



Pediatrician' Knowledge of the Importance of Stem Cells in Primary Teeth in Isfahan City

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ABSTRACT

Stem cells that are present in the pulp of primary teeth can be used for treating several diseases as well as renovation and regeneration. This research dealt with the pediatrician's awareness of the importance of primary teeth stem cells in Isfahan. This descriptive-analytic, cross-sectional study was done on 97 pediatricians of the city of Isfahan and based on a structured questionnaire. To analyze data, t-test, one-way ANOVA, Spearman correlation coefficient, and Pearson correlation coefficient ($\alpha = 0.05$ and Cronbach's alpha coefficient ($=\alpha 0.05$) were used. 96/9% of the sample were familiar with the overall concept of the term "stem cell". Out of a total number of samples 52 were female (53/6%) and 45 were male (46/4%). The average age of the total sample was 48 years. The average score of knowledge in the entire sample was $5/63 \pm 3/15$ based on 0-13 and the average score of attitudes was $48/13 \pm 6/96$ based on 13-65. Pearson correlation coefficient revealed that there was a direct, relative correlation between the average score of knowledge and attitude (p value=0/001 $r=0/33$), with the positive attitude the awareness increased. However, there was no significant relationship between the mean score of age and knowledge was found ($r = -0.7$, p -value = 0.176). The data of this study showed a relatively high positive attitude and limited knowledge of using stem cells in dentistry among pediatricians.

Keywords: Knowledge, Attitude, Stem cells, Primary tooth.

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INTRODUCTION

Stem cells are kind of cells that have spontaneous reproduction and differentiation into at least two different types of cell [1]. The stem cells' self-renewal potential makes them present in multiple cell division cycles while maintaining the ability to differentiate into and proliferate different adult cells types [2]. There are two

types of stem cells: Adult Stem Cells (ASCs) and Embryonic Stem Cells (ESCs).

In general, embryonic stem cells are derived from a 4 or 5-day-old embryos (the blastocyst stage), and because accessing these cells requires that the fetus is removed, their acquisition is morally controversial [3]. The embryonic stem cells are the most powerful stem cells that are highly able to proliferate and differentiate [4]. However, these cells have possible neoplastic changes if the

differentiation and proliferation of these cells are not well controlled. Adult stem cells do not need to destroy the fetus. They are successfully used for the treatment of diseases even though they are less capable than their fetal counterparts [5]. Some sources of ASCs include amniotic fluid, umbilical cord blood, skin, brain, urine, bone marrow, and teeth [6, 7]. Dental stem cells (DSCs) that are derived from the dental structure, especially dental pulp, are one of the adult stem cells, which can be obtained by minimally invasive methods [8, 9]. In 2000, dental pulp stem cells (DPSCs) were first discovered by Songtaoshi and Stan Gvanthos in the pulp of impacted third molar teeth [6]. Afterwards, the shi group obtained other dental stem cells types from the Stem Cells from Human Exfoliated Deciduous Teeth (SHED) [10], Stem Cells from Apical Papilla (SCAP) [11], and Supernumerary Tooth-derived Stem Cells (SNTSCs) [12].

According to recent studies, the dental pulp-derived stem cells have characteristics like high proliferative activity [13], self-renewal ability [13, 14], and multipotency as well as the ability to renovate the tissue, including dentin/pulp complex reconstruction [6, 11], reconstruction of root [12], and osteoporosis [15, 16]. These cells can also be used for the treatment of diseases such as Alzheimer's [17] and Parkinson's [18], regeneration of motor function in spinal cord injuries [19], improvement of neurological symptoms in patients with stroke [20], treatment of autoimmune diseases such as lupus systemic erythematosus [21, 22], and treatment of bone diseases such as early stages of menopausal osteoporosis [23], liver diseases such as liver cirrhosis [24], type 1 diabetes [25], and cardiac ischemia [26].

