unproven methods, the very limited evidence base for their efficacy, and the risk associated. [6]

Although a wide range of medical services is offered at high quality and provided by reputable clinics and clinical professionals, stem cell therapies, in general, have no proof that they are safe and effective, except for blood-related disorders. [7]

Unfortunately, stem cell therapy is promoted for several serious illnesses like Parkinson's, Multiple Sclerosis (MS), amyotrophic lateral sclerosis, commonly known as Lou Gehrig's disease,

Alzheimer's, and a number of congenital conditions [8] around the world including. As a result, many illegal and unlicensed treatments that lack scientific proof were heavily reported. [6] However, they are occurring much less frequently because of the current regulations, monitoring, and administration. Government agencies around the world are working on the regulation and improving the safety and efficacy of stem cell therapy.

Because the health worker would be the source of information to the public. As well as the limited public knowledge and awareness about stem cell therapy. This paper would assess the level of public and health care awareness toward the growth of such services and the potential users of such services and analyses the knowledge about their safety and clinical use for such services in the city of Riyadh.

## Materials and Methods

The study was independently reviewed and approved by the

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Institutional Review Board (IRB) at King Saud University, and it complied with the rules related to the 'Research Ethics on Living Organisms' issued by Royal Decree no. M/29 and with the World Medical Association's declaration of Helsinki.

This study was cross-sectional self-administered questionnaires assessed the level knowledge and attitude at public sectors (400 surveys) for public and 200 surveys were distributed among health care workers. The design of our survey instruments was followed the protocol applied by the Canadian Medical Association (CMA) referral survey<sup>[9]</sup> previously, the College of Family Physicians of Canada (CFPC) survey,<sup>[10]</sup> and the royal colleges survey.<sup>[11]</sup> To improve clarity, the survey were piloted by five health care workers unaffiliated with the research team, this was followed by testing it on elected group of 30 health care workers and public candidates<sup>[12]</sup> Then the surveys were edited iteratively to improve clarity, accuracy, face, and content validity based on the views of the investigators based on validity and reliability scores of the instruments.<sup>[12,13-15]</sup>

The face validity was adjusted by modifying certain questions on both the public and the health workers' survey forms. The content validity was improved by adding the level of qualification, and the profession of the participants.

To minimize the bias, a random sampling method was used using Microsoft Excel 2007 software (Microsoft Corporation, USA).<sup>[12]</sup> In this study, a total of 400 respondents were randomly chosen from the population and different health care workers in different health centers in the city of Riyadh for analysis.

The self-administered instrumentation tool used in this research study was a self-developed questionnaire formulated by the researcher based on the literature reviewed regarding stem cells and their application in the medical setting among health care professionals that particularly focus and/or reflected on the knowledge and attitudes.

The instruments used in this research were arranged by the authors based on their knowledge and after literature search. The main focus was the role of stem cell therapy centers worldwide and the attitude of both healthcare workers and public toward it

### Data interpretation and statistical analysis

Knowledge for both evaluated groups were evaluation using dichotomous questions with "Yes" and "No". Then the answers for the given questions [Table 1] were scored, for right answer score of "2", and if the answer was wrong a score of "1" were given. Thus, the knowledge score obtained was categorized into 3 levels: High (20-18), Moderate (17-14) and Low (13-10).<sup>[13]</sup> Moreover, the level of knowledge was related to candidate demographic data, and then the retrieved data were presented in form of numbers and percentages. Therefore, the higher the knowledge scores, the higher the level of knowledge among the respondents.

On the other hand, Likert 5-point scale was used for assessment of attitude for the healthcare workers and the public candidates. Then the answers for the given questions [Table 1] were scored as follow: Scores range from 1 point, which is "strongly disagree" to 5 points, which is "strongly agree". Since there were 7-10 statements, the range of score is from (7-10), (35-

**Table 1: Demonstrate the level of knowledge for healthcare workers.**

1	Do you know about stem cell therapy which would cure some clinical challenging conditions	88
2	Do you know/study or studies show increasing evidence of therapeutic effectiveness of stem cell therapy	59.3
3	Did you come across one or more study about the clinical application of stem cell therapy?	52.7
4	If yes, would you think that stem cell therapy alone would cure some clinical conditions?	34.6
5	Only short-term clinical trials are reported	31.3
6	One of the potential problems of stem cell therapy is pro-tumorigenic effect	29.3
7	Low immunogenicity of stem cell make transplantation well tolerated by recipient organ	44.7
8	Adult stem cell therapy has great advantage over the embryogenic stem cells with regard to immune rejection	24.7
9	Are you aware about centers of stem cell therapy are advertising on line for their services to public for cure of some common chronic illness	42
Mean knowledge		45.17

50) points. The calculated scores were categorized into 3 levels: Do not approve ((7-10), (22-26)), Unsure ((23-27), (32-37)) and approve (33-35), (38-50). Therefore, the higher the attitude scores, the higher the level of attitude among the respondents. Likewise, the level of knowledge was related to candidate demographic data, then the retrieved data were presented in form of numbers and percentages Pearson correlation was used to determine the association between knowledge of health care and the public, and same was done for the attitude of both groups. All tests were two-tailed and the significance level was set at  $p < 0.05$ .

