Stem Cells in Dentistry: A Study Regarding Awareness of Stem Cells among Dental Professionals

Abstract

**Background:** Dental stem cell, a type of adult stem cell, exhibits multipotent differentiation capacity and is drawing worldwide attention because of its numerous applications. The advances in applications of dental stem cells seem to be unsurpassed in the near future, for which specialized skills and knowledge in this area are of prime significance. Hence, there is a need to acquire more knowledge about dental stem cells to obtain maximum benefits from it in the coming years. Dental stem cells in India are still at the budding stage, and there seems to be limited awareness regarding dental stem cells. **Aim:** This study aimed to assess the awareness of stem cells among the dental professionals. **Methodology:** The present study was a questionnaire-based study of dental professionals (MDS, BDS, postgraduates, and interns) of three different institutions. **Results:** Results showed that 95.2% of dental professionals are aware of the terminology dental stem cells and 53.9% of them are aware of various applications of dental stem cells. Chi-square test showed a significant correlation between the sources of information, source of dental stem cells, and clinical applications in relation to the academic qualification of the dental professionals. **Conclusion:** This study revealed a good level of awareness among the dental professionals, and it also showed the need to spread more knowledge about the advances in applications, storage, banking, and guidelines related to dental stem cells.

**Keywords:** Cell, dental professionals, dental stem cell, stem cells

Introduction

Stem cells are defined as clonogenic cells capable of both self-renewal and multilineage differentiation. They are also termed as progenitor cells. It has found various applications in the field of dentistry in the recent years after the discovery of dental stem cells.[1] There are primarily two types of stem cells, namely, embryonic stem cells (ESCs) and adult stem cells (ASCs) or somatic stem cells. Dental stem cell, a type of ASC, exhibits multipotent differentiation capacity and is drawing worldwide attention because of its various applications.[2‑4] The advances in applications of dental stem cells seem to be unsurpassed in the near future, for which specialized skills and knowledge in this area are of prime significance. Hence, there is a need to acquire more knowledge about dental stem cells to obtain maximum benefits from it in the coming years. Dental stem cells in India are still at the budding stage, and there seems to be limited awareness regarding dental stem cells. Therefore, this study aimed to assess the awareness of stem cells among the dental professionals.

Methodology

The present study is a questionnaire-based study, wherein the questionnaire was circulated among the dental professionals (MDS, BDS, postgraduates (PG), and interns) of three different institutions, namely, Al-Badar Rural Dental College and Hospital, HKE Dental College and Hospital, both from Kalaburagi and Al-Ameen Dental College and Hospital from Vijayapur. The questionnaire[2,5‑7] contains 18 questions, which have been developed on the basis of other similar articles related to stem cells and dental stem cells.[3,5‑7] The questionnaire includes both close-ended and self-administered questions. The data was analyzed using the percentages of the total and Chi-square test.

Results

The study sample consisted of a total of 189 dental professionals (MDS – 22.2%;...
Stem cells are the cells that have the ability to differentiate into different types of cell by undergoing numerous cell divisions along with maintaining the property to differentiate and proliferate into mature cell types. Stem cells are also called as the precursor cells or the progenitor cells because of the ability of self-renewal and transdifferentiation. The term “stem cell” was coined by Wilson. A histologist from Russia by name Alexander Maksimov postulated the existence of hematopoietic stem cells in the year 1908. Based on the origin and their potential of differentiation, stem cells are broadly classified as ESCs and ASCs. ASCs are multipotent cells that have the ability to differentiate into more than one type of cell but not all the type of cells. ASCs are also known as postnatal stem cells or somatic stem cells which can be obtained from bone marrow, umbilical cord, pancreas, adipose tissue, and dental pulp. Dental stem cell is a type of adult mesenchymal cell which has ease of access and is feasible source of stem cells. There are various sources of dental stem cells in the orofacial region such as dental pulp stem cells, dental follicle stem cells, stem cells of apical papilla, periodontal ligament stem cells, tooth germ progenitor cells, and immature dental pulp stem cells. There are numerous applications of this progenitor cell such as continued root formation, regeneration of an immature tooth with extensive pulp damage, periodontal regeneration, biological tooth, and stem cell-based therapies which are gaining worldwide attention because of its copious benefits. This questionnaire study was conducted to assess the awareness of dental stem cells among the dental professionals.

In the present study, Chi-square test showed a significant correlation between the source of information, source of dental stem cells, and clinical applications in relation to the academic qualification of the dental professionals which may be due to more knowledge acquired by highly qualified dental residents. On contrary, Sede et al. showed nonsignificant association between attitudes toward the use of stem cell with qualification.

Even significant correlation was also found regarding awareness of dental stem cell banks, investment and willingness to collect dental stem cells with respect to academic levels of the respondents.

Almost 95.2% of dental professionals are aware of the dental stem cells. This study revealed 53.9% awareness of the application of dental stem cells. Sede et al. found 81% of awareness about the use of stem cell in dentistry. According to our study, the major source of information was internet followed by books which may be due ease of access to this source. In contrary to this, a study conducted by Sede et al. showed that the undergraduate training and conference/symposium/seminar were the primary source of information. This could be due to increased spurt of conversation regarding the topic within the public through a variety of forums like increased publication of scientific articles and also because it is one

**Discussion**

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of the most novel topics ruling the world of medicine and dentistry.[7,20,21]

In this study, a thumping majority, i.e., 89.42% [Graph 3] showed interest to attend CDE programs or conferences in near future which could be due to increasing research, applications in this field, and also may be due to lack of sufficient in-depth knowledge about dental stem cells. This necessitates the organization of training/CDE program-related dental stem cells. Goyal reported that 73% of the participants were enthusiastic to attend such conference/workshop/CDE programs because they had never attended the same.

