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The Effect of Educating Mothers in Inter-Dental Cleaning Behavior on Their Children's Dental Health Behavior: Testing the Transtheoretical Model

Golaleh Tavakoli[1], Arezoo Falahi[2*]

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Abstract

Aim: Many of the oral health problems start in childhood that may affect the way of speaking, eating and even the social manners of the individual. The aim of this study was to test the Trans-theoretical Model to gain an understanding of the inter-dental cleaning behavior change in mothers and their children in the city of Sanandaj.

Methods: This study was a randomized controlled trial, conducted in 2011 in eight Health Centers in Kurdistan province, Iran. Using a cluster sampling, we conducted a prospective study. The participants were grouped into an intervention group including 25 couples of mother and child, and a control Group including another 25 couples of mother and child. The intervention program was designed based on Trans-theoretical Model. The Gingival index of mothers and their children were recorded before and after the intervention. The data were analyzed using SPSS-16 software and with paired T-test.

Findings: Most of the mothers in the intervention group (64% vs. 96% in control group) did not use any of the tools (dental floss and tooth picks). After intervention, most of the mothers and their children were in action and preparation stages and the direction of change improved after the intervention. Significant statistical differences were found in self-efficacy, perceived benefits, and also Gingival index before and after the intervention between two groups (p= 0.03-0.001).

Conclusions: There was a positive relationship between stages of behavior of inter-dental cleaning in mothers and their children. Qualitative research can be used to reveal underlying inter-dental cleaning perception and behaviors of mothers and children.

Keywords: Transtheoretical Model (TTM), Gingival Index, Student, Education, Inter-Dental Cleaning

1. Visiting Assistant Professor, Ph.D., School of Environment and Health Sciences, Canadian University of Dubai
Email: golaleh@cud.ac.ae
2. Ph.D. Candidate, Department of Health Education & Health Promotion, Faculty of Medical Sciences, Tarbiat Modares University, Tehran, Iran, Scholarship of the School of Health, Kurdistan University of Medical Sciences, Kurdistan, Iran
Email: arezofalahi@yahoo.com

Introduction

Oral health is important in the overall health of the body, and affects the quality of life of individuals through affecting their body, mind and well being. Toothache, teeth loss and teeth infections may affect the way of speaking, eating and even the social manners of the individual [1]. Many of the oral health problems start in childhood, [2] cause teeth loss [3] and in the case of negligence can be more widespread [4]. The index of teeth decay, DMFT (Decayed/Missing/Filled Teeth), in America, Europe and Africa have been 2.76, 2.57and 1.3, respectively [5]. For Iran, this Index is 2.46 in children and for ages of 15 and 16 is 2.66 and 2.76, respectively [6]. The mean surface index, DMFS², in 6 years old children in Tehran, Semnan, and Deebaj Village in Iran is estimated to be 7.2, 9.1, and 7.1, respectively [7]. For Iran, tooth decay index in 12 years old Children is 1/9 [8] and for ages of 15 and 16 years are 2/66 and 2/76 respectively [9].

Controlling dental plaque mechanically is the most reliable method for keeping mouth and teeth healthy. Tooth brushing can prevent gum infection (gingivitis), but it is not sufficient by itself and needs a supplement [10]. Therefore, for having healthy teeth and preventing teeth decay and periodontal diseases, it is necessary to clean teeth by brush twice a day and by inter-dental cleaning tools once a day [11]. Habitual healthy behaviors can also be established by education and change of behavior models [12].

One of the models of changing behavior is the Trans-theoretical Model (Stages of Change) which was developed by Prochaska & DiClemente. This model was conceptualized on the assumption that changing of behavior is a process and different individuals have different degrees of preparedness for change of behavior [13]. This model consists of four factors: Stages of change, decisional balance, self efficacy and processes of change, which are used in several studies [6, 10, 14, 15]. Decisional balance implies the relative importance of behavioral change in individual [16]. Self confidence of the individual for being consistent in following the healthy behavior in various challenging conditions is called self–efficacy [17]. Change process includes open and hidden cognitive behavioral activities that are performed by the people for progressing through behavioral stages (from pre-contemplation stage to contemplation stage, etc.). There are 5 important stages of behavioral change 1- Pre-contemplation, 2- Contemplation;, 3- Preparation;, 4- Action and 5- Maintenance [16].