## Results

### Stem cell therapy awareness among health care workers

Out of 200 distributed surveys, a total of 135 participants were respondents from the health care workers 90 participants their age range was (30-49 years) and female. Their level of education, 45 participants is the PhD holders, 39 were at bachelor degree, 41 at master degree and 10 were at diploma level. Most of our respondents were physicians (medical doctors or dentists) 70, followed by applied sciences 34 participants.

General stem cell awareness: 88% of the participant has had knowledge about stem cell therapy and its role in treating some challenging clinical conditions. Of which 59% were aware of studies that show evidence of the effectiveness of stem cell therapy. On the contrary, around 50% were not aware of any clinical studies showing the application of this therapy in treating some medical conditions. Of which 35% believed that stem cell therapy alone can cure diseases. The calculated score for level of knowledge was 15 which are considered a moderate level of knowledge.

Regarding stem cell applications and safety and clinical application, Table 1 summarizes important questions regarding the attitude regarding stem cell therapy.

More than 80% agree that stem cell therapy showed more success in non-human trials. On the same track, 85% agree that

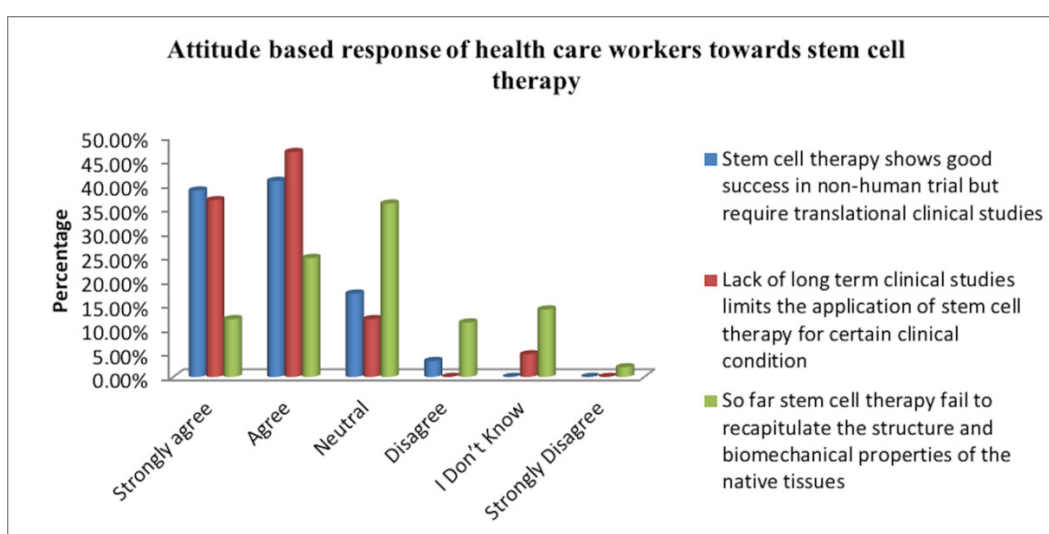
“lack of long-term human trial preclude the application of this therapy clinically. When it comes to the shortcoming of stem cell therapy more than 35% were not sure if stem cell therapy able to recapitulate the structure and the biomechanical properties of the native tissues [Figure 1].

Moreover, more than 50% agreed on statements related to stem cell therapy still in their primary stage. Interestingly, more than 60% thought that cell numbers, ways, frequency of delivery were crucial parameters for the success of this therapy. Regarding safety and clinical application, most participants don't have an idea about the quality of the clinical trial. Only 31% were certain only short clinical trial was reported, however, 53% they were not aware of this information. 61 % didn't know if stem cell therapy had a pro-tumorigenic effect. 44% had positive thoughts about the role of immunogenicity and how it helps in