About 49.6% of dental professionals believed that the main obstacles to seek treatment with the aid of dental stem cells are high cost, lack of awareness, ethical issues, and insufficient knowledge about stem cells among dental practitioners, and comparable results were found in a survey done by Goyal where 63.50% agreed that the high cost, lack of awareness, and lack of sufficient knowledge were hindering people to obtain treatment using dental stem cells. These factors that refrain the people from obtaining treatment using dental stem cells could be minimized by reasonable charging the fees similar to other standardized management procedures[7] and by also spreading awareness at the public level by conducting seminars/lectures at public level which in return will decrease the misconceptions related to stem cells.

Nearly 75.13% of dental professionals agreed that dental professional associations should regulate the use of stem cell and regenerative dentistry as this may be due to the fact that dental pulp stem cells have equivalent potential to differentiate when compared with the stem cells obtained from bone marrow [Graph 4]. Analogous results (85.3%) were noticed in a study done by Utneja et al.

Almost 84% are unaware of the guidelines related to dental stem cells given by the Indian Council of Medical Research [Graph 5]. Hence, there is a need to spread awareness regarding these guidelines as the opinion of the dental residents may help to reframe them which in turn might facilitate to enhance the safety of procedures/treatment done using dental stem cells.
Conclusion

This questionnaire study revealed a good level of awareness among the dental professionals. When divided into groups, MDS staff was completely aware of the terminology followed by PG students, BDS staff, and interns. This study also showed a significant correlation between the academic qualification and the level of knowledge and awareness among the dental professionals. This urges a need to spread more knowledge about the advances in applications, storage, banking, and guidelines related to dental stem cells at UG level which can be done by conducting seminars and also by organizing seminars and conferences. Similar surveys and research must be conducted at different levels to spread the awareness globally so that everyone can gain the benefits in the near future.

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Conflicts of interest

There are no conflicts of interest.

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STEM CELLS IN DENTISTRY: A STUDY REGARDING AWARENESS OF STEM CELLS AMONG DENTAL PRACTITIONERS

QUESTIONNAIRE

General information
Name:
Age:
Gender: Male/Female
Qualification: Intern/BDS/Postgraduate student/MDS
Specialty:
Years of experience:

QUESTIONNAIRE
1. Have you heard of the terminology dental stem cells?
   □ Yes
   □ No

2. Specify your source of information.
   □ Books
   □ Journals
   □ Magazines
   □ Internet
   □ Mass media
   □ Conference/Convention/Symposium
   □ Seminar
   □ Undergraduate training
   □ PG training
   □ If others (Specify)

3. Are you aware of the different types of stem cells?
   □ Yes
   □ No

4. If yes, what are different types of stem cells?
   □ Embryonic stem cells
   □ Adult stem cells
   □ All the above
   □ No idea

5. Are you aware of the different types of dental stem cells?
   □ Yes
   □ No

6. Dental stem cells can be extracted from which of the following sources?
   □ Dental pulp stem cells
   □ Stem cells from human exfoliated deciduous teeth
   □ Stem cells from apical papilla
   □ Dental follicle progenitor cells
   □ Stem cells from periodontal ligament
   □ All of the above
   □ None
   □ No idea

7. Which of the following tooth can be used to obtain dental stem cells?
   □ Deciduous teeth
   □ Permanent third molars
8. Are you aware of dental stem cell banks in India?
   - Yes
   - No

9. Are you aware of the various applications of dental stem cells?
   - Yes
   - No

10. If yes, what are the different clinical applications of dental stem cells in relation to oral health care?
    - Whole tooth regeneration
    -Periodontal ligament, cementum, alveolar bone regeneration
    - Regeneration of pulp/dentin
    - Root formation
    - All the above
    - None
    - No idea

11. In your clinical practice, will you recommend or advise your patients to store/preserve dental stem cells?
    - Yes
    - No

12. Are you willing to collect dental stem cells?
    - Yes
    - No

13. What do you think is the main obstacle to seek the treatment with the aid of dental stem cells?
    - High cost
    - Lack of awareness
    - Ethical issues
    - Insufficient knowledge about stem cells among the dental practitioners
    - Insufficient knowledge about stem cells among people
    - Insufficient knowledge about stem cells among dental practitioners as well as people
    - All the above
    - None

14. Are you willing to invest for dental stem cell banking?
    - Yes
    - No

15. Have you attended any workshop/conference/seminar or continuing dental education program on application of stem cells?
    - Yes
    - No

16. In future, are you interested to attend any workshop/conference/seminar or continuing dental education program about the applications of stem cells?
    - Yes
    - No

17. Do you believe that dental professional associations should regulate the use of stem cell and regenerative dentistry?
    - Yes
    - No
    - Not sure

18. Are you aware of the guidelines related to dental stem cells given by the Indian Council of Medical Research?
    - Yes
    - No