

Awareness of Stem cells & Health Implications of SHED found in Pediatric Dentition among Indian Population

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Abstract:

Background: Primary teeth may be an ideal source of postnatal stem cells to regenerate tooth structures and bone, and possibly to treat neural tissue injury or degenerative diseases. SHED (stem cells from human exfoliated deciduous teeth) were identified to be a population of highly proliferative, clonogenic cells capable of differentiating into a variety of cell types including neural cells, adipocytes, and odontoblasts. The present study was carried out to assess the knowledge, awareness & attitude of parents visiting various dental clinics in tricity area of india regarding stem cells from primary teeth and their potential health benefits.

Materials & Methods: A total of 250 parents of pediatric patients seeking dental treatment at various dental clinics in tricity area were included in the study. Parents were personally interviewed with a questionnaire and their responses were immediately computed.

Results: Among 250 parents only 95(62%) had knowledge regarding stem cells. While only 47(18.8) were informed regarding stem cells from baby teeth & their benefits. Maximum subjects were informed through internet 21(44.6%) followed by information through friends(23.4%) and dentist(21.2%). Very few were informed through magazines, newspaper and only one (2.1%) person was informed by television.

Conclusion: It is important to create more awareness among the populace of our country about the potential health benefits of stem cells from primary teeth. Dentist should educate parents, caregivers and teachers regarding SHED & its benefits, ensuring

good health for every Indian child and hence health of future citizens.

Key Words: Health, SHED, stem cells

Introduction

Stem cells are unspecialized cells that continually reproduce themselves and can differentiate into specialized cells of one or more types.¹

Stem cell therapy is emerging as a revolutionary treatment modality to treat diseases and injury with wide- ranging medical benefits. SHED are stem cells found in exfoliated primary teeth of children.² Recent studies have shown that SHED have the ability to develop into more types of body tissues than any other types of stem cells.³

The pulp of exfoliated primary teeth have been found to contain chondrocytes, osteoblasts, adipocytes, and mesenchymal stem cells.^{4,6} All of these cell types hold enormous potential for the therapeutic treatment of: Neuronal degenerative disorders such as Alzheimer's, Parkinson's, and ALS (Amyotrophic Lateral Sclerosis or Lou Gehrig's Disease); chronic heart conditions such as congestive heart failure and chronic ischemic heart disease; periodontal disease and to grow replacement teeth and bone.⁷ The American Academy of Pediatric Dentistry recognizes the emerging field of regenerative medicine and encourages dentists to follow future evidence-based literature in order to educate parents about the collection, storage, viability, and use of dental stem cells with respect to autologous regenerative therapies. As the technology continues to evolve, the process of procurement of dental stems cells should be accomplished only with deliberate integrity and appropriate informed consent to assure the highest ethical standards and quality of outcomes.^{8,9} Dentists, pediatricians, and other public health specialists are on the front line of this healthcare issue and need to inform their patients and help them understand the issue and need for retaining these primary teeth. This study was done to assess the knowledge, awareness & attitude of parents regarding stem cells from primary teeth and their clinical applications in future.

Materials and Methods

The study population consisted of 250 parents of children within 6 to 12 years of age visiting various dental clinics in tricity area. They were randomly selected and were asked to fill a questionnaire. The study was completed in 3monthsperiod. Patients visiting various dental clinics in tricity area were included in the study. Questionnaire comprised of various questions. These questions were written in both English and local understandable language.

socioeconomic status.

Table 1 describes answer to the next question which concluded that 95(38%) out of 250 had knowledge regarding stem cells & 155(62%) were never informed about stem cells.

Table 2 describes how many of those informed had knowledge regarding their medico legal applications. Out of 95 subjects only 82(32.8%) had knowledge, rest 168 (62%) were never informed.

Table 1: No. of parents having knowledge regarding stem cells.

| Participants | Never informed | Informed | % Never Informed | % Informed |
|--------------|----------------|----------|------------------|------------|
| 250 | 155 | 95 | 62 | 38 |

Table 2: Parents having knowledge regarding medico-legal applications of stem cells.

| Participants | Never informed | Informed by source | % Never Informed | % Informed by source |
|--------------|----------------|--------------------|------------------|----------------------|
| 250 | 168 | 82 | 67.2 | 32.8 |

Table 3: No. of parents who were informed regarding SHED and their potential health implications.

