



# Knowledge, Awareness, Attitude, and Opinion about Application of Dental Stem Cells: A Dental School-Based Questionnaire Study

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## Abstract

**Objective** The aim of the study is to assess the knowledge, awareness, attitude, and opinion concerning dental stem cells among faculty, postgraduates, and interns in a dental school.

**Materials and Methods** A questionnaire consisting of 12 questions was circulated among the 150 participants (50 faculty, 50 postgraduate students, and 50 interns). A questionnaire was prepared that could assess the basic knowledge on stem cells (dental) based on similar previous studies. The questionnaire data were entered by the investigator in Microsoft Excel 2010 on a corresponding day. Using Predictive Analytics Tools (Version 18), the analysis was done. Probability ratios by Pearson were used to analyze the application of knowledge, perception regarding stem cells.

**Results** The survey participants consisted of ~73% of females and 27% of males. Most of the participants have come across the term stem cells and thought that only pulp stem cells signified the only source of dental stem cells. The majority of the participants pointed out the anticipated high cost to be the biggest obstacle to a patient accepting regenerative dental treatment by stem cells.

**Conclusion** This study reveals a good level of knowledge among dental professionals, and it also showed the need to develop more awareness about the advancements in applications and banking.

## Keywords

- dental school
- knowledge
- stem cells
- survey

## Introduction

Stem cells can be defined as a cell that can continuously produce unaltered daughters and produce daughter cells with different but more restricted properties. Moreover, it is known that stem cells' influence was the range of options to the commitment that was available to a cell.<sup>1</sup>

Given the novel regenerative capabilities of stem cells, they allow new potentials for managing various diseases.

However, the significant effort remains to be done in the laboratory and in the clinic to concede how to use them for cell-based therapeutics to treat disease, referred to as regenerative or reparative medicine.<sup>2</sup> Adult stem cells, including mesenchymal and hematopoietic stem cells, were among the first competitor cell sources for cell-transplantation therapeutics because they lack any tumor-forming potential and are not forced by ethical concerns. Considering that obtaining bone marrow mesenchymal stem cells (MSCs) is a painful,

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traumatic procedure due to invasive bone marrow aspiration and insufficient numbers of harvested cells, attempts to harvest MSCs from dental tissues, such as the periodontal ligament, gingiva, dental follicles, dental pulp, apical papilla, and human exfoliated deciduous teeth have been made.<sup>1,3,4</sup> Dental stem cells promise an opportunity for tooth banking, which may be used to store stem cells to treat challenging diseases and illnesses that would occur in life due to their comparatively fewer ethical issues and ease of harvest. Hence, knowledge and awareness about stem cells, particularly dental stem cells, are essential for stem cell research and its potential clinical application soon.

This survey was undertaken to determine and compare the knowledge, awareness, and attitude of faculty, interns, and postgraduates in A B Shetty Memorial Institute of Dental Sciences toward the possible utilization of stem cells in dentistry. This survey is a step toward creating awareness about stem cells in the dental college as dental stem cell research is an emerging field in oral sciences and seems to possess great potential.

## Materials and Methods

The current survey was a questionnaire-based study conducted among 50 faculty, 50 interns, and 50 postgraduate students (total = 150). The questions were formed based on some relevant studies, some publications associated with dental stem cells, and other Internet references. The questionnaire data were entered by the investigator in Microsoft Excel 2010 on a corresponding day. Using Predictive Analytics Tools (Version 18), the analysis was done. For analysis, likelihood ratios were used to obtain insight into the extent of knowledge, awareness, and possible application of stem cells in clinical dentistry.