Since stem cells maintain their differentiation ability after freezing and melting, banking these cells is useful for future therapies. Hence, several banks have been established in the world [27, 28]. On the other hand, there are several challenges to the use of stem cells in society, and the opponents and supporters of this domain have their particular attitudes [29].

Unfortunately, most studies have shown that a lack of information and education about the potential of stem cells in the treatment of several types of diseases, which cause the loss of millions of primary teeth rather than saving them for future use. Pediatricians, Dentists, and other

community health professionals deal with this and so, they should inform their patients about primary teeth maintenance.

Sede *et al.* [30] investigated the use of dermatologic stem cells in 200 Nigerian dentists. They showed that despite the high awareness of Nigerian dentists, they had poor knowledge about using stem cells. In 2014, Rohan Bhatt *et al.* [31] assessed the awareness of undergraduate dental students about the clinical application of dental pulp stem cells in Ahmedabad and Kandahar. Their results showed that most students did not know about the use of primary teeth as the source of stem cells. 84.44% of the students believed that dental stem cells were the best source for therapeutic use, while 30% of them believed that bone marrow or umbilical cord stem cells were the best sources. In 2015 Ankita Goyal *et al.* [32] did a similar study on Indian general dentists and specialists. They generally evaluated the knowledge and attitude of stem cell application in dentistry and indicated that there is a positive attitude toward the use of stem cells in dentistry. The type of educational degree and work experience had a positive role in the level of knowledge and attitude, but in the case of knowledge, their study showed that the educational degree (theoretical information) had a more effective role than the work experience (experience). In 2016, Norbakhsh *et al.* [33] carried out a study on 308 general dentists and 82 periodontists in Isfahan and revealed the participants had insufficient knowledge of using stem cells despite their relatively good awareness and positive attitude.

Unfortunately, many families who have not managed to keep their children's umbilical cord, do not keep the dental stem cells of their children due to a lack of knowledge about the ability of the stem cells of the primary teeth for curing many diseases. Therefore, it is important to inform various strata of society of the banking and storage of stem cells. Because pediatricians usually have a very close relationship with parents and children, and since there is no information about the knowledge and attitude of Iranian pediatricians about stem cells, including dental stem cells. This study aimed to determine the mean scores of attitude and knowledge of Iranian pediatricians about the importance of stem. The Zero hypothesis was inadequate

attitude and knowledge of Isfahanese pediatricians about the importance of stem cells.

MATERIALS AND METHODS

The present study was a descriptive-analytic and cross-sectional study, based on designing a self-administered structured questionnaire with closed questions. This study was performed on 97 pediatricians in Isfahan. The mean score of knowledge and attitude was estimated with the maximum reliability of 95% and maximum error of 1. The criteria for involving in the study were pediatricians working in Isfahan who had informed consent to participate in the study. The exclusion criteria were questionnaires that were not completed by pediatricians for any reason. The ethics of accountability and cooperation of the relevant pediatricians were optional and all the information of the questionnaires were assessed completely confidential and tried to complete all stages with maximum accuracy and trust.

A sampling method was used to survey 97 of the 102 pediatricians in Isfahan. Sampling was done by referring to all private clinics or public hospitals in Isfahan in the fall 2015 and winter of 2016. The hours of referral were also considered between the two groups of pediatricians working in private clinics and working in hospitals to undermine the coherence and order of work. At this point, since most private clinics were more active in the afternoon, hours of referral were segregated and often the remaining hours were allocated to state clinics and hospitals.

Questionnaire

The data gathering tool in this study was a questionnaire containing 26 questions of single-answer packets in two fields of knowledge and attitude. It was structured in Persian language and published articles were used as the guideline for designing the questionnaire [30-33].

To confirm the face and content validity of the questionnaire, it was provided to five pediatricians of the Isfahan dentistry faculty. To validate the content, the questionnaire was delivered to each of the experts for an opinion poll. The experts were asked to answer each question in accordance with the following pattern of rating:

1. Question with a high degree of fit, 2. Question with the average degree of fit, 3. Question with a low degree of fit.

In addition, the experts were asked to comment on any of the questions if they had specific suggestions. After studying the results of the survey, the questions that were scored 2 or 3 were deleted or corrected according to the experts' opinion.

