International Journal Dental and Medical Sciences Research
Volume 3, Issue 2,Mar-Apr 2021 pp 171-178 www.ijdmsrjournal.com ISSN: 2582-6018

Evaluation of Contemporary Knowledge, Awareness and Perception Regarding the Implication of Stem Cells in Dental Practice- A Survey among Dental Surgeons of Kolkata and Suburban Area

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Submitted: 01-03-2021 Revised: 09-03-2021 Accepted: 12-03-2021

ABSTRACT: Background: The regenerative science and stem cell research are budding fields with enormous future prospects in both dental and medical fields. Dental stem cells are a convenient source of stem cells being medical waste. Studies on stem cell knowledge revealed inadequate basic information among fresher and experienced dental surgeons. Thus we need a clear picture of basic knowledge of stem cells that will definitely help us to understand the interest and attitude of dental surgeons in this domain. **Aim:** This study aimed to evaluate the basic knowledge, awareness, perception and attitude about stem cells among the dental surgeons of Kolkata and suburban area. **Methodology:** The present study is designed as a cross sectional online and manual questionnaire based survey. The final questionnaire was distributed after institutional pilot study among the dental surgeons of Kolkata and suburban area. Collected data was statistically analyzed in percentage of total and Chi Square test. **Results:** The statistical analysis revealed that 96.27% of dental surgeons knew of the terminology stem cells and 71.43% of them were aware of utility of dental stem cells. Chi square test showed a significant correlation between collected data and the experience and qualification of the dental surgeons. **Conclusion:** This study concluded an increased trend of interest for stem cell knowledge, therapy and research among dental surgeons. Most of them showed positive perception and attitude towards regenerative dental practice and future research.

KEY WORDS: Stem cells, Stem cell research, Regenerative Endodontics.

I. INTRODUCTION:

The next generation of dentistry is eager to observe the advances in the field of regenerative endodontics. This requires the elucidation of this therapy from lab to clinic and thus there is a need of the collaboration between basic scientists and clinicians. Stem cells are a group of miracle cells that have unique characteristics of self renewal and differentiation potential.[1] Recently, medical wastes such as dental pulp stem cells (DPSCs) are becoming popular in regenerative research being easily available. There is no strong ethical debate against sample collection and fundamental research on DPSCs.[2] In India, reported studies demonstrated lack o updated concept regarding regenerative endodontics along with knowledge related to dental stem cells (DSCs) among dental practitioners.[3-5] Till date, no text book is available to deliver adequate knowledge to the

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Volume 3, Issue 2,Mar-Apr 2021 pp 171-178 www.ijdmsrjournal.com ISSN: 2582-6018

under graduate and post graduate students. Few students and practitioners are availing knowledge from conferences, seminars and internet. In this context, when it is the demand of time, we should move our field not only in a conservative way but also towards dental repair- regeneration and translational therapies. This study tried to evaluate the basic knowledge, awareness, perception and attitude about stem cells and regenerative dentistry among the dental surgeons of Kolkata and suburban area.

II. MATERIALS AND METHOD:

The present study is designed as a cross sectional questionnaire based survey. In this survey, to validate the questionnaire a pre-testing of sample questionnaire was done after an approval from the local ethical committee. The questionnaire was subjected for pilot study among the institutional dental surgeons. Next, the final questionnaires were distributed in dental graduates and postgraduates of Kolkata and suburban area manually (231) and online (271) media in the dental graduates and postgraduates. We received feedback of 375 dental surgeons manually (214) and online (161). The questionnaire includes 21 questions including general information of the participants and their basic knowledge, awareness, perception and attitude on stem cells and regenerative dentistry. **[Figure-1, 2]** After collection of data the statistical analysis was done in percentage of total and Chi-square test to gain insight into extant of knowledge, awareness and perception of the dental surgeons.