Parent's attitude, knowledge and proper oral and dental health behaviors influence oral and dental health of their children [18]. Here, attitude of mother is of special importance [19] and mothers play a significant role in the oral health of their children [20]. While many

studies have been conducted on the correlation between plaque and Gingival Index(GI) of mothers and their children at early age (d) less survey studies have investigated relationship between the oral health behavior of young children and that of their mothers [3].

The students need health promotion programs [15] asprevalence of dental decays in Iranian school children is high [21] and using of suitable model in inter-dental cleaning behavior is low [22]. Inter-dental cleaning tools are proven to be effective in reducing dental decays and periodontal diseases [10], and also the Trans-theoretical Model is a suitable model for behavioral change and for oral and dental healthcare [14]. Parents play key role in developing healthy behavior in their children [18, 20]. Due to facts and reasons mentioned above and because studies haven't surveyed the relationship between stages of behavior of inter-dental cleaning in mothers and their children, this study was undertaken with the aim of determining the influence of systematic education on relationship between inter-dental cleaning behavior in mothers and their children based on Trans-theoretical Model. Researchers hope to identify barriers and benefits of interdental cleaning behavior among Sanandajian mothers. The following assumptions were made in the study:

1- There is a meaningful statistical relationship between stages of behavior of inter-dental cleaning in mothers and their children.

2- Self-efficacy of mothers and their children increases after the educational program.

3- GI in both mothers and their children decreases after the educational program.

Methods

This survey was carried out in Kurdistan province, west of Iran, from April to October 2011. The sample size was determined using Sample size formula [$N = \frac{S_1^2 + S_2^2}{(M_2 - M_1)^2} F(\alpha,\beta) = \frac{1.3^2 + 1.41^2}{(23.2 - 22.1)^2}$, $\frac{3.67}{1.21} \times 7.84 = 23.84$] and 95% confidence coefficient and 80% power. Listing all the health centers in the area, eight health centers were selected by systematic sampling method. The authors went to health centers to enroll mothers of adolescent for the study. Two hundred and thirty eight mothers were screened and 50 were found to meet the criteria. GI of mothers and their one child was measured before and after the intervention and recorded for 50 couples of mother and child, by two dentists. The dentists didn't know the aim of the study (blind study) and finally mean of two GI was recorded. The participants were grouped into intervention group including 25 couples of mother and child and control group (remaining 25 couples) by a simple equal probability method. After 24 weeks, GI was again measured. Time Interval was selected based on maintenance stage of

TTM that it had significant impact on GI. The inclusion criteria was having GI of 2 and 3, being in pre-contemplation stage of Trans-theoretical Model (not having used inter-dental cleaning tools, dental floss and tooth picks in the past 6 months).

The exclusion criteria were having GI of 0 or 1 and being in higher stage of inter-dental cleaning behavior. It is to be mentioned that GI has 4 degrees from 0 to 3: "0" without bleeding and infection, "1" minor change in tissue and color of the gum, slight inflammation in lower parts of gum, "2" atrophy and irritation of gum (Gingivitis) and inflammation and color change in its tissue, "3" severe infection, gum sore and bleeding [23].

This investigation was a prospective study and a part of our study. The questionnaire used included 10 self-efficacy questions, its scale included items such as use of interdental cleaning devices after any meal and cleaning teeth every night, before going to bed, 8 perceived benefits questions (prevent me from having bad breath and prevent me from getting gum diseases) and 8 perceived barrier questions (I forget to clean between my teeth, because I am too busy, and I do not have enough time to clean between my teeth) [24]. The questionnaire, after taking out its questions no. 9 of self-efficacy and no. 1 of perceived barrier, (because these two items were not designed for mothers and only meant for the students), was then used for evaluating self-efficacy (a=0.81), perceived barrier (a=0.76) and perceived benefits (a=0.82) of mothers. Also validity, CVI and CVR of questioners was confirmed by panels of health education specialists. High and low scores on the benefits and the barrier scales were 8-40 and self-fffficacy of the student was 10-40, and high and low scores on the benefit scale, the barrier and the self-efficacy of mothers were 8-40, 7-35, and 9-36, respectively. Also, high and low means of scales were showed in the tables 3 and 4. For clarifying stages of inter-dental cleaning behavior based on Trans-theoretical Model, the tool designed by Tillis [14] was used which includes 4 questions related to inter-dental cleaning behavior with Kappa coefficients of 0.75, 0.78, 0.45 and 0.75 respectively.

