

Knowledge and Attitude Regarding Dental Stem Cells in a Dental College of Bareilly City: A Cross-sectional Study

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ABSTRACT

Introduction: Stem cells (SCs) have a property of self-renewal and replication. Dental SCs are considered as an important and valuable source of SCs which can be collected from the healthy pulp. Different human dental SCs (DSCs) are rich in mesenchymal cells; therefore, it can be stored for future use through minimally invasive procedures. Hence, the aim of the present study is to assess the knowledge and attitude of dentists in a dental college related to dental SCs.

Materials and methods: A cross-sectional descriptive, questionnaire-based survey based on knowledge and attitude was conducted and a total of 100 dentists participated in the survey from the Institute of Dental Sciences, Bareilly, Uttar Pradesh, India. A total of 20 questions were asked regarding sociodemographic variables which included age, gender, area of work, qualification, and years of experience followed by the awareness regarding SCs and DSCs in detail.

Results: The study consisted of 100 participants who completed the questionnaires (39 males and 61 females) which comprises 41% dental graduates (BDS) and 59% postgraduates (MDS). In the present study, out of 100 participants, 94% were aware (i.e., 35 dental graduates and 59 postgraduates) and rest 6% were unaware about SCs in general; while 83% were aware of dental SCs (i.e., 24 dental graduates and 59 postgraduates) and rest 17% were unaware about dental SCs.

Conclusion: A positive attitude has been displayed by the respondents toward updating the knowledge regarding dental SCs.

Keywords: Attitude, Cross-sectional, Dental stem cells, Knowledge.

Journal of Dental Sciences and Oral Rehabilitation (2019): 10.5005/jp-journals-10086-1209

INTRODUCTION

In 1908, the term SC was proposed by Russian histologist Alexander for scientific use.¹ The SCs are defined as clonogenic unspecialized cells which are capable of both self-renewal and multiline age differentiation for long periods, contributing to regenerate specific tissues. Multiple specialized cell types that make up the heart, lung, skin, and other tissues are originated from the SCs. Stem cells are the master cells of the body and they are of two major types: embryonic and adult SCs.^{2,3} One embryonic SC has the potential to differentiate into all 220 types of specialized cells that make up the human body. Adult SCs are responsible for the regeneration and replacement of tissue damaged by disease or injury. The two properties of SCs that make them different from any other specialized cells in the body are self-renewal, the ability to go through numerous cycles of cell division while maintaining their undifferentiated state, and differentiation—the ability to form into a specialized cell type. Another unique property of SCs is their ability to grow *in vitro*—outside of the body in a laboratory.⁴

Dental SCs derived from the oral and maxillofacial region mainly belong to the mesenchymal type of SCs.⁵ These mainly include SCs like SCs from human exfoliated deciduous teeth (SHED), periodontal ligament SCs (PDLSC), dental pulp SCs (DPSC), SCs from apical papilla (SCAP), dental follicle SCs (DFSC), and bone marrow-derived mesenchymal SCs (BMSC).^{6,7}

SHED is a unique and distinctive type of cell present in the human body which is able to develop into several different types of cells.⁸ The technique for the collection of SHED is relatively easy and a noninvasive procedure. Immediate placement of the exfoliated teeth in the normal saline solution, then refer to the dentist working with the stem cell bank.⁸ The pulp of the tooth exfoliated may be of two different colors (red color and grey color).

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How to cite this article: Kumar R, Ajai K, *et al.* Knowledge and Attitude Regarding Dental Stem Cells in a Dental College of Bareilly City: A Cross-sectional Study. *J Dent Sci Oral Rehab* 2019;10(1):5–9.