| | Participants | Never informed | Informed | % Never Informed | % Informed |
|-------------------|--------------|----------------|----------|------------------|------------|
| | 250 | 203 | 47 | 81.2 | 18.8 |
| Educated | 190 | 183 | 45 | 96.3 | 3.7 |
| Uneducated | 60 | 20 | 2 | 33.3 | 66.7 |

Table 4: How were the parents informed that baby teeth contain stem cells?

| No. of participants | Internet | Radio | Television | Newspaper | Magazines | Dentist | Physician | Friend | Other |
|---------------------|----------|-------|------------|-----------|-----------|---------|-----------|--------|-------|
| 250 | 21 | - | 1 | 2 | 2 | 10 | - | 11 | - |

Table 5: Amount of visit each child had to a dentist?

| 1-5 | 5-10 | 10-15 | 15-20 | 20-25 | 25-30 | 30-35 | 35-40 | 40-45 | 45-50 |
|-----|------|-------|-------|-------|-------|-------|-------|-------|-------|
| 54 | 31 | 62 | 38 | 39 | 22 | 1 | 1 | 2 | - |

If parents don't understand any question, they were asked to contact the author. Among initial questions asked were name & occupation of the parent. How many children do they have? whether they have a child in between 6 to 12 years of age. Next question was whether they have any idea about stem cells and if the answer was yes, then do they have any idea about its medicolegal applications. Next question asked was whether they were informed about stem cells from primary teeth and their potential health benefits. If the answer was yes, then by which source were they informed. Lastly they were asked how many times they have visited dentist for their child.

Results

Among 250 parents who filled the questionnaire no one refused and the questionnaire was completely filled out. The initial question asked was name and occupation of the parents. 190(76%) were educated and 60(24%) were uneducated. Most of them were belonging to high

Table 3 describes number of subjects having knowledge regarding SHED and their potential health implications. The results concluded that only 47(18.8%) subjects had knowledge regarding SHED & 203(81.2%) were never informed. Also among 190 educated participants& 60 uneducated participants, 183(96.3%) and 20(33.3%) respectively were never informed.

Table 4 describes the source by which they were informed regarding SHED& their implications for future use. 21(44.6%) were informed through internet. 11(23.4%) were informed through friends and 10(21.2%) were informed by dentist. Only 2(4.2%) were informed through newspapers and magazines. Only 1(2.1%) was informed through television.

Table 5 shows response to the last question. The amount of visits each child has had to a dentist in their lifetime. The distribution ranged at an interval of five upto 50 visits. 62 (24.8%) had visited dentist 10-15 times in their life time.

The questionnaire data were manually entered using Microsoft Excel 2007 (Microsoft, Redmond, WA, USA).

Discussion

Every child loses primary teeth, which creates the perfect opportunity to recover and store this convenient source of stem cells which can be used to treat future injuries or ailments and presents a far better alternative to simply discarding the teeth or storing them as mementos from the past.

Further research has revealed that the stem cells of primary teeth are mesenchymal in origin, which is the same cellular origin for neuronal and bone tissue.^{4,6} For this reason, scientists hypothesized that stem cells from the primary dentition can combat diseases of the hard tissue (bone, cartilage, and dentition) and the nervous system of a patient.^{10,11}

SHED cells are complementary to stem cells from cord blood. While cord blood stem cells have proven valuable in the regeneration of blood cell types, SHED are able to regenerate solid tissue types that cord blood cannot -such as potentially repairing connective tissues, dental tissues, neuronal tissue and bone.⁶

Unfortunately, a lack of insight and education about this potential life saving stem cell research has allowed for millions of viable primary teeth to be discarded rather than cryopreserved for future applications. According to our study 62% parents are not aware of the importance of retaining primary teeth and thus it is must for us to educate them regarding this recent advancement in dentistry.

Recent exciting new discoveries place dentists at the forefront of helping their patients benefit from potentially life-saving therapies derived from a patient's own stem cells obtained from deciduous teeth and permanent teeth. First person to come in contact with the child among health professionals are the pediatricians. Also patients in pediatric age group are treated by dentists and primary care physicians. So medical professionals should motivate and guide them regarding importance and cryopreservation of primary teeth.^{12,13}

Furthermore, using ones own stem cells poses few, if any, risks for developing immune reactions or rejection following transplantation and also eliminates the potential of contracting disease from donor cells.

As the number of people affected by degenerative diseases continues to increase, there will be a greater need for new treatment options for the ever-growing aging population.