At the beginning of the intervention program a 40-minutes orientation session was conducted by the health education specialists for mothers in intervention group regarding the aims of the program. Than 4 educational sessions [10] were held on in intervention group. The control group didn't receive any thing. Objectives of the intervention in the intervention group included increase of self-efficacy and benefits, decrease of perceived barriers of inter-dental cleaning behavior and also improving GI in mothers and their children. The strategy for increasing self-efficacy, based on Trans-theoretical Model of

Prochaska, included showing documentaries related to inter-dental cleaning and group discussions. This strategy for increasing perceived benefits and decreasing barriers included educational CD, films and slides, educational pamphlet and lectures about importance of healthy mouth and teeth and inter-dental cleaning in life and preventing dental decays, its remedies and ways to decrease personal and environmental barriers. It should be said that the intervention program was created for this study.

In this study, GI of 2 and 3 are taken into consideration which, along with other constructs of the model, are measured and recorded again after 6 months. The collected data were analyzed by statistical software "SPSS-16" and using statistical tests "chi-square", "paired t-test", "fisher test", "sign test", "Mann-Whitney U" and "T-test". P-value<0.05 was considered for a meaningful level. It is possible that mothers in the intervention and control group might have shared information with each other; however, the authors attempted that control group does not become familiar with intervention group. After implementing of the interventional program and the end of time of study, educational package was trained to control group.

The study was approved and supported financially by the research council that was affiliated with Kurdistan University of Medical Sciences, Sanandaj, Iran. The council supervised the study and corroborated its ethical considerations. All the participants were informed about the study's method and purpose, the confidentiality of their identities and filled informed consent forms. They were informed that participation in the study was voluntary and that they could refuse to participate or withdraw from the study any time.

Results

Mean values of the ages of mothers and their high school children were 41±4.01 (33-44 years) and 16.68±1.33 (14-19 years), respectively. Before the intervention, no meaningful statistical difference was observed in the two groups with respect to age, sex, income, level of parents' education, model constructs and GI. Before the intervention, none of the participants were using inter-dental cleaning tools, however, after the study, inter-dental cleaning behavior by mothers and their children in the intervention Group was: Using dental floss by mothers 16% (by children 20%), tooth picks by mothers 16% (by children 12%), using both tooth picks and dental floss by mothers 4% (by children 4%). 64% of the mothers (64% of their children) did not use any of the tools. One mother in the control Group also used dental floss.

Frequency of inter-dental cleaning behavior in students is shown in Table 1. The results of

Fisher Test showed that most of the students were in Action and Preparation stages. Also, results of this test for comparing inter-dental cleaning behavior stages in the two groups of mothers, shown in Table 2, is indicative of a meaningful statistical difference (p= 0.01, df=4, F=12.24). 4 persons of the intervention Group were in pre-contemplation stage (compared to 10 persons in the Control Group), 5 persons were in contemplation stage (compared to 11 persons in the Control Group), 7 mothers were in preparation Stage (compared to 3 mothers in the Control Group), 6 persons were in Action Stage (compared to 1 person in the Control Group) and 3 persons were in Maintenance Stage, while nobody in Control Group was at this stage. Most of the mothers in the intervention Group were in Action and Preparation stages. Meaningful statistical relationship was observed between stages of inter-dental cleaning behavior in mothers and their children (df=4, p=0.02, x^2=17.78). Results of the Paired t-Test in Table 3 showed a meaningful statistical difference in self-efficacy, perceived benefits, and GI in the couples of mothers and their children before and after the intervention (p= 0.03-0.001). No meaningful statistical difference was observed with respect to perceived barriers of Children. As for changes in GI in the intervention group compared with changes in control group, intervention group showed greater improvement regarding GI than did control group (Table 4). The respondent believed that there are more benefits and the barriers associated with inter-dental cleaning. The correlation of the variables of Trans-theoretical model between mothers and their children is shown in Table 5. A significant correlation was shown between Mothers' Perceived Benefits and their Children's Perceived Benefits and Self-Efficacy. No significant correlation between mother and child was obtained by analyzing the self-efficiency.