The first questionnaire consisted of 17 questions for measuring knowledge and 16 questions for measuring attitude. After the study, 4 questions of knowledge and 3 questions of attitude were excluded and the final questionnaire consisted of 13 questions of knowledge and 13 questions of attitude. The questions were reinstated by experts. In the end, the opinions of the experts were obtained regarding the formal validity of the questionnaire.

In designing the attitude-oriented sentences, efforts were made to have the principles according to attitude-based questionnaires. For example, sentences were written to the present state as much as possible and were not in a way that provokes the answer.

The questions related to the level of knowledge and attitude of pediatricians working in Isfahan city about the stem cells based on Likert score were scored as follows:

Knowledge section "0 uninformed, 1 informed", the section of attitude "1 completely disagree, 2 disagree, 3 no opinion, 4 agree and 5 agree completely".

To assess and confirm the reliability of the questionnaires, a pilot questionnaire was distributed randomly among 20 pediatricians. The validity of the questionnaire was assessed by using the split half method. According to the high correlation between the questionnaire ($p = 0.002$ and $r = 0.7$), the validity of the questionnaire was confirmed.

For the attitude section of the questionnaire, Cronbach's alpha was 0.72, which was acceptable according to the statistical consultant.

The final questionnaire consisted of three parts

Section one: These questions were about demographic information and were evaluated using 7 questions including age (in terms of age), gender (female/male), religion (Muslim / Christian / Jewish / other religions), work experience (<5, 10-5, 10 <), University and city

that doctoral and postdoctoral degree were gotten from, University and city that they graduated in doctoral and postdoctoral degree, Year of graduation and finally the provision of the services of a pediatrician (private/public / teaching / other).

Part II: These questions included the scientific information of the pediatricians about the stem cells of primary teeth, which, at the first question, measured their information about the main subject of the study, and the next questions included the pediatrician's scientific information about the subject. An overview indicates the level of pediatrician awareness in this area. This section contained 13 questions with a minimum score of 0 and a maximum score of 13.

Part III: These questions included assessing the attitudes and points of view of the pediatrician, which revealed their ideological background. This section contained 13 questions of 5 options (I totally disagree / disagree / disagree / agree / totally agree) with a minimum score of 13 and a maximum score of 65.

Statistic analysis

Data were fed into SPSS-22 software and analyzed by one-way ANOVA, t-test, Pearson correlation coefficient, Spearman, and Cronbach's alpha coefficient. The significance level was considered to be $0.05 > \alpha$. Finally, after completing the data, the Cronbach's alpha for the knowledge part was calculated at 0/804 and was 0/861 for the attitude level.

RESULTS AND DISCUSSION

The purpose of this study was to determine the knowledge and attitude of Isfhanese pediatricians about the use of primary teeth stem cells. After collecting data, a questionnaire of statistical analysis was used in the form of descriptive and statistical method that was as follows presented:

A sample of 97 physicians working in Isfahan city, 52 were females (53.6%) and 45 were male (46.4%). The mean age of the sample was 48.0 ± 11.6 , the mean age of women was 45.0 ± 10.10 and the mean age of men was 44.6 ± 11.8 , respectively. Among the 97 pediatricians participating in the study, 90 (92.8%) were Muslim, 6 (6.6%) were Christian, and 1 (0.1%) was a follower of other religions. Of the 97

pediatricians, 18 (18.6%) had less than 5 years of experience, 16 (16.5%) had between 5 to 10 years and 63 (64.9%) had more than 10 years of experience.

Of the 97 pediatricians, 54 (55.7%) were graduated from Isfahan University, 18 (18.6%) were graduated from the University of Tehran and 25 (25.8%) were graduated from other cities or abroad. Among postgraduate period: "54 (55.7%) were graduated from the University of Isfahan, 25 (25.8%) were graduated from the University of Tehran, 18 (18.6%) Graduated from other cities or abroad."