Source of support: Nil

Conflict of interest: None

The samples containing SCs should be placed in a screw tight vial during transportation.⁹

The pulp tissue is transported in a solution for sufficient nutrition as well as maintenance of the SCs in its original form and prevents it from drying. Hypotonic phosphate-buffered saline is the appropriate solution which may fulfill the above-mentioned criteria.¹⁰ SCs are very sensitive to time and temperature; so, the sample should reach the storage facility within 40 hours. The storage of the SC is done either by cryopreservation or by magnetic freezing.¹¹

Dental SCs are easily obtained as compared to other sources of SCs with the additional advantage of fewer ethical concerns.¹¹ Therefore, it is the causative factor to increase the popularity of tooth banking and harvesting of dental SCs. It is important that clinical dental student as well as dental practitioners should be aware of advantages and disadvantages of dental SCs to guide their

patients regarding the same.¹² Therefore, the aim of the present study is to assess the knowledge and attitude of dentists in a dental college regarding dental SCs.

MATERIALS AND METHODS

The present study was a cross-sectional questionnaire based which was conducted from October 2018 to November 2018. The study protocol was reviewed and approved by the Institutional Ethical Committee, Institute of Dental Sciences, Bareilly, Uttar Pradesh. The survey carried out was knowledge and attitude based. The questions were formulated after going through similar studies and articles published in academic journals related to dental SCs.

The survey population comprised dentists of the institute of dental sciences, Bareilly, Uttar Pradesh, India. A total of 100 undergraduate and postgraduate dentists participated in the survey which included interns, postgraduate students, and teaching faculty. The questionnaire was close-ended, self-administered, and hand delivered (questionnaire).

The initial five questions pertained to sociodemographic variables included age, gender, area of work, qualification, and years of experience. The next set of questions assessed the awareness regarding SCs and DSCs, source of knowledge, tooth banking procedure, applications, ethical concerns, barriers toward the use of SCs, and methods of increasing awareness regarding the same.

RESULTS

The present study was undertaken to assess the knowledge and attitude of dentists in a dental college regarding dental SCs. The study consisted of 100 participants (39 males and 61 females) which comprises 41% dental graduates (BDS) and 59% postgraduates (MDS). Among these participants, 96% were from below 35 years of age and the rest 4% were between 35 and 50 years of age. Maximum respondents (76%) were having an experience of less than 5 years followed by 19% respondents having an experience of 5–10 years and least respondents (5%) were having an experience of more than 10 years (Table 1).

In the present study, it was found that association of age and experience with awareness and attitude regarding dental SCs were statistically not significant while the association of qualification with awareness and attitude regarding dental SCs were found to be statistically highly significant p value = 0.000 (Tables 2 to 4).

Table 1: Distribution of demographic details based on age, gender, qualification and experience among the study subjects

| | Frequency | Percent |
|-----------------------|-----------|---------|
| Age (in years) | | |
| <35 years | 96 | 96.0 |
| 35–50 years | 4 | 4.0 |
| Gender | | |
| Male | 39 | 39.0 |
| Female | 61 | 61.0 |
| Qualification | | |
| BDS | 41 | 41.0 |
| MDS | 59 | 59.0 |
| Experience (in years) | | |
| <5 years | 76 | 76.0 |
| 5–10 years | 19 | 19.0 |
| >10 years | 5 | 5.0 |

In the present study, it was found that association of age with awareness and knowledge regarding dental SCs was statistically not significant but the association of qualification was found to be highly statistically significant with p value = 0.000. Also, the association of experience with awareness and knowledge regarding dental SCs was found to be statistically significant p value = 0.004 (Tables 5 to 7).

In the present study, out of 100 participants, 94% were aware (i.e., 35 dental graduates and 59 postgraduates) and rest 6% were unaware about SCs in general (Fig. 1); while 83% were aware of dental SCs (i.e., 24 dental graduates and 59 postgraduates) and rest 17% were unaware of dental SCs (Fig. 2).

In the present study, the source of information regarding dental SCs was found to be highest (44%) from Internet followed by 25% from journals, 8% from professional societies, 3% from others sources like CDE programs, 2% from magazines, and least (1%) from commercial companies (Fig. 3).