Table 1: Frequency of stages of change of inter-dental cleaning behavior in children in the 2 groups of the study after the intervention.

Group \ Stages of Change		Pre-contemplation	Contemplation	Preparation	Action	Maintenance	Total
intervention	Frequency	5	5	6	6	3	25
	Percent	20	20	24	24	12	100
Control	Frequency	13	11	1	0	0	25
	Percent	52	44	4	0	0	100
Total	Frequency	18	16	7	6	3	50
	Percent	36	32	14	12	6	100

F=17.78 P<0.001 df=4

Table 2: Frequency of stages of change of inter-dental cleaning behavior in mothers in the 2 groups of the study, after the intervention.

Group \ Stages of change		Pre-contemplation	Contemplation	Preparation	Action	Maintenance	Total
intervention	Frequency	4	5	7	6	3	25
	Percent	16	20	28	24	12	100
Control	Frequency	10	11	3	1	0	25
	Percent	40	44	12	4	0	100
Total	Frequency	14	16	10	7	3	50
	Percent	28	32	20	14	6	100

F=12.24 df=4 P=0.01

Table 3: Mean and standard deviation for constructs of TTM and GI in mothers and their children in the 2 groups, before and after the intervention.

Variable \ Time	Group	Before Intervention		After Intervention		Paired T-test Results
		Mean	Standard Deviation	Mean	Standard Deviation	
Self-Efficacy of Mothers	intervention	18.24	3.41	25.6	5.89	P<0.001
	Control	16.88	2.56	18.26	3.69	P=0.09
Perceived Benefits of Mothers	intervention	27.4	3.46	33.52	5.82	P<0.001
	Control	27.04	3.57	29.28	8.36	P=0.26
Perceived Barriers of Mothers	intervention	30.32	2.83	32.68	2.17	P<0.001
	Control	31.36	2.87	32.28	7.28	P=0.59
Gingival Index of Mothers*	intervention	2.56	0.50	1.88	0.83	P<0.001
	Control	2.68	0.47	2.44	0.58	P=0.22
Self-Efficacy of Children	intervention	22.52	3.01	29.96	8.10	P<0.001
	Control	21.88	6.72	24.60	5.23	P=0.169
Perceived Benefits of Children	intervention	29.04	2.9	33.88	4.95	P<0.001
	Control	30.20	2.92	31.84	4.69	P=0.03
Perceived Barriers of Children	intervention	32.68	3.57	29.28	9.87	P=0.07
	Control	32	3.46	32.36	5.17	P=0.69
Gingival Index of Children*	intervention	3.6	0.50	1.36	0.90	P<0.001
	Control	2.56	0.50	2.52	0.56	p=0.6

*Sign test was used for Gingival Index

Table 4: Comparison of the mean and SD of self-efficiency, perceived barriers & benefits and GI in the two groups of Intervention and Control after the intervention.

Variables	After Intervention			T-test Result
	Group	Mean	SD	
Mothers' Self-Efficacy	intervention	25.60	5.89	P<0.001
	Control	18.36	3.79	
Mothers' Perceived Benefits	intervention	33.52	5.82	P<0.001
	Control	29.28	8.36	
Mothers' Perceived Barriers	intervention	32.28	7.28	P=0.44
	Control	32.68	2.17	
Mothers' Gingival-Index*	intervention	1.88	0.83	P<0.001
	Control	2.44	0.58	
Childrens' Self-Efficacy	intervention	29.96	8.18	P<0.001
	Control	24.60	5.23	
Childrens' Perceived Benefits	intervention	33.88	4.95	P=0.02
	Control	31.84	4.69	
Childrens' Perceived Barriers	intervention	29.28	9.87	P=0.17
	Control	32.36	5.17	
Childrens' Gingival-Index*	intervention	1.36	2.52	P<0.001
	Control	2.52	0.65	

* Mann-Whitney u test was used for GI

Table 5: Pearson's correlation between the variables of TTM for all of the mothers and adolescent before the intervention.