Of the 97 pediatricians, 23 pediatricians (23.7%) were graduated in 1993, 22 of them (22.7%) were graduated between 1994-2003, and 52 members (6.53%) were graduated between 2004-2015.

Among 97 pediatricians, 33 pediatricians (34%) were employed in private clinics and only 19 (19.6%) worked for public hospitals while 45 (46.4%) worked in different places.

The mean score of knowledge in the whole sample was 5.36 ± 3.15 based on 0-13 and the mean score of attitude was 48.13 ± 6.95 based on 13-65. The calculation of the Pearson correlation coefficient showed that there was a significant relationship between the mean score of knowledge and attitude ($r = 0.330$, $P\text{-value} = 0.001$).

The mean score of women knowledge was 5.75 ± 3.45 and was 4.91 ± 3.46 for men, and the mean score of attitude was 49.65 ± 7.17 for women and 46.77 ± 6.31 for men. T-test showed that there was no significant difference between the mean score of knowledge of women and men ($P\text{-value} = 0.194$). But there was a significant difference between the mean attitude score of the two sexes, which was higher for women ($P\text{-value} = 0.002$).

Pearson correlation coefficient showed that there is a negative and weak correlation between age and mean score of knowledge ($r = -0.193$, $P\text{-value} = 0.05$), but there was not a significant relationship between age and attitude ($P\text{-value} = 0.061$, $r = -0.191$). Also, this test showed that there was no significant relationship between the mean score of knowledge and experience of pediatricians ($r = -0.308$, $P\text{-value} = 0.105$). But there was a negative, inverse, and poor relation between the attitude and work experience of pediatricians ($r = -0/217$, $P\text{-value} = 0.033$) this

test showed that there was not a significant relationship between the mean score of knowledge and attitude with the year that the pediatrician had been graduated ($r = 0.089$ P-value = 0.379) ($r = 0.073$, P-value=0.478).

One-way analysis of variance showed that there was a significant difference between the mean score of knowledge of those who received their general and special certificate from Tehran University, Isfahan, and other cities (P-value < 0.001, P-value = 0.045) However, there was no significant difference between the mean score of attitudes of graduates of general and specialized Ph.D. degrees from different universities (P-value = 0.961, P-value = 506) (**Figure 1**).

One-way analysis of variance showed that there was a significant difference between the mean score of the awareness of those who worked in the private clinic with those who worked in the public hospitals or pediatricians working in several places (P-value = 0.399). But, the LSD test showed that there was no significant difference between the mean score of knowledge of those who worked in the private clinic and those who worked in the public hospital (P-value = 0.940). But there was a significant difference between the average score of physicians working in private clinics and those who worked in several places, and this was higher for those who worked only in a private clinic (P-value = 0.026). Also, there was a significant difference between the

mean score of those who worked in the hospital and those who worked in several places, which was higher for those who worked only in the hospital (P-value = 0.005).

T-test showed that there was a significant difference between the mean score of the awareness of those who received their information from watching television and those who had obtained their information from other sources, and this amount was significant for those who obtained information through sources rather than television (P-value = 0.37).

However, there was no significant difference between the average score of those who received their information from watching television and those who do not watch TV (P-value = 0.186). This test also showed that there was a significant difference between the mean score of the awareness of those attending the seminar and the scientific conference and those who did not participate, and this was higher for those who obtained their information through participation in seminars (P-value=0.003). However, there was no significant difference between the mean scores of attitudes of those attending the seminar and the scientific conference and those who did not participate (P-value = 0.803).

Figure 1 shows the distribution of the frequency of using different sources to obtain information about the stem cells of the teeth.

