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RESEARCH ARTICLE

KNOWLEDGE, AWARENESS AND ATTITUDE REGARDING STEM CELLS AMONG DENTAL PRACTITIONERS IN UDAIPUR CITY, RAJASTHAN

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Awareness and Attitude Regarding Stem Cells Among Dental Practitioners in Udaipur City, Rajasthan

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Abstract

Background: The advances in application of dental stem cells seem unparalleled in coming years, for which specialized skills and knowledge are of prime importance. Also, there is a need to understand the knowledge, perception and awareness regarding this topic. In India, application of stems cells in dentistry is at a nascent stage and there is limited awareness and knowledge regarding their application. **Objective:** This study was undertaken with an aim to assess the knowledge, awareness and attitude of dental practitioners towards the use of stem cells in dentistry. **Methods:** Questionnaire- based study of 126 dental professionals (MDS and BDS) from various dental clinics in Udaipur city. **Results:** Respondents had knowledge of classification of stem cells (60.3%) and sources of dental stem cells (54.8%). Only 34.9% of respondents had knowledge about development of dental stem cells from non dental organs. Chi- Square tests showed significant association between academic- levels and source of information of stem- cells, harvesting stem cells from the source other than teeth and development of dental stem cells to develop non dental organs. **Conclusion:** There is a positive attitude towards dental stem cells, although the knowledge about this method is limited. The knowledge is based on the qualification and not the experience. There is a need to increase knowledge among professionals regarding clinical application of the same.

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INTRODUCTION

Stem cells are undifferentiated cells with the ability to divide and give rise to identical, undifferentiated cells [Vipin A , Pooja A 2009, Rai S, Kaur M 2012, Acharya S 2013]. The term stem cell was proposed for scientific use by Russian histologist Alexander Maksimov in 1908 [Marwar PP, Mani A 2012]. Stem cells are defined as having the capacity for extensive self-renewal and for originating at least one type of highly differentiated descendant [Rai S, Kaur M 2013, Casagrande L, Cordeiro MM 2011]. Stem cells have been classified according to growth stage, plasticity and sources. There are 2 main types of stem cells – embryonic stem cells and adult stem cells – which are classified according to their origin and differentiation potential [Narang S, Sehgal N 2012].

Sources of postnatal dental stem cells include permanent teeth, deciduous teeth, periodontal ligament, stem cells from apical papilla and stem cells from supernumerary tooth, stem cells from teeth extracted for orthodontic purposes, dental follicle progenitor cells, stem cells from human natal dental pulp, and stem cells from dental follicle [Nedel F and André Dde A 2009, Acharya S 2013]. In a study by Tziafas D and Kodonas K (2010) it was found that the dental pulp might be only used as a source of progenitor cells with dentinogenic competence for the regeneration of the dentin-pulp complex.

Dental stem cells including DPSC (Dental Pulp Stem Cells, SHED and stem cells from apical papilla, dental follicular progenitor cells and periodontal ligament cells are accessible, can be stored easily and are cost-effective

for future cure of ailments [Acharya S 2013, Horst OV, Miquella G 2012]. Some studies have proved that DPSCs are capable of producing dental tissues *in vivo* including dentin, pulp, and crown-like structures [Yan M, Yu Y 2011]. SHED cells are retrievable from naturally exfoliated teeth as a source of postnatal human tissue [Acharya S 2013]. Recent studies have shown that SHED has the ability to develop into more types of body tissues than other types of stem cells. The application of stem cell therapy using SHED to treat these diseases is currently being pursued by many researchers at the institutions around the world. Until recently, stem cells harvested from umbilical cord blood were the only storage option to guard against future illness or disease [Vipin A, Pooja A 2009].

Dental pulp stem cells (DPSCs) have been reported to exhibit multipotent differentiation capacity into various cell lineages such as adipocytes, osteocytes, chondrocytes, and myocytes *in vitro* including *in vivo* studies showing differentiation of DPSCs into odontoblasts, neural cells, and in cardiac repair by improving angiogenesis [Rashi Khanna-Jain, Vanhatupa S 2012, Horst OV, Miquella G 2012].