III. RESULTS:

The total number of circulated questionnaire was 502 where 375 participants completed the survey. Margin of error was calculated ±3% with Confidence level 95%. The analysis of data was calculated based on percentage of total and Chi-square test. **[Table-1]** In this study population the graduates were 58.39% and post graduates were 39.75%. The male female and urban rural ratio was 3:2 and 3:1 respectively. Only 31.06% subjects had 10 years or more experience in dental surgery. In context of basic knowledge, 86.96% dental surgeons knew the terminology 'regenerative dentistry' where 96.27% were familiar with the term 'stem cell'. [**Chart-1**] Nearly 43.48% of dental surgeons were aware of different types of DSCs. Most of them gathered this basic knowledge from books (31.68%) and internet (12.42%).Only 9.94% acquired information from conferences and seminars. Nearly, 48.45% dental surgeons identified umbilical cord as a stem cell source. The observation revealed that one third of the participants (75.16%) knew a tooth can be a stem cell source. More than half (63.98%) of them had the knowledge of stem cell banking where only 47.83% had information about tooth banking. Most of the dental surgeons were aware of utility of DSCs (71.43%) [**Chart-2**] but they had insufficient information regarding GMP (Good Manufacturing Practice) protocol (18.01%) and ICMR (Indian Council of Medical Research) guidelines (19.88%). Both graduates and post graduates had positive perception and attitude towards incorporation of regenerative therapies in regular clinical practice (92.55%). They showed similar attitude in incorporation of regenerative dentistry in under graduate syllabus (74.53%). [**Chart-3, 4, 8**] Around 88.20% positive attitude was observed for future research. Almost 68.32% were sure about good future prospect of regenerative therapies where 7.45% had no idea about it. [**Chart-5, 6**] 59.19% participants showed interest to attend continued dental education programs, seminars or conferences and workshops. [**Chart-7**]

A significant correlation was found between basic knowledge (source of information, different source of stem cells and types of DSCs), awareness (information of stem cell banking, tooth banking and utility of DSCs), and attitude (interest in incorporation of regenerative therapy in regular clinical practice, incorporation in undergraduate syllabus, attend programs, prospect of future regenerative therapies and future research) with the experience and qualification of the dental surgeons (graduates and post graduates) using Chi square test.

IV. DISCUSSION:

The regenerative therapy is a field of discussion and practice in medicine today. Dental regeneration is a comparatively new field and thus a fundamental concept in this field is necessary for dental surgeons. Studies among health professionals suggest that there is lack of basic understanding of regenerative science among fresher and experienced medical practitioners, dental surgeons and nurses.[3-5.8-12] Thus surveys related to their concept and attitude will show new direction in course curriculum for undergraduates and post graduates. The term "stem cell" evolved as back as 1908 when Russian histologist **Alexander Maximow** introduced a theory of hematopoiesis.[6] The concept of dental regeneration first reported by **Dr. B. W. Hermann** (1952) who used calcium hydroxide for apexification and observed subsequent hard tissue formation.[7] In this survey, most of the

participants have the familiarity with basic terminologies such as 'stem cells' (~96%) and 'regenerative dentistry' (~89%). A similar finding was observed in a study done by **Parita K Chitroda et al.** (2017) in karnataka.[3] Most of the participants gathered knowledge from books (~32%) and internet (~12%) followed by programs and seminars (~10%). **Sede et al.** (2013) showed undergraduate training and conference/symposium/seminar as the primary source of information in their study.[8] More than half of the dental surgeons (~64%) had the knowledge regarding stem cell banking but the information of tooth banking was below half (~48%). Around 75% knew a tooth can be considered as stem cell source where only about 43% heard the different types of dental stem cells. It is clearly evident that most of the participants had lack of basic information regarding dental regenerative science. In this study, nearly 71% dental surgeons claimed that they know the utility of DSCs but they had inadequate information regarding standard protocols and guidelines (< 20%). Therefore, it is important to spread information regarding these standards to the dental practitioners who are willing to conduct regenerative dental approaches clinically. The attitude towards incorporation of regenerative therapies in regular clinical practice (~93%) and under graduate syllabus (~75%) shows the interest of dental surgeons in the regenerative dentistry. Diferent studies demonstrated same positive attitude of dental professionals to learn this subject.[3-5] The positive attitude of dental surgeons (~88%) towards future research demonstrated the need of regenerative therapies and advancement in dentistry. Around 68 % participants were optimistic regarding future prospect of regenerative therapies. More than half study population (~59%) showed interest to attend continued dental education programs, seminars or conferences and workshops. Similar studies reported same attitude of health professionals in respect to attend programs.[3,4,9-12] **[Table-2]**

