Research Article

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Awareness about the Role of Dental Stem Cells in Periodontal Regeneration

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ABSTRACT

Background: Tissue engineering triad includes dental stem cells as a major factor in regeneration of periodontal tissues. Due the advances in the field of tissue engineering it is of prime importance to have knowledge and awareness on the regeneration potential of dental stem cells.

Aim: The present survey was carried out to assess the awareness about the role of dental stem cells in periodontal regeneration.

Materials and Methods: 320 dentists of Maharashtra participated in the questionnaire-based survey.

Results and Conclusion: Out of the 320 dentists, 185 were females and 135 males. All the dentists were aware of the term dental stem cells however, they lacked clinical knowledge on the regeneration potential of dental stem cells. The use of dental stem cells clinically can be increased by conducting more conferences and webinars focusing on tissue regeneration capacity of dental stem cells and making dentists aware of the great potential of stem cells.

Keywords: Dental stem cell, Periodontal regeneration, Tissue engineering, Awareness.

INTRODUCTION

Dental stem cells are considered important when tissue engineering concept is applied to restore lost periodontal tissues and their functions. Stem cells are those immature progenitor cells that are capable of self-renewal and multilineage differentiation through a process of asymmetric mitosis that leads to two daughter cells formation, one which is identical to stem cell (daughter stem cell) and one capable of differentiation into more mature cells (progenitor cells) [1]. Stem cells can be totipotent cells which gives rise to placenta and embryonic tissue, pluripotent cells which differentiates into endoderm, mesoderm and ectoderm and multipotent cells which gives rise to tissues from one germ layer that is either ectoderm or mesoderm or endoderm.

On the basis of how dental stem cells develop, they are broadly divided into embryonic stem cells and adult stem cells [2]. Embryonic stem cells are totipotent in nature. Due to its tumorigenic nature and high chances of teratoma formation and due to ethical concern, its use has been restricted. Adult stem cells on the basis of their origin are classified as haemopoietic stem cells and mesenchymal stem cells [3]. Mesenchymal stem cells also called as bone marrow derived stem cells have the capability to differentiate into multiple tissues like bone, muscle, cartilage and tendon. Mesenchymal stem cells are

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used for periodontal regeneration in the field of tissue engineering.

AIM

The present study aimed to gather data regarding the awareness about the role of dental stem in periodontal regeneration among dental professionals.

MATERIALS AND METHOD

The present survey was a questionnaire-based survey conducted in the department of Periodontology and Oral Implantology from September 2019 to November 2019. The survey consisted of 16 close ended questions which were prepared based on articles related to dental stem cells.[4][5][6] The sample size comprised of 320 dentists practicing or residing in Maharashtra, India. The sample included academicians, private practitioners and postgraduate students from the state of Maharashtra. The first four questions were based on sociodemographic variables which included the age, gender, qualification and years of experience of the dentist. The next set of questions assessed the knowledge and awareness amongst the practitioners regarding dental stem cells. The survey was prepared through google forms and then the link of the questionnaire was passed to each dentist

RESULTS

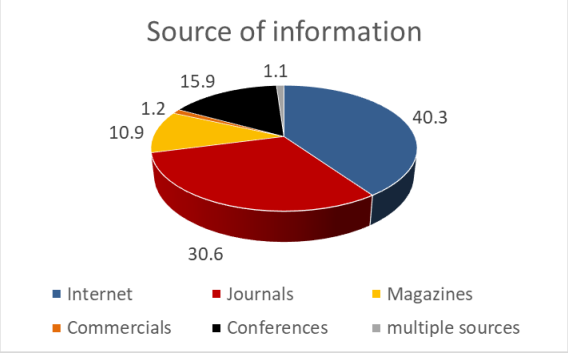
320 dentists participated in the survey comprising of 185 females and 135 males. 115 (35.9%) of participants were less than 25 years of age, 140 (43.8%) of participants were in the age range of 25-50 years and 65 (20.3%) participants were more than 50 years of age. Maximum dentists who participated in the survey had an experience of less than 5 years (46.9%) followed by more than 10 years of experience in clinical practice (34.1%) and about 5-10 years of experience (19.1%). Most of the dentists had MDS qualification (40.9%) followed by BDS (34.4%) followed by postgraduate students (24.7%). Table 1 shows the sociodemographic distribution of participants.