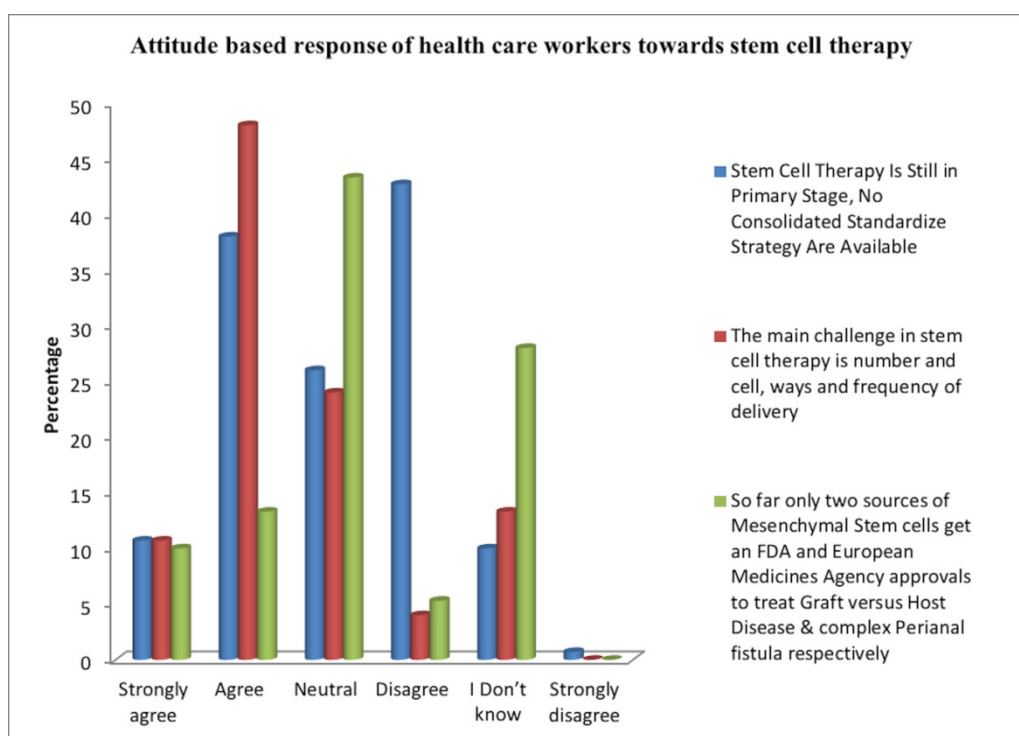
the transplantation to recipient organs. Moreover, more than 40% were reported neutral information and 25% were not aware of Food and Drug Authority (FDA) stem cell therapy approval for anal fissure and GVHD [Figure 2].

Regarding centers for stem cell therapy worldwide, more than 58% were not aware of any centre. However, 47% were willing to advice for the therapy, from which 17% strongly advised for stem cell therapy centers. The mean score for attained of health care workers was found to record at which was recorded to be unsure about the therapy neither the application nor the safety of the clinical applications [Figure 3].

In general, most of the healthcare workers reported total reported scores for the majority of the participants were which means most of the participants were not sure about the statements in



**Figure 1:** Shows the responses of the healthcare workers about the clinical application of stem cell therapy.



**Figure 2:** Shows more than responses of health care workers regarding the limitation of clinical application.

their questionnaire.

### Stem cell therapy awareness among public

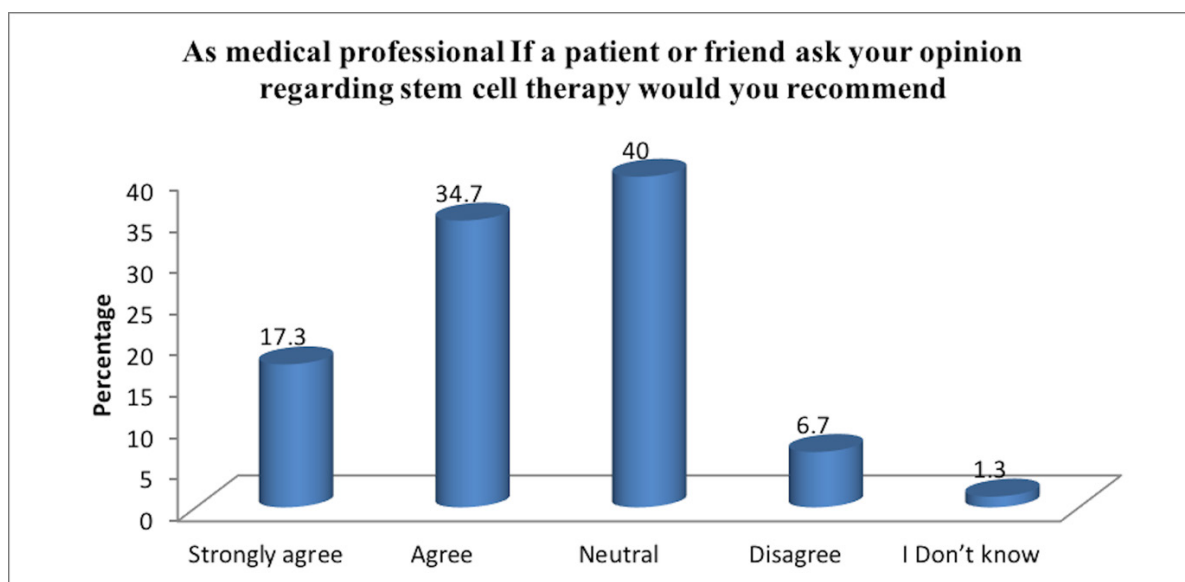
A total of 360 participants were respondents from the general public, 70.5 % were female, 45% their age ranged between 30-39 years old, and 58.8% are bachelor holders. Out of 360 subjects, 299 participants have answered that they are aware of stem cells with a percentage of 83.05%.