Harvesting and banking SHED now will ensure their availability in the future when they will be needed most. Thus government agencies should realize the importance of primary teeth as life saving entity and should take necessary action to promote research and growth in upbringing of this new technology.^{14,15}

There is much research left to be conducted, but the existing research has clearly shown that primary teeth are a better source for stem cells. While the promise of the immense scope and magnitude that stem cell therapies will have upon the population will only be fully realized in the future, Dental Professionals should realize that the critical time to act is now. The available opportunities to bank their patient's dental stem cells will have the greatest future impact if seized while patients are young and healthy. The Dental professional will play an important role in both the recovery and the use of these stem cells in both Dental and Medical regenerative therapies.^{2,16}

Conclusion

The parents need to be motivated and educated about the importance of storing their dental stem cells and create awareness regarding the use of stem cell banking and evolution of stem cell therapy. Further research is needed with respect to the knowledge among general dental practitioners regarding stem cells from primary teeth and they should also be educated regarding the same so that they can create awareness among the populace of our country.

References

1. Abdullah FM, Ponnuraj KT, Mokhtar KI. DPSCs and SHED in Tissue Engineering and Regenerative Medicine. *Open Stem Cell J* 2013;4:1-6.
2. Arora V, Arora P, Munshi AK. Banking Stem Cells From Human Exfoliated Deciduous Teeth (SHED): Saving For The Future. *J Clin Pediatr Dent* 2009;33(4):289-94.
3. Nakamura S, Yamada Y, Katagiri W, Sugito T, Ito K, Ueda M. Stem cell proliferation pathways comparison between human exfoliated deciduous teeth and dental pulp stem cells by gene expression profile from promising dental pulp. *J Endod* 2009;35:1536-42.
4. Miura M, Gronthos S, Zhao M, Lu B, Fisher LW, Robey PG, Shi S. SHED: stem cells from human exfoliated deciduous teeth. *Proc Natl Acad Sci USA* 2003;100:5807-12.

5. Perry BC, Zhou D, Wu X, Yang FC, Byers MA, Chu TM, Hockema JJ, Woods EJ, Goebel WS. Collection, cryopreservation, and characterization of human dental pulp-derived mesenchymal stem cells for banking and clinical use. *Tissue Eng Part C Methods* 2008;14(2):149–56.
6. Shi S, Bartold PM, Miura M, Seo BM, Robey PG, Gronthos S. The efficacy of mesenchymal stem cells to regenerate and repair dental structures. *Orthod Craniofac Res* 2005;8(3):191–9.
7. Rai B. Stem Cells from human exfoliated deciduous teeth and SHED Bank: A Mini View. *Internet J Bioeng* 2007;2:2.
8. Telles PD, Machado MA, Sakai VT, Nör JE. Pulp tissue from primary teeth: new source of stem cells. *J Appl Oral Sci* 2011;19(3):189-94.
9. Garvin J. Dental Stem Cell Potential Explored. Companies urge harvesting your own, but use remains theoretical. Available at <http://www.ada.org/news/1088.aspx> [Last accessed on 09 Sep 2013]
10. Koyama N, Okubo Y, Nakao K, Bessho K. Evaluation of pluripotency in human dental pulp cells. *J Oral Maxillofac Surg* 2009;67(3):501-6.
11. Huang GT, Gronthos S, Shi S. Mesenchymal stem cells derived from dental tissues vs. those from other sources: their biology and role in regenerative medicine. *J Dent Res* 2009;88(9):792-806.
12. Lyssikatos A. Parental awareness of the potential health implications of stem cells found in the pediatric dentition. *J Oral Health Comm Dent* 2012;6(1):1-3.
13. Cordeiro MM, Dong Z, Kaneko T, Zhang Z, Miyazawa M, Shi S, Smith AJ, Nör JE. Dental pulp tissue engineering with stem cells from exfoliated deciduous teeth. *J Endod* 2008;34(8):962–9.
14. Reznick JB. Continuing Education: Stem Cells: Emerging Medical and Dental Therapies for the Dental Professional. *Dent Town Mag* 2008;10:42–53.
15. Mao JJ, Giannobile WV, Helms JA, Hollister SJ, Krebsbach PH, Longaker MT, Shi S. Craniofacial tissue engineering by stem cells. *J Dent Res* 2006;85(11):966–79.
16. Stanko P, Kaiserova K, Altanerova V, Altaner C. Comparison of human mesenchymal stem cells derived from dental pulp, bone marrow, adipose tissue, and umbilical cord tissue by gene expression. *J Endod* 2009;35:1536-42.