In the present study, out of 100 participants, 17% did not answer that which teeth can be used for SC banking, while rest 83% answered as 40% for the tooth extracted due to nonpathologic condition, 33% for the exfoliated tooth, 8% for the tooth extracted due to pathologic condition followed by 2% for the carious tooth (Fig. 4).

In the present study, out of 100 participants, 17% did not answer about the methods recommended to increase dental SCs awareness while rest 83% answered as 40% from conferences and CDE programs, 22% from seminars followed by 12% from advertisements, 8% from journals, and 1% from other sources (Fig. 5).

DISCUSSION

It has been found that research in the field of SCs and dental SCs is progressing at a fast pace. Conferences, continuing dental education programs, and seminars were the main sources cited for the recommendation of methods for dental SCs awareness followed by advertisements and journals. One of the reasons for this may be due to the participation of interns, PG students who regularly attend conferences, and CDE programs inside and outside the college related to their specialty.

In the present study, the source of information regarding dental SCs was found to be highest (44%) from Internet followed by 25% from journals, 8% from professional societies, 3% from others sources like CDE programs, 2% from magazines, and least from commercial companies (1%) and these findings of the study are similar to the study done by Katge et al.¹²

The first commercial tooth bank was established as a venture company at the National Hiroshima University of Japan in 2004.¹³ Tooth banks have emerged in all parts of the world including India and marketing strategies are employed to promote tooth banking. More than 50% of the participants were not aware of the presence of DSC banks in India and this finding is similar to the study done by Nitha.¹⁴ It is imperative that dentists should not only have thorough scientific knowledge through literature but also have awareness regarding the commercial aspects of DSC banking. The awareness among participants regarding the teeth used for banking was moderate, with higher awareness among postgraduates. This may be due to the possibility that the postgraduate curriculum includes topics related to DSCs.

In the current study, out of 100 participants, 17% did not answer that which teeth can be used for SC banking, while

Table 2: Association of age with awareness and attitude regarding DSCs

| Age | <35 years | | 35–50 years | | p value |
|--------------------------------------------------------------|-----------|----|-------------|----|---------|
| | Yes | No | Yes | No | |
| Awareness of SCs in general | 90 | 6 | 4 | 0 | 0.469 |
| Awareness of DSCs | 79 | 17 | 4 | 0 | 0.778 |
| Awareness about tooth banking procedure following extraction | 28 | 51 | 1 | 3 | 0.564 |
| Interest in updating knowledge about DSC | 76 | 3 | 4 | 0 | 0.861 |
| Inclusion of DSC topic in curriculum | 74 | 5 | 4 | 0 | 0.776 |

Table 3: Association of qualification with awareness and attitude regarding DSCs

| Qualification | BDS | | MDS | | p value |
|--------------------------------------------------------------|-----|----|-----|----|---------|
| | Yes | No | Yes | No | |
| Awareness of SCs in general | 35 | 6 | 59 | 0 | 0.004 |
| Awareness of DSCs | 24 | 17 | 59 | 0 | 0.000 |
| Awareness about tooth banking procedure following extraction | 7 | 17 | 22 | 37 | 0.330 |
| Interest in updating knowledge about DSC | 22 | 2 | 58 | 1 | 0.199 |
| Inclusion of DSC topic in curriculum | 20 | 4 | 58 | 1 | 0.023 |

Table 4: Association of experience with awareness and attitude regarding DSCs

| Experience | <5 years | | 5–10 years | | >10 years | | p value |
|--------------------------------------------------------------|----------|----|------------|----|-----------|----|---------|
| | Yes | No | Yes | No | Yes | No | |
| Awareness of SCs in general | 70 | 6 | 19 | 0 | 5 | 0 | 0.365 |
| Awareness of DSCs | 60 | 16 | 18 | 1 | 5 | 0 | 0.152 |
| Awareness about tooth banking procedure following extraction | 18 | 42 | 10 | 8 | 1 | 4 | 0.105 |
| Interest in updating knowledge about DSC | 57 | 3 | 18 | 0 | 5 | 0 | 0.551 |
| Inclusion of DSC topic in curriculum | 56 | 4 | 17 | 1 | 5 | 0 | 0.831 |