Chi square test showed a significant correlation between source of information, different source of stem cells and types of DSCs, information of stem cell banking, tooth banking and utility of DSCs, interest in incorporation of regenerative therapy in regular clinical practice, incorporation in undergraduate syllabus, attend programs, prospect of future regenerative therapies and future research with the experience and qualification of the dental surgeons. A study showed significant correlation between the utility of DSCs, the source of DSCs and source of information with academic qualification of the dental professionals where in another study, there was insignificant association between the attitude towards the application of stem cells and qualification.[3,8]

V. CONCLUSION:

The advances in application of dental stem cells seem unparalleled in present scenario and there is a need of knowledge, awareness and perception to develop a specialized skill to establish stem cell therapy in regular dental practice. An increased trend of knowledge, awareness and perception were recorded with advancement of professional experience and wisdom. Most of the dental surgeons have positive perception and attitude to practice regenerative dentistry as well as for future research. Contemporary quantum of knowledge in the field of stem cell research is essential for regenerative dental practice. A larger sample with different variables will ensure more insight in future surveys.

Financial support and sponsorship- Nil

Conflict of interest- There is no conflict of interest

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[**Table -1:** Collected data from participants in percentage of total]

General Information	**Basic Knowledge**	**Awareness**	**Perception and Attitude**
≤ 35 yrs- 70.19 ≥35 yrs – 27.95	Regenerative Dentistry terminology Yes – 86.96 No – 9.94	Stem cell banking Yes – 63.98 No – 34.16	Incorporation in Regular clinical practice (IRCP) Yes – 92.55 No – 4.35
Male- 59.01 Female- 38.51	Stem cell terminology Yes – 96.27 No – 0.62	Tooth banking Yes – 47.83 No – 48.45	Incorporation in UG syllabus (IUGL) Useful-74.53, N- 5.59 Not sure-16.77
Urban – 75.16 Rural – 14.91	Source of information Books – 31.68 Internet – 12.42 Conference/Seminar-9.94	Utility of DSC Yes – 71.43 No – 24.84	Interest to attend CDE/Seminar/Workshop-59.19
Graduates (G) – 58.39 Post graduates (PG) – 39.75	Umbilical cord-48.45	GMP protocol Yes – 18.01 Never – 78.26	Prospect of Regenerative therapies- Good- 68.32, Difficult- 20.50, No- 7.45
≤ 10 yrs- 65.84 ≥10 yrs – 31.06	Tooth as source Yes – 75.16 No – 21.74	ICMR guidelines Yes – 19.88 No – 78.28	Research in this field- Yes- 88.20, No- 0.62, Not Sure- 8.07
	Different Types of DSCs – 43.48		

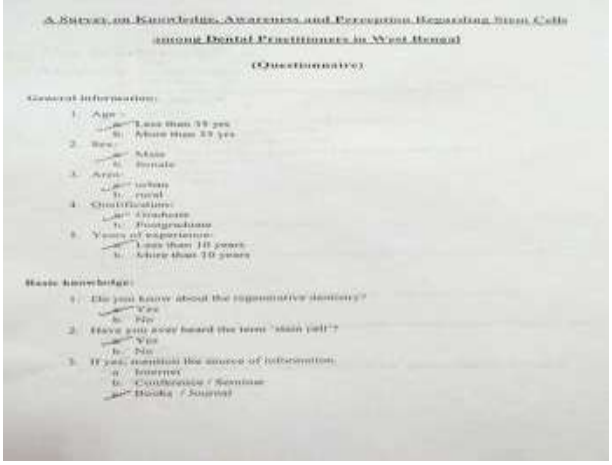
[**Table -2:** Previous studies of basic knowledge, awareness and attitude of health professionals on stem cell research and regenerative dentistry]