Table 1: Shows the sociodemographic distribution of participants.

CHARACTERISTICS	FREQUENCY	PERCENT
AGE (in years)		
<25 years	115	35.9%
25-50 years	140	43.8%
>50 years	65	20.3%
GENDER		
Male	135	42.2%
Female	185	57.8%
QUALIFICATION		
BDS	110	34.4%
MDS	131	40.9%
Postgraduate student	79	24.7%
EXPERIENCE		
<5 years	150	46.9%
5-10 years	61	19.1%
>10 years	109	34.1%

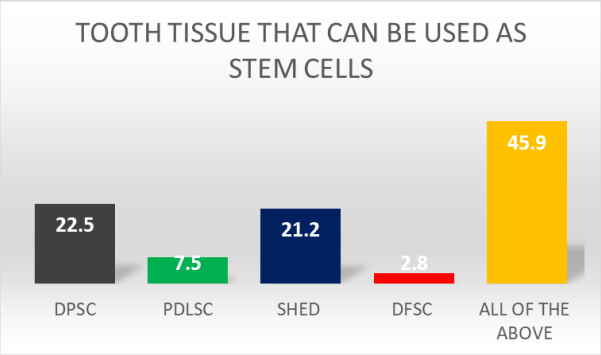
All the participants were aware of the term stem cell and the term dental stem cells (100%). Most of the participants regarded internet (40.3%) as their source of information regarding dental stem cells which was followed by journals (30.6%), conferences (15.9%), magazines (10.9%), commercials (1.2%) and (0.9%) participants said that they got information regarding dental stem cells from multiple sources. (Figure 1)

Fig 1: Source of information.



Participants were asked for their knowledge on the tooth tissue that can be used for stem cell banking and (22.5%) of participants felt dental pulp stem cells can be used, (21.2%) felt stem cells from exfoliated teeth can be used, (7.5%) felt periodontal ligament stem cells can be used, (2.8%) felt dental follicular stem cells can be used and (45.9%) of participants felt all the above tissues can be used for stem cell banking. (Figure 2)

Fig 2: Tooth tissue that can be used as stem cells.



Dentists were also asked about their knowledge on dental stem cell banks in India and where they are located and (71.9%) of dentists were not aware of the dental stem cells banks and only (28.9%) were aware of the dental stem cell banks. (Figure 3). They were also asked if they are aware of the term tissue engineering and (88.1%) were aware and (11.9%) were not aware of the term tissue engineering (Figure 3)

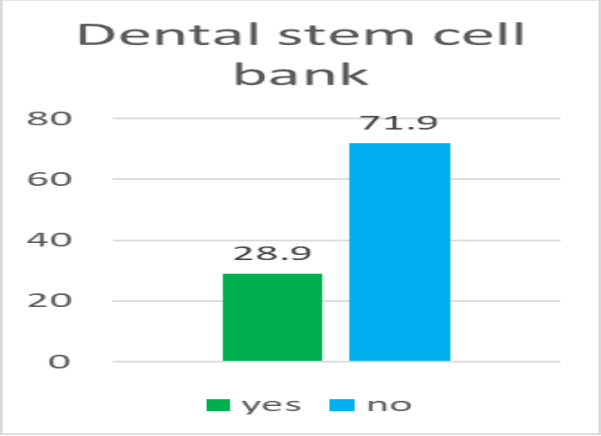
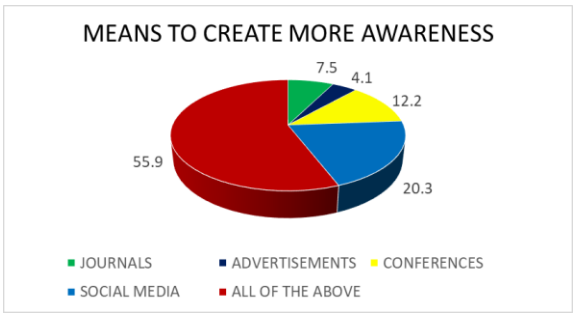


Fig 3: Dental stem cell bank.