## Results

Results and statistical analysis have been summarized in ►Table 1 and ►Figs. 1, 2. A total of 150 participants consisted of 73% female and 27% male respondents who participated in

the study (►Table 1; ►Fig. 1). A significant correlation was found between all the questions and respondents' designation except for question 8 (In clinical practice, will you advise banking of dental stem cells and explain its prospects). All the faculty (100%), postgraduates, and most of the interns (>90%) have come across the term stem cells. The respondents' primary source of knowledge content was obtained from undergraduate training, the Internet, academic books, and journals (►Fig. 2). Unerringly, 100% of the faculty knew about dental stem cell sources than 58% of the postgraduates, while 82% of interns thought that pulp stem cells were only a reservoir of dental stem cells. 100% of the faculty, 38% of postgraduates, and 58% of interns knew that other stem cells besides dental exist. 46%, 54%, and 18% of faculty, postgraduates, and interns, respectively, knew that stem cell banking was available in India, and 88%, 86%, and 44% of faculty, postgraduates, and interns, respectively, thought that this stem cell banking could be of future clinical use.

The majority of the respondents thought that 0 to 10 years would be taken for regenerative stem cell therapies to be used in dentistry, but 20% of postgraduates thought it might take 11 to 20 years. Most of the faculty and postgraduates were open to attending a training course and continuing education courses to apply cell-based therapy to treat oral disease. However, 70% of the interns were unsure about this. In clinical practice, >84% of the faculty, postgraduates, and interns were open to advise regarding dental stem cell banking, explaining its prospects to patients and were willing to support stem cells' application to treat oral conditions if their safety and efficacy aspects are proven. 92% of the faculty and 66% of the postgraduates thought that stem cells should be a part of the college curriculum, where 46% of the interns were unsure that this should be the case.

Less than 4% of the respondents had any relatives who had used stem cell banking. 82%, 70%, and 40% of faculty, postgraduates, and interns have pointed out the anticipated high cost to be the biggest obstacle to a patient accepting regenerative dental treatment followed by lack of knowledge and fear of the outcome.

**Table 1** Statistical analysis of the survey

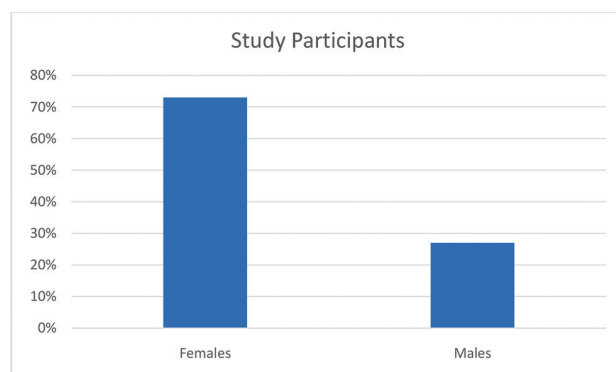
		Staff		PG		Interns		Statistics	p-Value
		f	%	f	%	f	%		
Q 1. Have you ever come across the term stem cells?	A	50	100	45	90	49	98	8.071	0.188
	B	0	0	5	10	1	2	LR	
Q 2. Can you identify the sources of dental stem cells?	A	0	0	0	0	41	82	108.276	0.018 <sup>a</sup>
	B	0	0	0	0	5	10	LR	
Q 3. Are you aware of any other sources of stem cells other than dental stem cells?	C	0	0	3	6	0	0		0.000 <sup>a</sup>
	D	0	0	3	6	0	0	LR 84.090 LR	
	E	0	0	0	0	1	2		
	F	50	100	29	58	0	0		
	G	0	0	10	20	3	6		
	A	50	100	19	38	29	58		
	B	0	0	18	36	0	0		

(Continued)