Authors & reference number	**Survey population**	**Year**	**Region**	**Conclusion**
Sede et al. [8]	Dentists	2013	Nigeria	81% had awareness

Jee Leng LYE et. al [9]	Nursing students	2015	Malayasia	76% showed positive attitude
Diana PK Lai et. al. [10]	Medical students	2015	Malayasia	Majority – interested to learn
Goyal et al [4]	Dental practitioners	2015	Udaipur, Rajasthan	73% interested to attend programs
Utneja et al. [5]	Endodontic residents	2013	New Delhi	85.3% positive attitude for utility of dental stem cells
Parita k Chitroda et al. [3]	Dental professionals	2017	Karnataka	89.4% interested to attend programs
Neha Patyal et al. [11]	Nurses	2018	Ambala, Haryana	28% good and 43% average knowledge on stem cell
Adel Alhadlaq et al. [12]	Recent dental graduates	2019	Saudi Arabia	Inadequate knowledge of stem cell in males and females

Legends of figures and charts-
Figure 1 & 2: Example of manually filled questionnaire by a participant.
Chart 1: Basic knowledge about the term 'regenerative dentistry' and 'stem cell'. **Chart 2:** Awareness regarding utility of dental stem cells.
Chart 3: Attitude towards incorporation of regenerative therapy in regular clinical practice.
Chart 4: Attitude towards incorporation of regenerative therapy in undergraduate level.
Chart 5: perception regarding future regenerative therapy.
Chart 6: Attitude towards future regenerative research
Chart 7: Interest towards attending regenerative therapy programs.
Chart 8: Comparison of perception and attitude of graduates and post graduates

[**Figure 1 & 2:** Example of manually filled questionnaire by a participant.]


A Survey on Knowledge, Awareness and Perception Regarding Stem Cells among Dental Practitioners in West Bengal

(Questionnaire)

General Information:

1. Age :
   a. Less than 35 yrs
   b. More than 35 yrs
2. Sex :
   a. Male
   b. Female
3. Area :
   a. urban
   b. rural
4. Qualification:
   a. Graduate
   b. Postgraduate
5. Years of experience:
   a. Less than 10 years
   b. More than 10 years

Basic knowledge:

1. Do you know about the regenerative dentistry?
   a. Yes
   b. No
2. Have you ever heard the term "stem cell"?
   a. Yes
   b. No
3. If yes, mention the source of information:
   a. Internet
   b. Conference / Seminar
   c. Books / Journal

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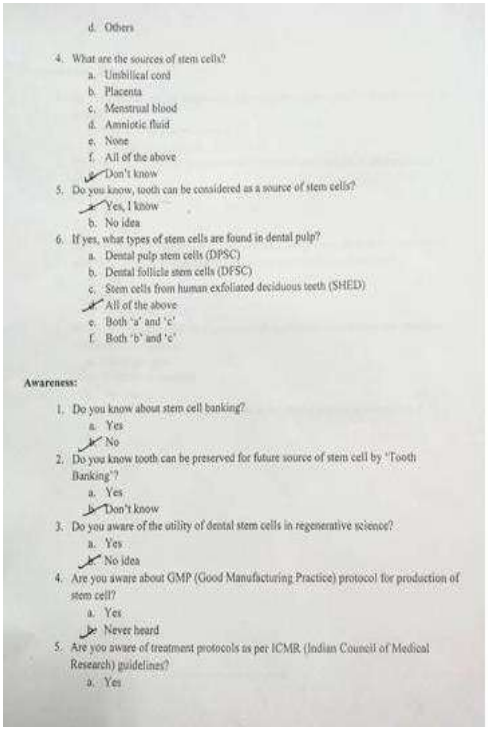
Volume 3, Issue 2,Mar-Apr 2021 pp 171-178 www.ijdmsrjournal.com ISSN: 2582-6018