Variables	Mothers' Perceived Benefits	Mothers' Perceived Barriers	Mothers' Self-Efficacy	Childrens' Self-Efficacy	Childrens' Perceived Benefits	Childrens' Perceived Barriers
Mothers' Perceived Benefits	1					
Mothers' Perceived Barriers	-0.334*	1				
Mothers' Self-Efficacy	0.544**	-0.392**	1			
Childrens' Self-Efficacy	0.281*	0.050	0.199	1		
Childrens' Perceived Benefits	0.320*	-0.221	0.225	0.508**	1	
Childrens' Perceived Barriers	-0.335*	0.448**	-0.133	0.176	-0.436**	1

* P < 0.01 ** P < 0.05

Discussions

Regular and effective cleaning of teeth is the main method for preventing and control of periodontal disease. Oral health behaviors are the key factors in prevailing very high prevalence of periodontal disease that is one of most common human diseases. Teenagers of today will be parents of tomorrow and they transfer the oral health behaviors to the next generation. Therefore, any study improving the oral health at these ages, in addition to benefits for teenagers, will eventually have great benefits for the future generation [25-26]. Studies show that parents have a significant role in prevention of teeth decay in their children [27]. The present survey was also conducted to study inter-dental cleaning behavior in mothers and their children. In this study, the extent of use of inter-dental cleaning tools in participants increased after the intervention. Previous studies support our findings [24]. In studies of Mazloomi and Roohani, 37.5% of students mentioned dental floss as the practical tool for inter-dental cleaning [28]. In study of Pakpour, 53.7% of the youth did not use inter-dental cleaning tools and 8.4% used dental floss once a day [29], however, many of the mothers and their children were still not using any tools. The low rate of use of dental floss and tooth picks indicates that this behavior is not yet part of the daily life of Iranian students and mothers. It also shows the need for employing various ways to educate about the importance of this practice and other preventive methods.

Studies have shown that students brush their teeth or call on a dentist only when they have toothaches [30] or for cosmetic reasons [31]. Many of the mothers and their children were found to be in pre-contemplation and contemplation stages which may be attributed to lack of toothache and their ignorance about their appearance. Iranian mothers and adolescents do not recognize the signs of poor oral health when they observe their own mouths and teeth and/or those of their children. In other words, they do not pay attention to their teeth, because they are inside the mouth and cannot be seen easily.

Moreover, the fact that majority of mothers are in pre-contemplation stage and that they lack inert-dental cleaning behavior can be attributed to their negative perceptions and beliefs about inert-dental cleaning as being time consuming and also to their preference of treatment over prevention. In the intervention of students, the reasons for not using inter-dental cleaning tools were related to their age, because at this age, the mothers emphasize more on university entrance examinations and do not attend to their children's oral health. They may think that their children have lack of time and cleaning their teeth is wasting time. In addition, it is possible that the adolescents

were distracted by the exams and therefore did not pay attention to their mothers' suggestions about oral health.

Parents have pivotal role in providing an environment for establishing right behaviors in teenagers related to oral and dental health. They form the good or bad habits in their children. Parents' awareness with respect to oral and dental health affects their children's choices and actions. In a study conducted in 2004, it was found that knowledge, attitude and healthy behavior of the Polish parents regarding their oral and dental health had direct relation to the level of oral and dental health in their children [32]. High level of dental decay in children was in direct relationship with their parents' knowledge [33]. Considering these findings, it is likely that lack of use of inter-dental cleaning tools by mothers is the key factor of having the same behavior in their children. The intervention program of this study couldn't reduce obstacles in intervention group. Therefore, more understanding of the perceived barriers of inter-dental cleaning behavior by mothers and their children is required.

Other negative factors, such as short training course for mothers, indirect involvement of students in intervention program, overlap of the implementation of educational programs with the university entrance exam and lack of attention toward oral health problems in this period may have influenced students' score of perceived barriers.