About (48.1%) of participants were aware of different methods of tissue regeneration, (32.8%) were not aware and (19.1%) of participants were unsure about different methods of tissue regeneration. When participants were asked if they were aware of tissue regeneration by stem cells then about (95.6%) were aware of it and only (4.3%) were not aware of tissue regeneration by stem cells. When participants were asked if they had used dental stem cells as a method of tissue regeneration in their practice then (95.3%) had never used it and (4.7%) of participants had used it. Participants were also asked if they were willing to practice tissue regeneration using stem cells in their clinical practice and about (50.3%) of them were willing to practice whereas (32.8%) of participants didn't want to use stem cells and about (16.9%) of participants were unsure about it. Participants were also asked if they were aware of the guidelines given by Indian council of medical research for dental stem cells and about (93.4%) were not aware about it whereas only (6.6%) of participants were aware about the guidelines.

Participants were also asked what are the means by which more awareness can be created regarding dental stem cells and (20.3%) of participants answered social media as method to create more awareness followed by (12.2%) conferences, (7.5%) journals, (4.1%) advertisements and (55.9%) considered all of the above option. (Figure 4)

Fig 4: Means to create to more awareness.



DISCUSSION

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.[7][8][9]

In the present survey it was found that all the participants were aware of the term dental stem cells and their main source of knowledge regarding dental stem cells was through internet and journals. One of the reasons for this may be less information available regarding stem cells in books and more

research and material available in journals and internet.

Dental stem cells can be secluded from pulp tissues of permanent teeth, apical papilla of permanent teeth, periodontal ligament, developing dental follicle, and from primary teeth.[10][11] Stem cells are also obtained from the pulp of exfoliating deciduous teeth and have been termed as SHED by Miura et al. in 2003.[11] Miura et al. has given evidence that stem cells from exfoliated deciduous teeth are capable of multipotential differentiation and extensive proliferation. Studies have shown that primary canines and incisors without any dental pathology and at least one third length of root remaining are ideal for dental stem cell isolation and harvesting. [11][12]

The first tooth bank commercially was established at National Hiroshima University of Japan in 2004.[13] Most of the dentists were not aware of the dental stem cell banks in India. It is important that dentists should have thorough knowledge through literature but also have awareness regarding the commercial aspects of DSC banking.

About 50% of participants were aware of different methods of tissue regeneration. Most of them were also aware that stem cells could be used as a method for tissue engineering. Maximum participants had never used stem cells for tissue regeneration in their practice and this can be attributed to the lack of knowledge on this subject.

Guidelines regarding stem cell harvesting were laid down by the Indian Council of Medical Research which has been updated in 2012.[14]

Most of the dentists wanted to update their knowledge on dental stem cells. This can be due the fact that dentists are realizing the benefits of dental stem cells in tissue regeneration.

CONCLUSION

From the study it may be concluded that there is lack of knowledge and awareness regarding the tissue regeneration capacity of dental stem cells. The study also shows that maximum number of dentists have never used dental stem cells in their clinical practice. The awareness about the role of dental stem cells in periodontal regeneration can be increased by including these topics in conferences and webinars focusing on tissue regeneration capacity of dental stem cells and making dentists aware of great potential of dental stem cells.

CONFLICTS OF INTEREST

The authors declare they have no potential conflict of interests regarding this article.

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