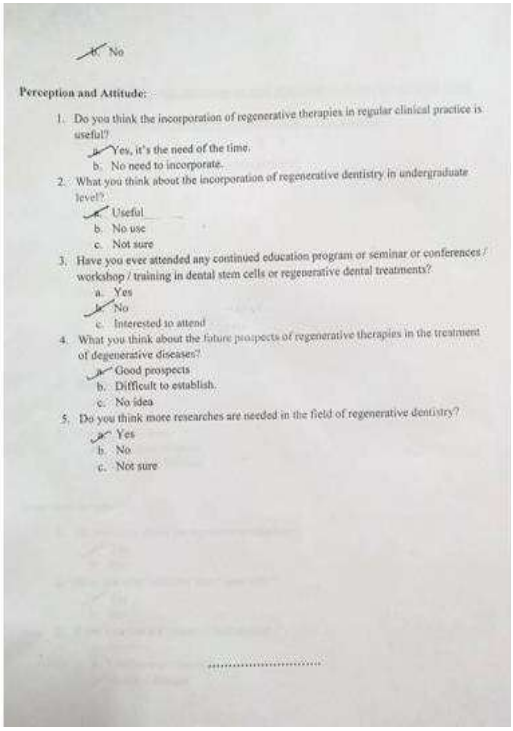


d. Others

4. What are the sources of stem cells?
   a. Umbilical cord
   b. Placenta
   c. Menstrual blood
   d. Amniotic fluid
   e. None
   f. All of the above
   ✓ Don't know
5. Do you know, tooth can be considered as a source of stem cells?
   ✓ Yes, I know
   b. No idea
6. If yes, what types of stem cells are found in dental pulp?
   a. Dental pulp stem cells (DPSC)
   b. Dental follicle stem cells (DFSC)
   c. Stem cells from human exfoliated deciduous teeth (SHED)
   ✓ All of the above
   e. Both 'a' and 'c'
   f. Both 'b' and 'c'

Awareness:

1. Do you know about stem cell banking?
   a. Yes
   ✓ No
2. Do you know tooth can be preserved for future source of stem cell by "Tooth Banking"?
   a. Yes
   ✓ Don't know
3. Do you aware of the utility of dental stem cells in regenerative science?
   a. Yes
   ✓ No idea
4. Are you aware about GMP (Good Manufacturing Practice) protocol for production of stem cell?
   a. Yes
   ✓ Never heard
5. Are you aware of treatment protocols as per ICMR (Indian Council of Medical Research) guidelines?
   a. Yes



✓ No

Perception and Attitude:

1. Do you think the incorporation of regenerative therapies in regular clinical practice is useful?
   ✓ Yes, it's the need of the time.
   b. No need to incorporate.
2. What you think about the incorporation of regenerative dentistry in undergraduate level?
   ✓ Useful
   b. No use
   c. Not sure
3. Have you ever attended any continued education program or seminar or conferences / workshop / training in dental stem cells or regenerative dental treatments?
   a. Yes
   ✓ No
   c. Interested to attend
4. What you think about the future prospects of regenerative therapies in the treatment of degenerative diseases?
   ✓ Good prospects
   b. Difficult to establish.
   c. No idea
5. Do you think more researches are needed in the field of regenerative dentistry?
   ✓ Yes
   b. No
   c. Not sure