Out of 360 subjects, 299 subjects with a percentage of 83.05% have heard about stem cells. Among all, 19% have no information about stem cells, 57% have basic knowledge, 20% with good information, and only 4% believe they have advanced knowledge when we ask the candidate directly [Figure 4].

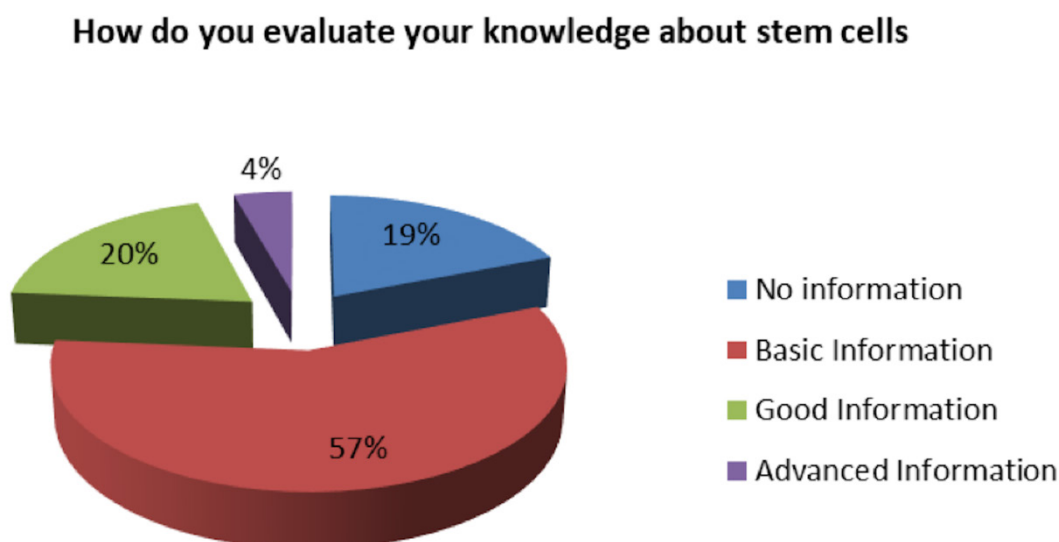
However, 43.5% are aware of one or more clinical applications of stem cell therapy, while the remaining 56.5% are not, with a total of 64.9% think that stem cells would treat diseases like diabetes, Parkinson's, cardiomyopathy, or Alzheimer, while 35.1% do not. The main source of information for most of the participants in the internet and TV (59.2%), followed by family

and friends (18.4%) then training and conferences (10%), and only 4.7% heard from their doctors, the remaining 7.7% did not know what their source was based on their information [Figure 5].

83.9% would recommend stem cell therapy while 16.1% would not, although only 21.4% are aware of the possible disadvantages of stem cell therapy, while 78.6% were not. In terms of ethical obstacles, only 15.1% of the participants know the ethical obstacles associated with the use of stem cell therapy, 57.9% do not know, while 27.1% think it is not associated with any ethical obstacles. In terms of the procedures involved in stem cell therapy, only 28.4% are aware of them, while the other 71.6% are not. If they have the option to do stem cell therapy, 64.5% would consult their doctors, while 20.1% would consult a person who underwent the therapy, 12% would consult a medical background person, 1.3% would consult a family and friends, while 2% think they don't need a consultation. In addition, 62.2% would seek another consultation in contrast to 5% who would not; the remaining 32.8% are not sure about the second consultation.



**Figure 3:** Shows the recommendation of healthcare works toward the public for stem cell therapy.



**Figure 4:** The direct level of information about stem cell therapy when the candidates were surveyed.



Overall, the calculated score for the indirect level of knowledge was 13 which is considered a low level of knowledge and attitude towards possible questions before considering a stem cell therapy and safety of the therapy. The attitude of the public toward stem cell therapy was summarized in Table 2 and Figures 6 and 7.

Regarding the safety of stem cell therapy, most of the participants strongly agree (58.2%) and agree (23.7) to ask about the risk of the procedure involved, 15.7% were neutral about it, while 2.3% disagree to ask the question. Furthermore,

the risk/side effects associated with stem cell therapy, most of the participants strongly agree (63.9%) and agree (21.7) were keen to know, 13.4% were neutral, whereas 0.3% and 0.7% disagree and strongly disagree to know. The final reported score for the attitude was falling between 38-50 which means most of the participants were approve the statements given.