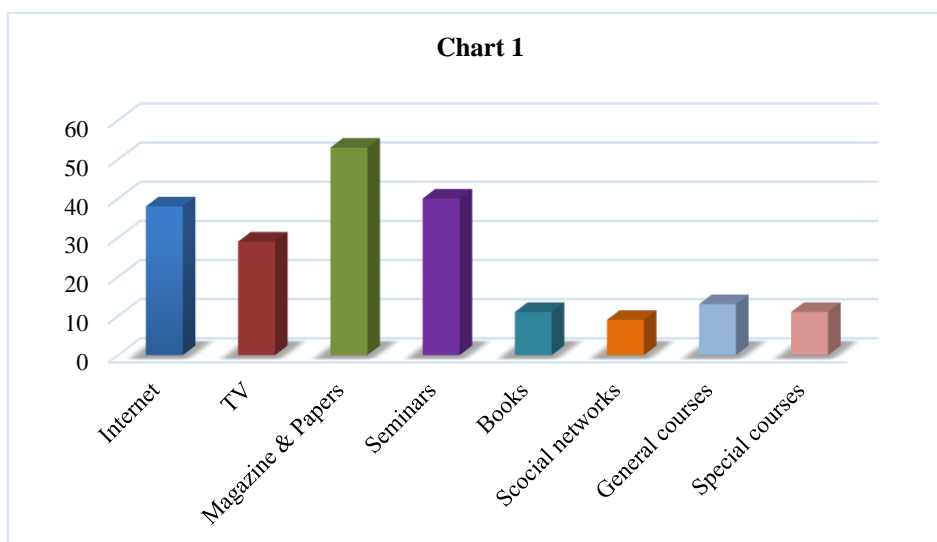


Figure 1. Frequency distribution of various sources for obtaining information about stem cells of primary teeth

Tables 1 and 2 show the distribution of frequency of responses, mean, and standard

deviation of the knowledge and attitude scores in terms of questions about using the stem.

Table 1. Frequency distribution of responses and comparison of mean score of responses on the application of stem cells in primary teeth

Row	Awareness Topics	Alternatives	Answer		Mean Awareness Score	Criterion
			Yes	No		
1	Word (stem cell) familiarity		94	3	97%	0.39
2	Attending Stem Cell retraining course		19	78	20%	0.17
3	Knowing primary teeth stem cell bank existence		18	79	19%	0.39
4	Knowing stem cell authorized exploitation		36	61	37%	0.48
5	Knowing about stem cell research centers		8	89	0.08%	0.27
6	Knowing the current condition of primary teeth pulp gathering		38	59	0.39%	0.49
7	Knowing stem cell religious topics		49	48	0.51%	0.50
8	Knowing stem cells' characteristics		43	54	0.44%	0.49
9	Knowing stem cells' resources		62	35	0.64%	0.48
10	Knowing the most reasonable, applicable, and convenient stem cells' gathering method		32	65	0.33%	0.47
11	Knowing stem cell pulp advantages		44	53	0.45%	0.50
12	Knowing stem cell pulp resources		40	57	0.41%	0.49
13	Knowing curable diseases with stem cells		36	61	0.37%	0.48
14	Knowing stem cells' mesenchymal categorization		20	77	0.21%	0.40
	Knowledge Mean score		5.36	3.15		

Table 2. Frequency distribution of responses, mean and standard deviation about the use of stem cells in primary teeth

Row	Awareness Topics	Alternatives	Answer		Mean Awareness Score	Criterion
			Yes	No		
1	Word (stem cell) familiarity		94	3	97%	0.39
2	Attending Stem Cell retraining course		19	78	20%	0.17
3	Knowing primary teeth stem cell bank existence		18	79	19%	0.39
4	Knowing stem cell authorized exploitation		36	61	37%	0.48
5	Knowing about stem cell research centers		8	89	0.08%	0.27
6	Knowing the current condition of primary teeth pulp gathering		38	59	0.39%	0.49
7	Knowing stem cell religious topics		49	48	0.51%	0.50
8	Knowing stem cells' characteristics		43	54	0.44%	0.49
9	Knowing stem cells' resources		62	35	0.64%	0.48
10	Knowing the most reasonable, applicable, and convenient stem cells' gathering method		32	65	0.33%	0.47
11	Knowing stem cell pulp advantages		44	53	0.45%	0.50
12	Knowing stem cell pulp resources		40	57	0.41%	0.49
13	Knowing curable diseases with stem cells		36	61	0.37%	0.48
14	Knowing stem cells' mesenchymal categorization		20	77	0.21%	0.40
	Knowledge Mean score		5.36	3.15		