The ultimate goal of tooth regeneration is to replace the lost teeth. Stem cell-based tooth engineering is deemed as a promising approach to the making of a biological tooth (bio-tooth). This study was undertaken with an objective of determining and comparing the knowledge, awareness and attitude of dental practitioners towards the possible application of stem cells in dentistry. Dental stem cell research is a new field in dental health sciences, which seems to hold a vast potential. However, not much is known about it among dental health caregivers. This research was carried out for scoping the span of knowledge that these professionals have in this area.

Material and methods

The present study was a Questionnaire based survey (cross-sectional study) conducted in Nov 2013. A 15 item questionnaire was delineated. The questionnaire was pre-tested, close ended and self administered. The questionnaire was in English language. The ethical approval was obtained from the ethical committee of Darshan dental college, Udaipur, Rajasthan.

The questionnaire was developed on the basis of other similar articles related to dental stem cells and other internet sources. The questionnaire was subjected to a pilot study on the dental practitioners. After deliberations, few questions were dropped and few were added. A final of 16 questions were included in the study to assess knowledge, awareness and attitude of dental practitioners towards the use of stem cells in dentistry.

The questionnaire was subjected to a pilot study on the staff and PG students of Dept. of Public Health Dentistry, Darshan Dental College. The suggested points were incorporated depending on their merits in relation to the mentioned study.

Sampling

Udaipur city was divided into four zones and dental clinics were randomly picked from these zones. 160 copies were circulated to dental professionals (MDS and BDS), 126 returned the questionnaire within the specified time of 30 min ((A sample of 60 is considered sufficient for a questionnaire based study).

The questionnaire data was entered in Microsoft Excel on the same day by the investigator and analyzed using SPSS 21 (Statistical Package for Social Sciences) package for relevant statistical comparison. The Pearson's Chi-Square Test, and percentages of the total were used for analysis to gain insight into extant of knowledge perception and application of stem cells in dentistry among dental practitioners.

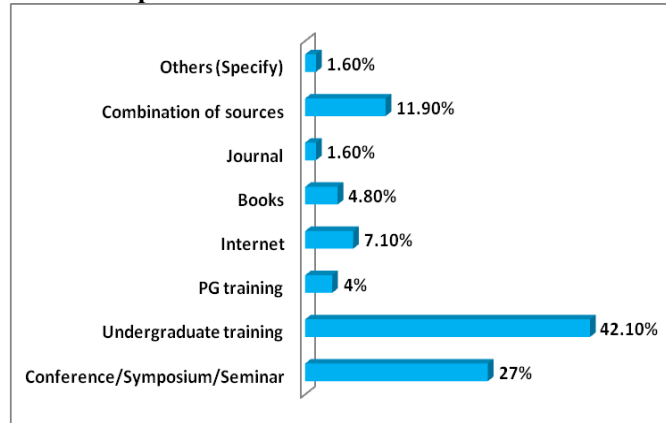
Result

There were 126 dental practitioners (MDS-30.2% and BDS-69.8%) and 63.5 % with less than 10 years professional experience. More than half (61.10%) were unsure of the application of dental stem cells in the treatment of other diseases (typically, in Hodgkin's Lymphoma, Thalassemia major and Fanconi's anemia).