**Table 1** (Continued)

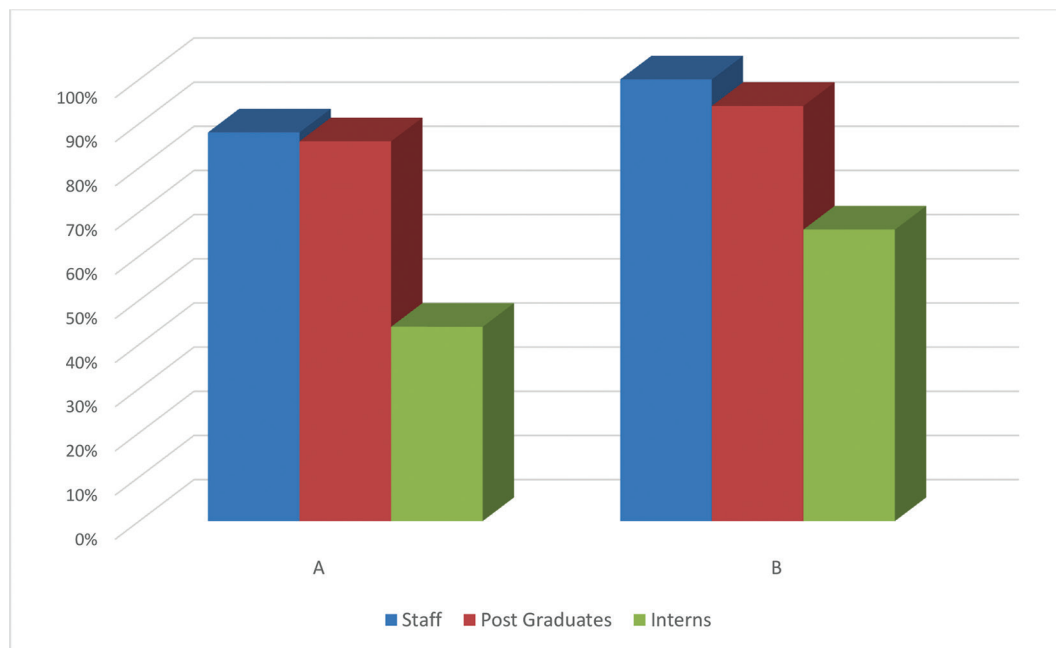
		Staff		PG		Interns		Statistics	p-Value
		f	%	f	%	f	%		
Q 4. Is banking of dental stem cells permitted in India?	C	0	0	13	26	21	42		0.000 <sup>a</sup>
	A	23	46	27	54	8	18	36.137 LR	
	B	16	32	5	10	4	8		
Q 5. Do you think banking of dental stem cells will be useful for future clinical applications?	C	11	22	18	36	37	74		0.000 <sup>a</sup>
	A	44	88	43	86	22	44	34.173 LR	
	B	1	2	0	0	0	0		
Q 6. How many years do you think it will take for regenerative stem cell therapies to be used in dentistry?	C	5	10	7	14	28	56		0.000 <sup>a</sup>
	A	38	76	26	52	40	80	33.716 LR	
	B	0	0	10	20	0	0		
Q 7. Would you be willing to attend a training course and/or continuing education courses to apply cell-based therapy for treatment of oral disease?	C	0	0	10	20	0	0	LR 89.665 LR	0.000 <sup>a</sup>
	D	0	0	2	4	0	0		
	DONT KNOW	1	2	1	2	0	0		
	A	43	86	44	88	15	30		
	B	7	14	0	0	0	0		
Q 8. In a clinical practice, will you advise banking of stem cells and explain its future prospects?	C	0	0	6	12	35	70		0.000 <sup>a</sup>
	A	42	84	46	92	47	94	2.984 LR	
	B	8	16	4	8	3	6		
Q 9. Though currently stem cells have no clinical applications in India, do you think it should be made part of college curriculum?	A	46	92	33	66	22	44	33.177	0.225
	B	0	0	5	10	4	8	LR	
Q 10. Have you or any of your relatives used stem cell banking to preserve stem cells for future use?	C	4	8	12	24	23	46		0.000 <sup>a</sup>
	A	0	0	2	4	1	2	30.360 LR	
	B	50	100	40	80	32	64		
Q 11. Would you support the use of stem cells for the treatment of oral disease if their safety and efficacy aspects are proven?	C	0	0	3	6	17	34		0.000 <sup>a</sup>
	A	50	100	47	94	33	66	11.046	
	B	0	0	0	0	0	0		
Q. 12 What do you think would be the biggest obstacle to a patient accepting regenerative dental treatment?	C	0	0	3	6	6	12		0.026 <sup>a</sup>
	D	0	0	10	20	11	22	38.936 LR	
	E	41	82	35	70	20	40		
	F	9	18	4	8	14	28		0.000 <sup>a</sup>
	G	0	0	1	2	4	8	LR	

Abbreviations: LR, likelihood ratio; PG, postgraduate.