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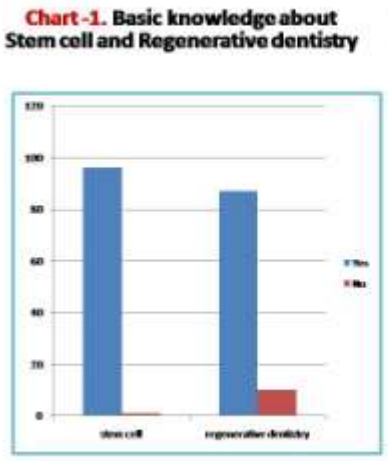
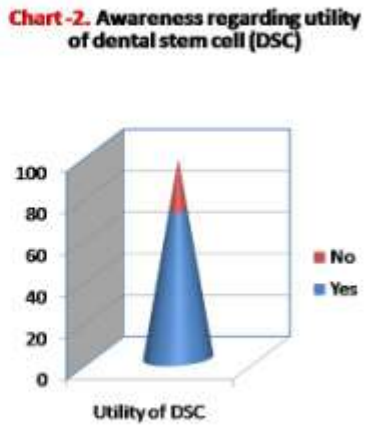
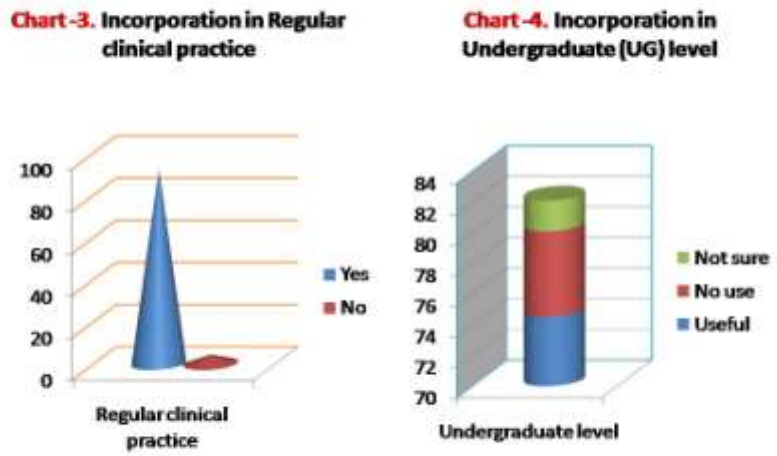
[**Chart 1:** Basic knowledge about the term 'regenerative dentistry' and 'stem cell'. **Chart 2:** Awareness regarding utility of dental stem cells.]



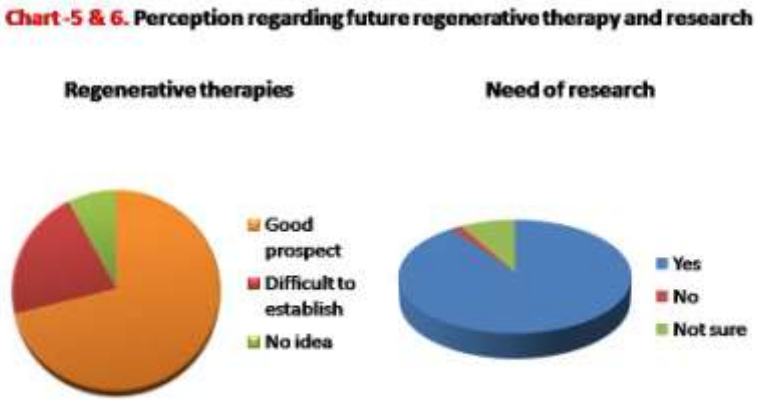


International Journal Dental and Medical Sciences Research
Volume 3, Issue 2,Mar-Apr 2021 pp 171-178 www.ijdmsrjournal.com ISSN: 2582-6018

[**Chart 3:** Attitude towards incorporation of regenerative therapy in regular clinical practice. **Chart 4:** Attitude towards incorporation of regenerative therapy in undergraduate level.]



[**Chart 5:** perception regarding future regenerative therapy. **Chart 6:** Attitude towards future regenerative research.]



International Journal Dental and Medical Sciences Research
Volume 3, Issue 2,Mar-Apr 2021 pp 171-178 www.ijdmsrjournal.com ISSN: 2582-6018

[**Chart 7:** Interest towards attending regenerative therapy programs. **Chart 8:** Comparison of perception and attitude of graduates and post graduates.]