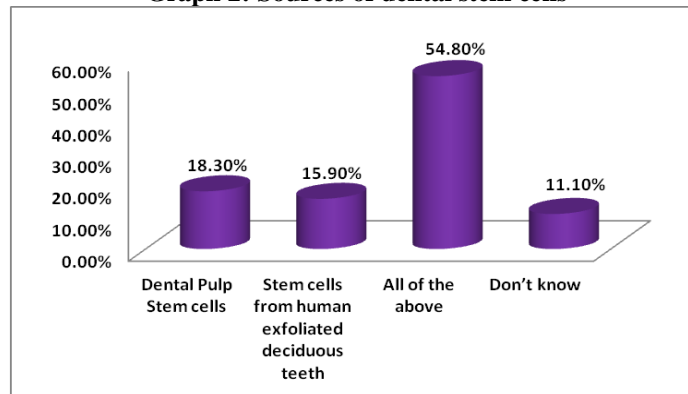
Respondents had knowledge of classification of stem cells (60.3%) and sources of dental stem cells (54.8%) (Graph 2). Only 34.9% of respondents had knowledge about development of dental stem cells from non dental organs. Chi-Square tests showed significant association between academic- levels and source of information of stem- cells, harvesting stem cells from the source other than teeth and development of dental stem cells to develop non dental organs. 63.5% of professionals recognized high cost, lack of awareness and lack of sufficient knowledge about stem cells in dentist as barriers inhibiting patients from seeking dental stem cell therapy. 52.6% of dental practitioners were aware of Indian Council of Medical Research guidelines regarding Stem Cells. It was noted that 43.7% were aware about dental stem cell banks in India. More than two- third (73%) of respondents were interested to attend any workshop/conference or continuing dental education program about application of stem cells as many have never attended the same (87.3%). According to dental practitioners more real life training would be most helpful for newly qualified dental professionals to gain knowledge about stem cells (47.6%). According to 69% of dental practitioners

dental stem cells research should be developed under both public and private sector in future for the further advancement of use of stem cells (Graph 5). More than half of the respondents (51.6%) acknowledged dental stem cells application for continued root formation, pulp healing regeneration and pulp/dentin engineering, replantation and transplantation and Bioroot engineering and reconstruction of the periodontium (Graph 3).

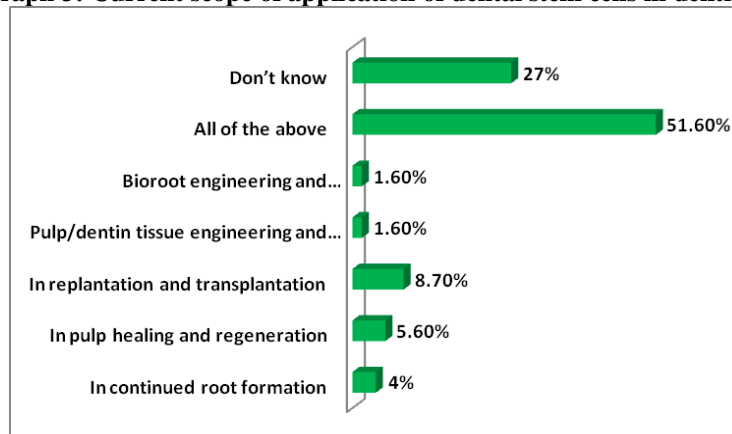
Graph 1: Source of information of stem cells