In general, the mean percentage of participants who have got right knowledge about stem cell therapy for health care worker and the public was reported at 45% and 38% with a direct relationship no significant difference [Figure 8]. Whereas, a

### Main source of information about stem cell therapy among general public

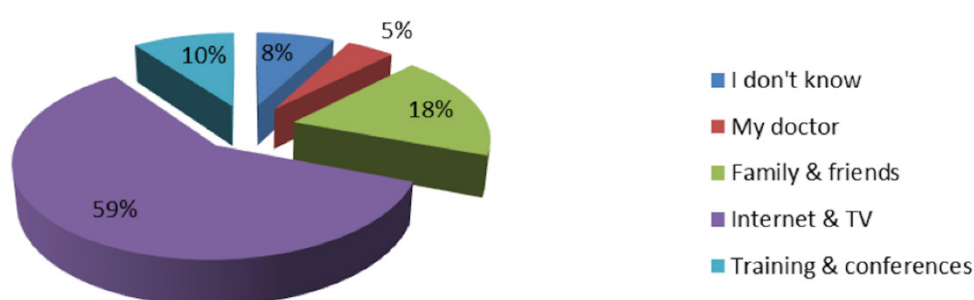
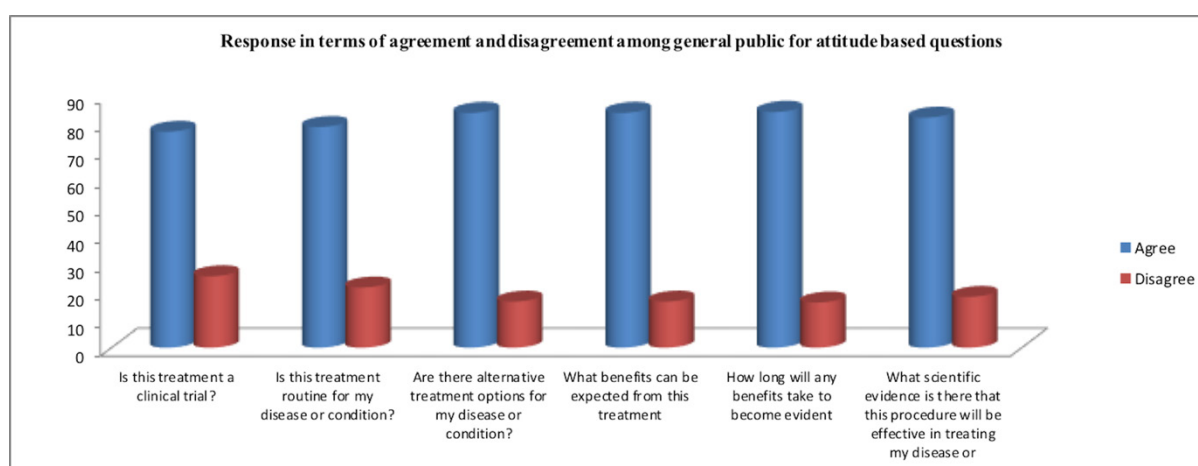


Figure 5: The pie chart presents the main source of information for the public.

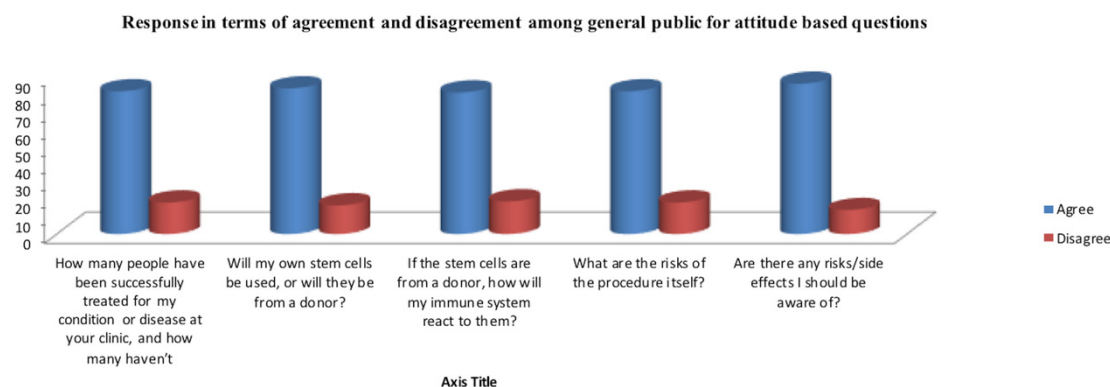
Table 2: Summarize the attitude of the public toward stem cell therapy.

SI No	Question	Response	Number	percentage
1	If you decide to do it, would you consider asking the following questions: [Is this treatment a clinical trial?	Neutral	63	21.10%
		Disagree	13	4.30%
		Agree	111	37.10%
		Strongly agree	111	37.10%
		Strongly disagree	1	0.30%
2	If you decide to do it, would you consider asking the following questions: [Is this treatment routine for my disease or condition?]	Neutral	57	19.10%
		Disagree	7	2.30%
		Agree	110	36.80%
		Strongly agree	122	40.80%
		Strongly disagree	3	1.00%
3	If you decide to do it, would you consider asking the following questions: [Are there alternative treatment options for my disease or condition?]	Neutral	45	15.10%
		Disagree	4	1.30%
		Agree	104	34.80%
		Strongly agree	144	48.20%
		Strongly disagree	2	0.70%
4	If you decide to do it, would you consider asking the following questions: [What benefits can be expected from this treatment?]	Neutral	45	15.10%
		Disagree	4	1.30%
		Agree	86	28.80%
		Strongly disagree	0	0%
		Strongly agree	164	54.80%
5	If you decide to do it, would you consider asking the following questions: [How long will any benefits take to become evident?]	Neutral	45	15.10%
		Disagree	3	1.00%
		Agree	97	32.40%
		Strongly agree	153	51.20%
		Strongly disagree	1	0.30%
6	If you decide to do it, would you consider asking the following questions: [What scientific evidence is there that this procedure will be effective in treating my disease or condition?]	Neutral	47	15.70%
		Disagree	7	2.30%
		Agree	88	29.40%
		Strongly agree	154	51.50%
		Strongly disagree	3	1.00%