Recent advances in the recognition and application of dental stem cells and tissue engineering strategies suggest that in the coming decades, medical engineering achievements can be successfully used to reconstruct dental and tooth tissues. This study was conducted to obtain information about the level of knowledge and attitude of pediatricians of Isfahan about stem cells of dental teeth.

The average age of the pediatricians in Isfahan was 48 years and most of them (65%) had dental work experience of more than 10 years. In comparison with the Sede study, the average age of Nigerian dentists participating in that study was 35 years, with a history of fewer than 5 years of dental work experience, which was higher in this study [30]. Also, the average age of the sample was greater than the average age of

general dentists and experts in the Ankita Goyal study, in which more than 50% of them were young and at the early stages of their activity [32]. In a similar study conducted by Norbakhsh *et al.* on general dentists and experts in Isfahan, the average age of participants was 41 years and most of the respondents had more than 10 years of work experience, which was similar to those of the participants in this study [33].

In this study, there was no significant relationship between age and attitude, but there was a negative and weak correlation between age and awareness, the higher the age of participants, the less their awareness was. These results were as same as the results of the Norbakhsh study [33] but were contradicted with the Sede study. In his study, dentists with more than 5 years of experience were more knowledgeable about dental stem cells [30]. This suggests that with the increasing age of pediatricians and dentists of Isfahan, the knowledge level about scientific issues decreases. On the other hand, there was no significant relationship between the knowledge and experience of pediatricians in the current study, but there was a negative, inverse, and poor relation between attitude and work experience that conflicted with the Norbakhsh, Goyal, and Sede study results. In the study of Norbakhsh and Goyal, by increasing work experience, the level of consciousness was decreased [30, 32]. While in Matthew's study, the degree of knowledge increased by increasing work experience [30]. This suggests that increasing the work experience of physicians, unlike pediatricians did not affect their knowledge level. which indicated that after graduation physicians kept their information more up to date than pediatricians. On the other hand, the Norbakhsh study did not show any significant relationship between work experience and attitude [33], while there was a negative relationship in this study.

In the present study, there was no significant relationship between knowledge and gender, but there was a significant relationship between attitude and gender, which showed a higher positive attitude in women. in the Norbakhsh study there was no significant correlation between gender, knowledge, and attitude [33]. But in Sede's study, knowledge was greater in men [30]. Also, in the present study, there was a significant relationship between knowledge and attitude, meaning that the increasing awareness

caused positive attitude of pediatricians, while in the Norbakhsh study there was no significant relationship between knowledge and attitude of physicians [33], which indicated the difference of knowledge and attitudes of pediatricians and physicians of Isfahan city.

The results of this study showed that the knowledge of those who received their certificate from Tehran University was higher than those who graduated from Isfahan and other cities, which indicated more modern education at Tehran University for the general dentist. On the other hand, the knowledge of pediatricians who received their certificate from Tehran and Isfahan University was significantly higher than other graduates from other cities, and there was no significant difference between the graduates of Tehran and Isfahan, which indicates a further increase in the education of Tehran and Isfahan university residents. But, there was no meaningful relationship between the degree of attitude and different universities.

The present study showed that the level of awareness of pediatricians who worked only at the office or just in the public hospital was greater than those who worked in several places. This suggests that pediatricians who worked in multiple places did not have enough time to update their information. These results were inconsistent with the findings of the Norbakhsh study, which showed that there was no significant difference between the knowledge of dentists who worked in different treatment centers [33].