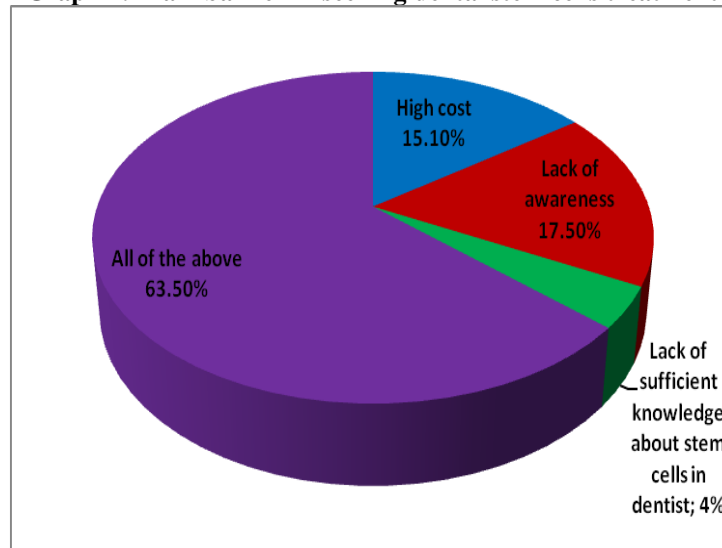
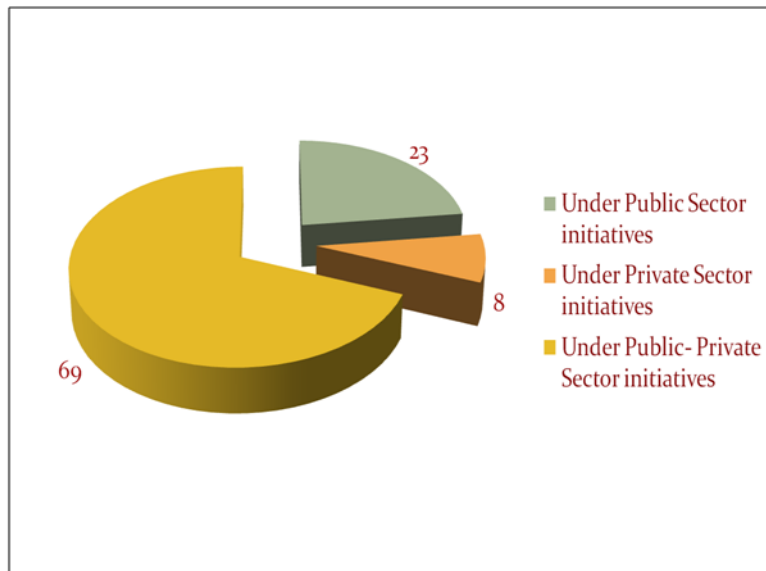


Graph 2: Sources of dental stem cells



Graph 3: Current scope of application of dental stem cells in dentistry



Graph 4: Main barrier in seeking dental stem cells treatment**Graph 5: In your opinion how should dental stem cells research be developed in future?**

Discussion

Recent advances in the identification and characterization of dental stem cells, and in dental tissue engineering strategies, suggest that within the next decade, bioengineering approaches may successfully be used to regenerate dental tissues and whole teeth. This survey was conducted to collect data about the level of awareness, knowledge and present clinical status about stem cell therapies amongst the dental practitioners in Udaipur city.

More than half of the respondents were young (53.2%) and in initial stages of their profession. They expressed enthusiasm about gaining knowledge on this subject. This is reflected in their belief that dental stem cell research will result in effective application within the next two decades. Utneja S et al (2003) found that 73% of participants in their study expressed enthusiasm about gaining knowledge on this subject. This positive response could be due to the surge in awareness regarding the topic through sources including scientific journals, discussions on this topic through forums including symposiums, Continued Dental Education Programs and conferences based on stem cell therapies and news dominating dental and medical tribunals (Graph 1). In the present study 73% of respondents were interested to attend any workshop/conference or continuing dental education program about application of stem cells as many have never attended the same (85%). Matthew AS et al (2013) reported that primary source of knowledge of stem cells were from undergraduate training and conference/symposium/seminar. The results were

similar with our study. Most of the respondents had knowledge about classification of stem cell. This may be because they were taught about stem cells during under graduation.

Dental practitioners had theoretical knowledge regarding the classification and sources of stem cells but also expressed desire for more practical experience by more real life training. This may be due to the lack of adequate skills, or sufficient proven knowledge regarding the subject, as a large majority has not had any formal exposure to dental stem cell research or any conference or symposium (87.3%). In addition, stem cell research in dentistry in India is still in its nascent stages and expensive and has a long way before its full-fledged application is reaped in clinical practice. This fact has been highlighted by the participants with majority acknowledging the fact that there is a lack of sufficient knowledge regarding the subject. Dental practitioners alike perceived that the patients may be hesitant in seeking dental stem cell therapy owing to lack of sufficient knowledge and/or skills while high cost was not considered by many to be a major deterrent to this effect (Graph 4).