7	If you decide to do it, would you consider asking the following questions: [How many people have been successfully treated for my condition or disease at your clinic, and how many haven't?]	Neutral	44	14.70%
		Disagree	10	3.30%
		Agree	80	26.80%
		Strongly agree	163	54.50%
		Strongly disagree	2	0.70%
8	If you decide to do it, would you consider asking the following questions: [Will my own stem cells be used, or will they be from a donor?]	Neutral	43	14.40%
		Disagree	6	2.00%
		Agree	88	29.40%
		Strongly agree	161	53.80%
		Strongly disagree	1	0.30%
9	If you decide to do it, would you consider asking the following questions: [If the stem cells are from a donor, how will my immune system react to them?]	Neutral	47	15.70%
		Disagree	9	3.00%
		Agree	79	26.40%
		Strongly agree	163	54.50%
		Strongly disagree	1	0.30%



**Figure 6:** Public response in term of agreement and disagreement for attitude-based questions.



**Figure 7:** Public response in term of agreement and disagreement for attitude-based questions.

poor correlation was found between the attitude of healthcare workers and the public. The chi-square test was applied and revealed a significant relationship between the level of knowledge and the attitude level regarding stem cells since  $p\text{-value}=0.015$  [Figure 9].

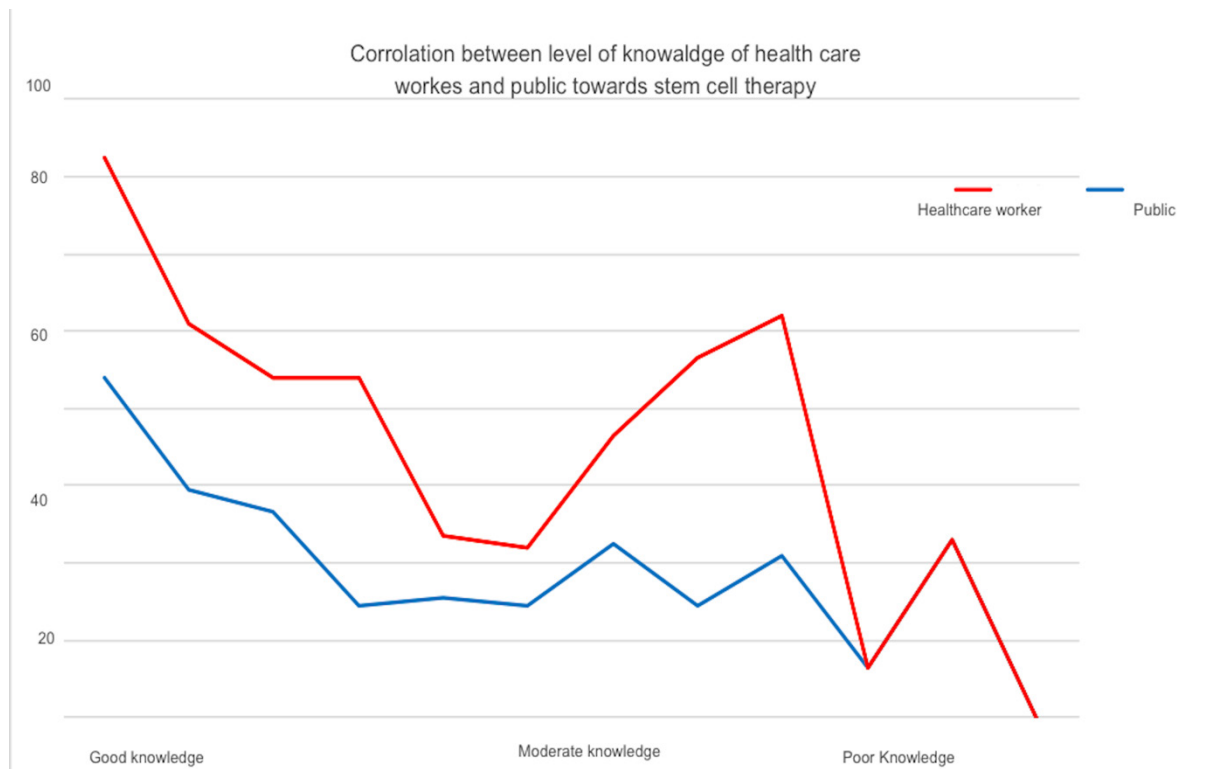
## Discussion

Health care professionals are considered the most credible source of information to the public especially with the evolution of alternative therapy like stem cell therapy. One of the main objectives of this research is to assess the knowledge and