Table 5: Association of age with awareness and knowledge regarding DSCs

| Age | <35 years | | | 35–50 years | | | p value |
|---------------------------------------------|-----------|----|----|-------------|----|----|---------|
| | Yes | No | Dk | Yes | No | Dk | |
| DSCs banks in India | 37 | 9 | 33 | 2 | 0 | 2 | 0.769 |
| Ethical concerns | 28 | 15 | 36 | 2 | 0 | 2 | 0.727 |
| Regulatory bodies in India | 23 | 8 | 48 | 2 | 0 | 2 | 0.598 |
| Use of DSCs in developing non-dental organs | 30 | 15 | 34 | 2 | 0 | 2 | 0.623 |

Table 6: Association of qualification with awareness and knowledge regarding DSCs

| Qualification | BDS | | | MDS | | | p value |
|---------------------------------------------|-----|----|----|-----|----|----|---------|
| | Yes | No | Dk | Yes | No | Dk | |
| DSCs banks in India | 5 | 3 | 16 | 34 | 6 | 19 | 0.769 |
| Ethical concerns | 5 | 6 | 13 | 26 | 8 | 25 | 0.000 |
| Regulatory bodies in India | 5 | 3 | 16 | 20 | 5 | 34 | 0.476 |
| Use of DSCs in developing non-dental organs | 4 | 7 | 13 | 28 | 8 | 23 | 0.025 |

Table 7: Association of experience with awareness and knowledge regarding DSCs

| Experience | <5 years | | | 5–10 years | | | >10 years | | | p value |
|---------------------------------------------|----------|----|----|------------|----|----|-----------|----|----|---------|
| | Yes | No | Dk | Yes | No | Dk | Yes | No | Dk | |
| DSCs banks in India | 23 | 8 | 29 | 14 | 1 | 3 | 2 | 0 | 3 | 0.046 |
| Ethical concerns | 17 | 13 | 30 | 12 | 1 | 5 | 2 | 0 | 3 | 0.039 |
| Regulatory bodies in India | 13 | 7 | 40 | 10 | 1 | 7 | 2 | 0 | 3 | 0.082 |
| Use of DSCs in developing non-dental organs | 17 | 11 | 32 | 13 | 4 | 1 | 2 | 0 | 3 | 0.004 |