The results of this study showed that most pediatricians (55.7%) had obtained their information about stem cells from journals, scientific articles (10.3 %) while social networks were the lowest rank among the sources of information. On the other hand, Norbakhsh showed that 31.6% of Isfahanese dentists were informed through the media, while conferences and seminars ranked at the bottom of the list (4.9%) [33]. While in the present study, the seminars and scientific conferences were the secondary sources of awareness of pediatricians (42.3%). This suggested the necessity to hold seminars and scientific conferences for dentists and a better holding of scientific seminars for pediatricians. In the study by Sede, 8 / 43% of dentists received their information through the symposium and congress, while the lowest

source of information was through public media [30], which is roughly the same as the results of this study. On the other hand, in the study of Goyal, 42% of dentists received their information during the Ph.D. program, and the conferences and seminars were the secondary rank (27%) [32] which was similar to the present study.

In this study, only 19.6% of pediatricians passed the courses of stem cell while when they were asked about their interest in the workshops or course of stem cell, about 65% responded positively, indicating the need for retraining courses in the field of stem cells. These results are consistent with the findings of the Goyal study, which showed that 73% of the participants were interested in participating in scientific workshops and conferences, but only 15% of them participated in this retraining [32].

In the present study, only 18.6% of pediatricians knew about the current status of the Iranian stem cell banks, and only 8 of them had accurate information about research centers about stem cells. These results were consistent with the findings of the study of Norbakhsh, which showed that 60% of general dentists and 68% of pediatricians knew about dental stem cells [33]. Their study also found that 84% of general dentists and 77% of pediatricians were aware of stem cell research centers in the country [33], which is different from the results of the present study. Because pediatricians could inform the parents properly, they do not have accurate and up-to-date information about stem cells and their ability to cure many diseases as the easiest and least costly method.

Concerning the benefits of dental pulp stem cells, 55% of pediatricians selected option NO, which was inconsistent with the results of the Norbakhsh study (53% of the options) [33]. This indicated the lack of knowledge of pediatricians and dentists in this area.

In the present study, 59% of pediatricians were unaware of stem cell dental sources, which is roughly the same as the results of the study of Norbakhsh, in which 68% of general and specialized dentists did not have enough knowledge about this [33].

In this study, 37% of pediatricians were aware of the application of stem cells for treating diseases, which was consistent with the results of the Norbakhsh study. It indicated that 33% of pediatricians and 29% of general dentists were

aware of using dental stem cells [33]. While in the Sede study, 81% of pediatricians were aware of the use of stem cells, and this was related to their type of expertise [30] which, according to the results, the need for a workshop and symposium was identified.

Overall, the attitude toward stem cells was positive, but the lowest score was concerning the use of stem cells. Clinical research and its promising results could somehow modify this attitude in the future. Also, about 52% of physicians stated that informing parents about collecting stem cells from primary teeth was related to their job. In this regard, only 50% of physicians believed that they should recommend their patients to store and maintain stem cells, which suggests that they should be fully explained in rehearsals and seminars. They should be justified that this is not only the dentist's responsibility but also their duty.

Ultimately, due to the novelty of this important issue and the lack of evidence-based documents about stem cell therapy, many measures are needed in this regard. One of the effective measures is to incorporate theoretical and practical concepts of tissue engineering into the educational curriculum, which fortunately about 70% of the dentists had a positive view of this issue.

The huge advances made in the use of stem cells have brought about the acquisition of specialized knowledge and skills in this field. On the other hand, it is important to be aware of the awareness and attitude of different levels of society in this regard. In advanced countries, with the establishment of stem cells, the use of this technology has passed the preliminary stages, and most experts believe that the process of stem cell therapy will be conducted in 2020. But in developing countries, this is important in its early stages, and awareness is very limited.

CONCLUSION

The results of this study showed that pediatricians had a positive attitude toward stem cells, while their knowledge in this area was limited.

Offers

Considering the results of this study and considering the importance of stem cells in the

treatment of diseases, it is suggested that knowledge in this field be enhanced by changing the curriculum of general and specialized doctoral courses, as well as holding seminars and symposia on the use of stem cells. It is also suggested that a similar study be conducted on dental students and parents.

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