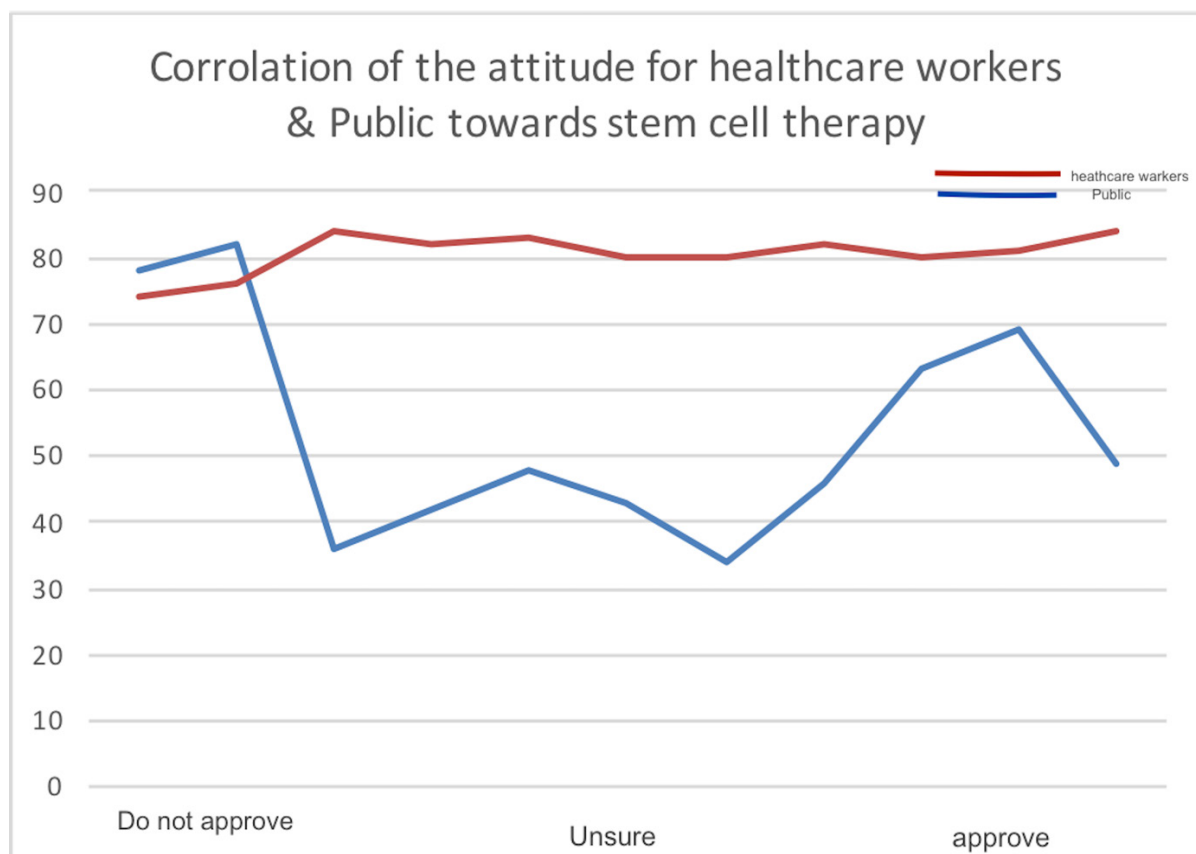
attitude of health care professionals in the city of Riyadh toward this therapy.

Our survey showed that most health care workers were aware of stem cell therapy female (70%) and their age range was fall between 30-49 years in the city of Riyadh. A similar study done in AL-Qassim that revealed most of the female respondents who have knowledge about stem cell therapy were 31% of health care workers and their age was less than 30 years old. [14] Whereas a similar study reported male physicians to score high knowledge regarding stem cell therapy compared to female physicians. [16]

It was found that 88% of our health care respondents have



**Figure 8:** Shows the correlation between level of knowledge of health care worker and public. Direct relation is presented with no significant level of knowledge.



**Figure 9:** Correlation of attitude between health care workers and public is poor. Most of the public have positive attitude, whereas most the health care workers are not sure about the application of stem cell therapy.

knowledge about stem cell therapy. In which 50% were not aware of any clinical trial done. It was reported that 35% of them believe that stem cell therapy alone can cure some clinical challenging diseases. Moreover, 50% (low/moderate level) had agreed that stem cell therapy is still in its primary stage, and 40% thought stem cell therapy in an advanced stage. Lack of information regarding the safety of the usage of this therapy was reported at a level of 53%. On the contrary, knowledge, and attitude among health care workers in Al-Qassim was reported positive (moderate/high level) attitude toward the therapy at 76%.<sup>[17]</sup> Our experience of the attituded reported for health care workers in the Riyadh region was neutral, *i.e.* they were not sure about the application and safety usage of stem cells.