<sup>a</sup>Statistically significant.**Fig. 1** Demographic data.

## Discussion

Recent approaches in identifying and characterizing dental stem cells and dental tissue engineering strategies suggest that bioengineering strategies may successfully revive dental tissues and whole teeth shortly.<sup>5</sup> To ensure that this approach reaches clinical relevance, reasonable interest, and knowledge backed by research among service providers is the prime requisite. The current survey results are in accordance with the study conducted by Chitroda et al in terms of knowledge regarding stem cell and its application in dentistry in India.<sup>6</sup> The present survey respondents had academic knowledge concerning the classification and reservoirs of



**Fig. 2** Opinion of the participants in the survey regarding (A) future clinical application of stem cells. (B) Use of stem cells to treat oral diseases.

dental stem cells, but intergroup analysis showed that post-graduates had limited knowledge on the subject compared with interns and faculty. Most of the participants expressed interest in gaining knowledge on this topic. This is reflected in their belief that dental stem cell research will impact practical deployment within two decades. This is consistent with the questionnaire analysis results by Nagraj and Acharya and Utneja et al, which showed that nearly all participants had comparable findings.<sup>7,8</sup> This positive response may be attributed to improved knowledge of the topic through outlets including scientific journals, discussion of this topic through forums including symposia, continuing dental education programs, and conferences on stem cell therapies.

Stem cell research in dentistry in India is still in its infancy stage and has a long way before its full-fledged application is reaped in clinical practice. The participants highlighted this fact, with most postgraduate and interns acknowledging that they were not sure of other stem cell sources other than dental stem cells, and less than 50% of respondents had any idea of stem cell banks in India, similar to another study.<sup>8</sup> Nearly all respondents were willing to attend stem cell-related programs, except for 70% of interns who were unsure if such programs would benefit them. This could be because stem cells are still evolving in dentistry and are yet to show their full spectrum of use, especially in clinical dentistry. This outcome is consistent with that of the Utneja et al study, which noted that most participants in the study were willing to attend training courses and continuing education courses to apply the regenerative dental treatment.<sup>8</sup> While there was a lack of awareness and sensitivity to stem cells, participants were optimistic about recommending the patients to consider stem cell banking and therapy whenever stem cells are being used for oral

disease therapy if the safety and effectiveness implications of stem cell banking are established. This is in line with the Utneja et al report, which notes that three-fourths of respondents agree that stem cells are a safer choice for dental implants. In this study, faculty (82%), postgraduates (70%), and interns (40%) pointed to the higher expense or cost as the largest deterrent to patients accepting regenerative dental care, followed by fear of adverse outcomes and lack of knowledge. In a related survey, the respondents perceived that due to lack of adequate expertise and skills, patients might be unwilling to pursue dental stem cell therapy, although high costs were not considered by many to be a substantial deterrent to this effect. The Utneja et al study states that stem cell fear is the primary fear factor that prevents patients from seeking treatment for dental stem cells, followed by cost. Ongoing research and the advancement of innovative, cost-effective methods can help in subduing this shortcoming over the next decade. As the faculty showed the most knowledge and honest opinion about dental stem cells and their inclusion in the curriculum and the clinical practice followed by interns and postgraduates, respectively, the years of professional experience had a relationship to knowledge and perception about dental stem technology. Therefore, the participant's qualification was not the determining factor in awareness of dental stem cells.

## Conclusion

The participants of this questionnaire were optimistic about the possibility of stem cell utilization in dentistry with the budding awareness of stem cells in the country. The study participants had good knowledge about stem cells, but interns were unsure about continuing the education in stem cells. It seemed that the faculty had better knowledge,

followed by interns and postgraduates. The introduction of stem cells at the undergraduate level might spark interest in students' research in stem cells and their application, as suggested by the study population. Since the research is in the nascent stage, at least in this country, there is a lot of research scope that should inspire students to research this field. Further survey research on this subject will help understand the degree of awareness, knowledge/skill among dental academics/professionals in the country, and the development of additional professional programs on the subject, particularly for those who aspire in the future to support (dental) tissue engineering.

#### Conflict of Interest

None declared.

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