The self-efficacy is an important factor in predicting behavioral change. People with high self-efficacy accept behavior better than others [34, 35]. In our study, self-efficacy and perceived benefits of mothers and their children in the intervention group were higher than baseline self-efficacy and perceived benefits. Our Findings are thus consistent with other studies [34]. This increase might be attributed to appropriate training program, mothers's' attention to intervention program and teaching it to their children and monitoring their correct behavior. Despite this increase, there was no significant relationship between self-efficacy of mothers and children. Probably definitions and concepts of self-efficacy in mothers are different from their children. Thus, more studies are needed to explain the concepts and perceptions.

In the present study, educating parents caused decrease of GI in them as well as in their children. Results of a study showed that in the group in which parents were involved in the educational intervention, the students had better marks in gums health and dental plaque. Involving parents can also be well effective in promoting the level of oral and dental health in their children [18]. The study by Frencken et al in Zimbabwe involving primary school children showed that educational intervention

for promoting level of oral and dental health in children resulted in reduction of dental plaque in these students. These results are in conformity with the findings in this study [36]. In this study, the educationsuitable for the target population was based on strategies of Trans-theoretical Model that have been effective previously in the reduction of GI [10], however, to achieve better results in this respect, either the educational methods should be changed or more effective model be designed for oral and dental health behavior.

Our findings indicated that the perceived benefits and self-efficacy of the mother and children after the educational program had a meaningful statistical difference that is consistent with findings of other studies [28]. Self-efficacy of the intervention group in comparison with the control group had a meaningful statistical difference which is consistent with the findings of study by Buglar et al about inter-dental cleaning behavior [37]. According to the findings of Bandura, self-efficacy is the most powerful construct for predicting change of behavior in individuals and play critical role in thinking, feeling and behaving. Normally, people showing more changes have higher self-efficacy level for performing specific behavior [10, 38]. In a study conducted in Iran showed that student's self - efficacy was low and self - efficacy and decisional balance differed significantly across the stages of interdental cleaning behavior change in students [9].

Predictors of perception of oral health behavior are different; therefore, in designing the interventions, attention should be paid to the differences and characteristics of cultural, social, and political barriers [39] for prevention and aiming at these elements as a confirmed need [40, 41]. Paying attention only to the personal factors in oral and dental health proves to be fruitless and the interventions on this basis not only will not be effective in oral and dental health, but also will be expensive and repetitive [40]. Therefore, the design of qualitative studies, through group discussions and in-depth interviews to gain a better understanding of the lack of inter-dental cleaning behavior and dental decays in students and mothers is suggested. Designing an effective and practical model based on these studies that enable the health education specialists to plan more efficient activities, is also suggested for the next researches and future research directions on this issue. It should be mentioned, however, that the current programs for health care of teenagers have not fulfilled their need for comprehensive programs and have not provided their oral and dental healthcare. Our findings showed that oral health behavior should be taught to children from very early stages of life in order to become part of their character in their future

life so that they will be less influenced by the peers and other factors. For this purpose, new health policies should be designed for giving mothers appropriate and systematic training on dental health during their pregnancy in health centers. Education and training of health workers should provide them with greater understanding of the importance of this issue.

On the whole, the results of our study confirmed the initial assumptions of the research. There was indeed a relationship between stages of behavior of inter-dental cleaning in mothers and their children. Self-efficacy of mothers and their children increased after the educational program. GI in both mothers and their children decreased after the educational program. We could not find any study published from Iran, focusing on the relationship between interdental cleaning behavior in mothers and their children. Knowledge and attitude of mothers of perceived barriers and benefits of dental care is of great importance in the prevention of tooth decay in children. However, designing oral health training programs for the Iranian mothers and teenagers leads to more familiarization with their oral health needs. Subsequently conducting these types of training in schools, health centers and dental offices provides educational appropriate protocols and treatments; and finally they will have positive impact on culture of using oral and dental health services in individuals.

There are few limitations that need to be acknowledged regarding present study. Firstly there were difficulties in accessing eligible subjects considering the sample selecting criteria. Secondly we had a difficulty with the tools for self-reporting used for parents and children, and finally there were some difficulties in following up in the limited time of the intervention.

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