Conclusion

There is a positive attitude towards dental stem cells, although the knowledge about this method is limited. The knowledge is based on the qualification and not the experience. There is a need to increase knowledge among professionals regarding clinical application of the same.

Recommendations

More knowledge should be incorporated at undergraduate and postgraduate level about stem cells. CDE and seminars should be organized about stem cells. Both private and public sectors need to take more aggressive initiatives. More stem cell banks should be started.

QUESTIONNAIRE

General Information :

Name:

Age:

Gender:

Qualification (BDS/MDS):

Specialty:

Years of experience:

KNOWLEDGE

Q.1 Have you ever come across the term stem cells?

1) Yes

2) No

If Yes 1(a) what is your source of information?

1) Conference/Symposium/Seminar

2) Undergraduate training

3) PG training

4) Internet

5) Books

6) Journal

7) Mass media

8) Others (Specify)

Q. 2. How stem cells are classified?

1) Embryonic Stem cells

2) Adult Stem cells

3) (1) & (2)

4) Don't know

Q3. What are the sources of dental stem cells?

1) Dental Pulp Stem cells

2) Stem cells from human exfoliated deciduous teeth

3) Stem cells from apical papilla

4) Dental follicle progenitor cells

- 5) Stem cells from Periodontal Ligament
- 6) All of the above
- 7) Don't know

Q 4. Other than teeth Stem cells can be harvested from?

- 1) Synovial Membrane
- 2) Liver
- 3) Umbilical cord
- 4) Amniotic fluid
- 5) Placenta
- 6) All of above
- 7) None
- 8) Don't know

Q 5. Type of Stem cells found in human exfoliated deciduous teeth?

- 1) Adipocytes
- 2) Chondrocytes
- 3) Osteoblasts
- 4) Mesenchymal
- 5) All of the above
- 6) None
- 7) Don't know

Q 6. What is the current scope of application of dental stem cells in dentistry?

- 1) In continued root formation
- 2) In pulp healing and regeneration
- 3) In replantation and transplantation
- 4) Pulp/dentin tissue engineering and regeneration
- 5) Bioroot engineering and reconstruction of the periodontium
- 6) All of the above
- 7) Don't know

Q 7. Can dental stem cells be used to develop non dental organs?

- 1) Yes
- 2) No
- 3) Don't know

Q. 8. Dental stem cells can be used in the treatment of which disease?

- 1) Muscular dystrophies
- 2) Corneal Ulcerations
- 3) Fanconi's anemia
- 4) Spinal cord injury
- 5) Parkinson and Alzheimer's disease
- 6) All of the above
- 7) None
- 8) Don't know

AWARENESS

Q 9. Are there any dental stem cell banks in India?

- 1) Yes
- 2) No
- 3) Don't know

Q 10. Are you aware of Indian Council of Medical Research guidelines regarding Dental Stem Cells?

- 1) Yes
- 2) No

ATTITUDE

Q 11. In a clinical practice, will you recommend patient to store dental stem cells and explain its future prospects?

- 1) Yes
- 2) No

Q 12. What is the main barrier in seeking dental stem cells treatment?

- 1) High cost
- 2) Lack of awareness
- 3) Lack of sufficient knowledge about stem cells in dentist

Q.13 Have you attended any workshop/conference or continuing dental education program about application of stem cells?

- 1) Yes
- 2) No

Q 14. Would you like to attend any workshop/conference or continuing dental education program about application of stem cells if given a chance?

- 1) Yes
- 2) No

Q.15. Which of the following statements would most help newly qualified dental professionals to be better able to gain knowledge about stem cells?

- 1) More real life training
- 2) Short courses to improve knowledge about stem cells
- 3) Topics related to stem cells to be included in the curriculum

Q 16. In your opinion how should dental stem cells research be developed in future?

- 1) Under Public Sector initiatives
- 2) Under Private Sector initiatives
- 3) Under Public- Private Sector initiatives
- 4) Other

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