47% of the participant who was willing to advice for stem cell therapy to family or friends, of which 17% strongly recommends the stem cell therapy. These differences between the regions Riyadh (the capital) and Al-Qassim could be due to the presence of larger and more specialized health care sectors with research unite in each medical city in Riyadh versus Al-Qassim. Thus, the level of exposure of health care workers to continuous education activates would be different between the regions. In contrast, with our study with a similar study done in Jordan testing the attituded of the medical physicians toward stem cell therapy, they demonstrated a low/moderate level of overall stem cell knowledge 51%. The total reported attituded score was moderate/high at 66.8%.<sup>[18]</sup>

An interactive review was conducted in 2016 to evaluate the health professional's knowledge, attitudes, and practice of stem cell future therapy and umbilical cord banking. Nine international papers were identified (Peberdy et al.).<sup>[19]</sup> The review concluded the presence of a considerable gap regarding understanding the information requirements of health professionals, and the influences on professional practice, as they relate to cord blood banking which impacts on health professional provision of evidence-based information of cord blood banking options.

In another more specific survey were conducted 2012 in the UK to understand the level of awareness and attitude towards stem cell therapy for hearing loss among ENT surgeons, physicians, audiologists and scientists.<sup>[19]</sup> The study reported >87% to have very little or no knowledge of stem cell therapy. The very low level in this study would be explained that this was conducted 10 years back at the time when stem cell therapy has just emerged.

On another hand, public awareness and the level of knowledge and attitude toward stem cell therapy were also assessed to defeat or accept uncontrolled and premature commercialization of stem cell interventions.

The main reason that drives public suffering from chronic disorders into stem cell therapies is the faith that it may be the last hope for treatment when conventional therapies fail. However, due to the huge financial costs and the risk associated, it is considered an ethical issue.<sup>[20]</sup>

This study is considered unique among all previous studies as we assessed the awareness and attitude of the public in Riyadh, Saudi Arabia, towards stem cell therapies. It has been found that the majority of the participants has low/moderate knowledge about stem cell therapies, and a positive attitude

was reported which could be attributed to the poor educational level, unreliable source of information, lack of enlightening cautionary measures of unauthorized stem cell therapies and the associated risks and possible complications.<sup>[21,22]</sup>

A previously published study assessed the public awareness, attitude, and knowledge in Saudi Arabia from different aspects reported that females have a higher understanding than males in regards to stem cell treatments, with more than half of the studied group unaware of the different types of stem cells.<sup>[23]</sup> Similarly, in our study, we reported more females (85.8%) familiar with stem cell therapy than males among all age groups and different qualifications, however, mostly with basic knowledge (57%). Likewise, we also reported poor sources of information about stem cells, mainly the internet and TV (59.2%). Luckily, most of the participants who are willing to do the therapy would consult their doctor (65%) and would seek another consultation (62%). Moreover, they showed a good attitude towards possible questions before considering stem cell therapy and concerns about the safety of the therapy. Although the current study reported a low/moderate level of attitude and knowledge of health care workers in the Riyadh region. 51% of health care workers were willing to advocate for this therapy if they got consulted. This finding is worrying and requires serious action no consolidated standardize strategy are available yet. Although in Saudi Arabia we have the Saudi FDA that applies strict regulations and guidelines towards stem cell therapy, the public showed a lack of knowledge and willingness to receive and recommend stem cell therapies.<sup>[24]</sup>

Outlining this issue could be a sensitive point to help improve public awareness of stem cell therapy.<sup>[24]</sup> Educational campaigns, counseling programs, conferences, workshops, and lectures for children and adults with updates on authorized application of stem cells and the risk associated with unauthorized stem cell therapies could be great and effective ways to provide the required knowledge, educate the public, and make them less vulnerable to false claims of effective stem cell therapies around the world.

Moreover, clear guidelines should be published and made accessible to the public in order to reduce the number of misleading advertising that claim the successful use of stem cell therapies<sup>[22,24]</sup> and apply some cautionary measures to be set in place to limit certain activities related to stem cell therapies. In addition, healthcare professionals should be responsible to advise and react to any consultations in regards to such treatments.<sup>[25]</sup>

## Conclusion

The study may suggest that various educational programs on stem cells should be implemented considering the religious, cultural, social, and behavioral determinants in the population to improve the knowledge toward stem cell therapy centers. Moreover, the attitude of healthcare workers must be hastened by emerging of consolidated guidelines for the stem cell therapy.

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## Declaration of Conflicting Interests

The authors declare that there are no conflicts of interest.

## Ethics Statement

The study protocol was approved by the ethical committee of the Institutional Research Ethics Board (IRB) of the KSU College of Medicine and College of Dentistry Research Centre. On 05.01.2021 (21.05.1442) Ref. No. 21/0021/IRB.

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