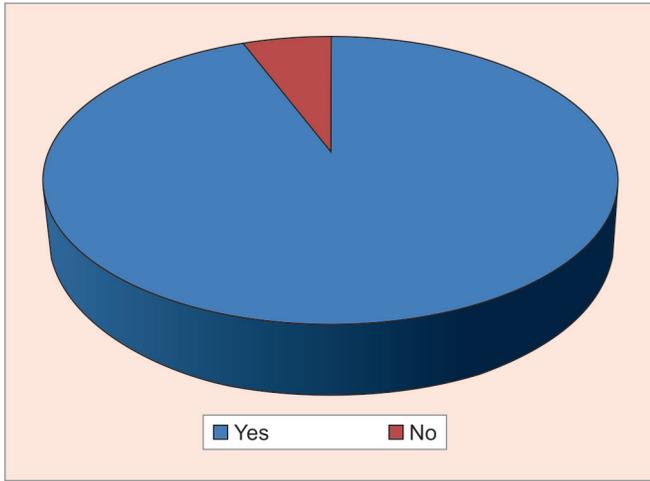


Fig. 1: Awareness of stem general among the study subjects

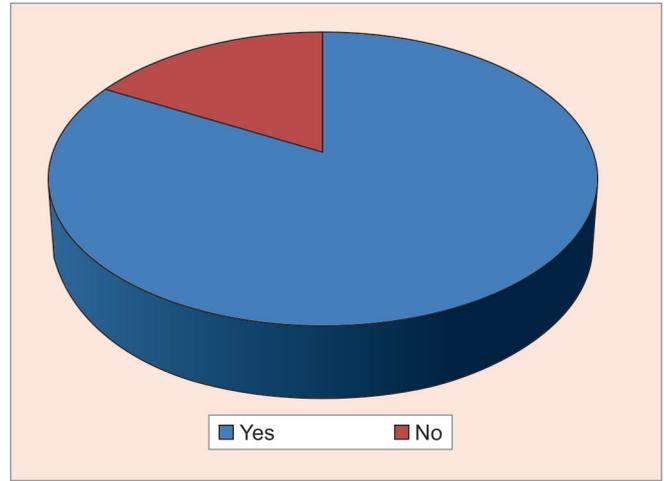


Fig. 2: Awareness of cells in dental SCs among the study subjects

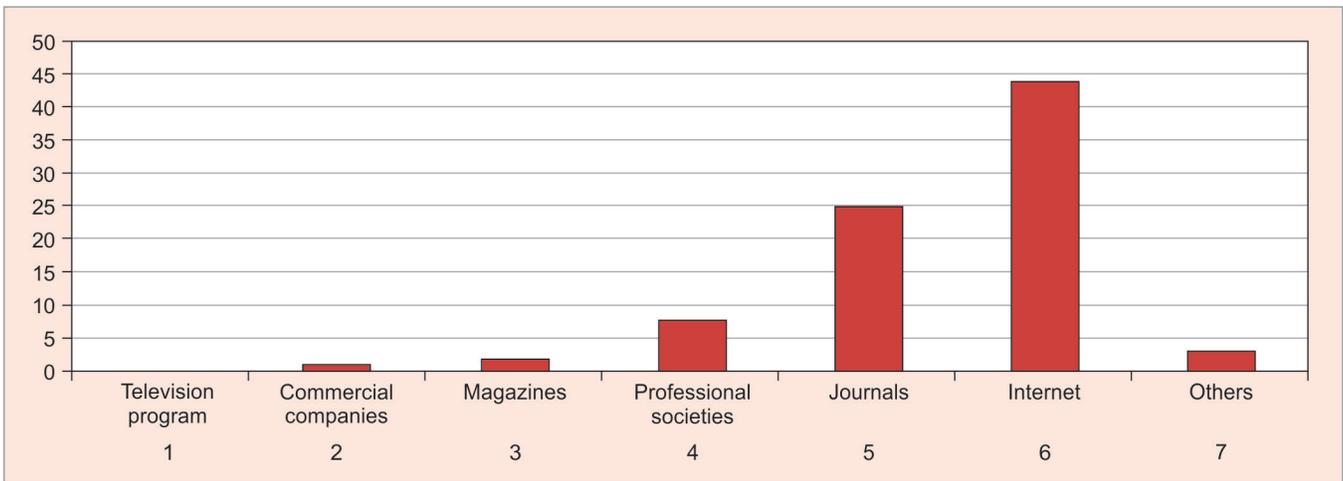


Fig. 3: Source of information regarding dental SCs

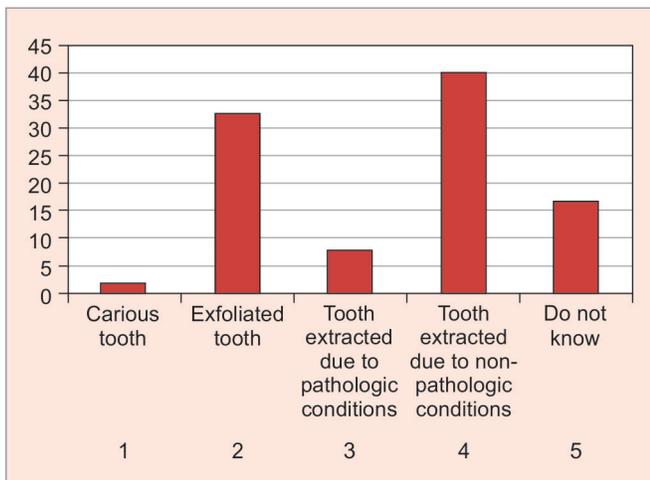


Fig. 4: Knowledge about the teeth used for SC banking

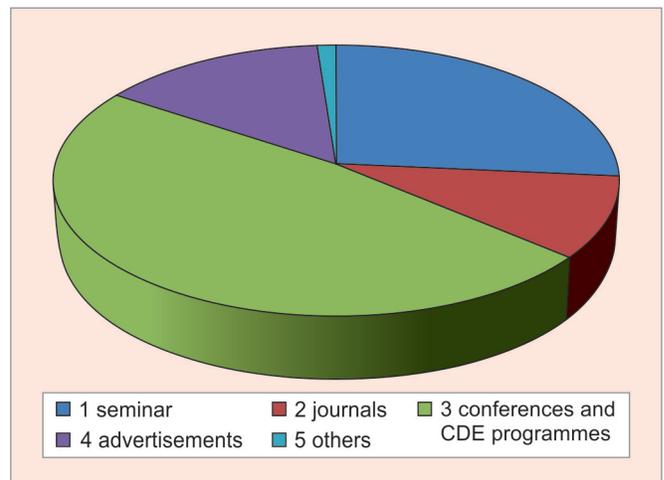


Fig. 5: Methods recommended for dental SCs awareness

rest 83% answered as 40% for the tooth extracted due to nonpathologic condition, 33% for the exfoliated tooth, 8% for the tooth extracted due to pathologic condition followed by 2% for the carious tooth.

In the present study, out of 100 participants, 94% were aware (i.e., 35 dental graduates and 59 postgraduates) and rest 6% were unaware about SCs in general. While 83% were aware of dental SCs (i.e., 24 dental graduates and 59 postgraduates) and rest

17% were unaware of dental SCs. This is because of the reason postgraduate curriculum includes topics related to DSCs and these findings are in consistent with the study done by Katge et al.¹³ and Nitha.¹⁴ Since the topic is not taught through the curriculum, this may be the outcome of the CDE programs and seminars, which are attended by most postgraduates when compared with undergraduates.

Guidelines regarding SC harvesting were laid down by the Indian Council of Medical Research which has been updated in 2012. These guidelines have been laid down to ensure that research with human SCs is conducted in a responsible and ethically sensitive manner and complies with all regulatory requirements pertaining to biomedical research in general and SC research in particular. These guidelines are applicable to individual researchers, organizations, sponsors, oversight committees, and others, associated with research on human SCs and for their derivatives, both basic and clinical. Hence, dentists aspiring to conduct research related to DSCs should keep themselves updated with these guidelines.¹⁵

Despite the lack of in-depth knowledge regarding DSC banking, isolation, and storage, a majority of dentists were keen on updating their knowledge and recommending DSC storage to their patients. This may be attributed to the fact that dental professionals are realizing that this is an upcoming and fast-growing field with benefits such as ease of obtaining the dental cells as well as potential to differentiate into multiple cell lineages. More than 80% of the participants showed a positive attitude toward updating their knowledge regarding DSCs. Internet and academic journals were considered as the source of obtaining information and increasing knowledge regarding DSCs but the methods recommended to increase dental SC awareness were found to be Conferences and CDE programs followed by seminars.

CONCLUSION

From the findings of the present study, it was revealed that there is good awareness regarding SCs and dental SCs in the dental college of Bareilly city. However, the awareness, knowledge regarding sources, applications, uses, and clinical research guidelines regarding DSCs are lacking among the dentists who were undergraduates. Relatively, higher awareness was seen among the postgraduates probably due to the updated and research-oriented

curriculum. A positive attitude toward updating the knowledge regarding dental SCs has been displayed by the respondents.

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