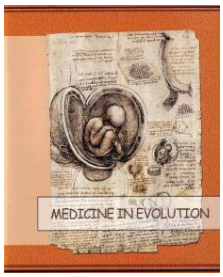
A model of experiential learning for teenagers' habits related to dental services utilization and smoking



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Abstract

Oral health promotion among adolescence is necessary due to the vulnerability specific to their age, such as the debut of smoking habits and the neglecting the dental services utilization. Taking into consideration the tendency of teenagers to be reluctant to conventional education, experiential learning is a more appropriate method for this target group since the participants are engaged in interactive activities with respect to a learning circle "Do", "Observe", "Think", "Plan", as described by David Kolb. The present paper describes the experiential learning activities used for oral health education of a group of 13-17 years-old adolescents in Bucharest, Romania enrolled in a 2-year longitudinal study as part of "Com4you" oral health promotion program. The activities described were part of the third lesson offered during the program and this last one approached as oral health subjects the importance regular visits to the dental office and the oral health risks of tobacco consumption. Students showed interest to both the subjects and the method and the results of the program showed greater changes in the adolescents' oral health-related behavior when this method was used compared to traditional learning.

Keywords: oral health promotion, adolescents' oral health, smoking, dental services use

INTRODUCTION

Oral health-related habits are formed early in life with proper education but while oral hygiene and food consumption behavior are the main subjects approached in oral health education programs offered to toddlers and children, adolescents need to be addressed subjects regarding behaviors often met in this life stage that are either neglected, such as regular dental check-ups and dental service utilization, or tempting and harmful, such as smoking. Most adult smokers start smoking in adolescence and recent studies conducted in Romania showed that around 15% of 13-16 years old teenagers smoke [1,2] and that that the frequency of smokers increased fast from age 13 years to 17 years [3].

Education at this age and, in particular, for the oral health care area tend to have better results if experiential learning is approached, compared to traditional learning [3]. Experiential leaning, developed by David Kolb [4], used the concept of ”learning by doing” in which the students are engaged in experiences (so called the ”Do” phase) then they are invited to evaluate their experience (the ”Observed” phase) and to decide for themselves what could be changed and improved at the previous experience (the ”Think” phase) and also to figure out how to apply the improved future version (the ”Plan” phase) and then the cycle resumes by testing the adapted experience.

The above mentioned learning method was applied in a 2-years longitudinal pilot study in Bucharest, as part of the”Com4You” Oral Health education program, and the results showed improvements in teenagers' awareness and behavior regarding the dental services utilization compared to control group(in which traditional education with oral presentations), as it follows: the frequency of subjects who visit the dental office regularly, at least once a year, increase from 55% at the baseline to 72,1% at the final of the program (compared to control group with an increase from 48,6% to 51,5%), and, moreover, the frequency of subjects who consider dental visits important for preventive reasons increased from 80,3% at baseline to 96,7% (compared to the control group with an increase from 80% to 82,9%) [5]

METHOD DESCRIPTION

The activities described in the present paper were performed in the “Com4you” Erasmus+ program for Oral Health Education and aimed to engage teenagers in experiential learning in order to increase the level of knowledge, to raise the awareness, and to improve the behavior related to the oral health. The activities were designed by a group of researches and trainers from Oral Health and Community Dentistry Department (“Carol Davila” Medicine and Pharmacy University in Bucharest, Romania) and TES Association, and then performed with a sample of 61 teenagers, 13-17 years old, students at 3 public schools in Bucharest, Romania. The sample group was divided in small sub-groups of 10-15 students who were offered oral health educational lessons in the classrooms, lasting around 30 minutes, using experiential learning and approaching two subjects: smoking and its negative impact on oral health, and the importance of regular visits to the dental office. These lessons were the last from a series of 3 lessons during the two-year period of the Com4you program (between 2014 and 2016), the other two having as themes: oral hygiene and caries-protective diet.

Activity 1. The risks for oral health of tobacco consumption

Aim: To increase the awareness regarding the oral health risk of smoking

Method of education: brainstorming and facilitated discussion

Description of the educational process:

The teenagers are informed by the coordinator of the activity (one member of the research team) that they are invited to an open discussion about the risks of smoking over the

oral health and they are asked to offer examples of modification in the oral cavity that tobacco consumption could induce. The students are encouraged to express their ideas and to offer as many answers as possible. All the answers are written down on a flip chart and discussed, the coordinator facilitates the discussion so that students engaged to offer also arguments and to try to find an explanation for the negative consequences mentioned. Correct answers are pointed out and bad answers are not criticized or deleted but debated under the guidance of the coordinator that directs the discussion to the correct medical explanation. The discussions are concluded by stressing out the severity of the negative effects of tobacco consumption over the whole mouth health. The key messages that should the repeated at the end of the activity should be: tooth discoloration, oral mucosa lesions such as leukoplakia, nicotine stomatitis, periodontal inflammation, poor wound healing, oral cancer, malodor.

Activity 2: Importance of the regular dental check-ups

Aim: Raising the awareness regarding the regular visits to the dental office for prevention and early detection of the disease

Method of education: Questionnaire

Description of the educational process:

The teenagers are informed that they will be given a set of cards with either questions or statements regarding the dental service utilization (Table 1). They are asked to read it and offer a personalized answer to the questions found on the card regarding the individual attitude or habit related to dental visits or decide whether the statement is true or false, in their opinion. Students are offered a couple of minutes to read the cards and prepare their answers and then they are invited to present their questions/statement and their answers to the other members of the group. The coordinator of the activity encourages the participants to offer honest answers accordingly to their opinions and habits. All the answers are discussed, developed base on reasons and explanation from students' point of view, debated, and guided by the coordinator. Proper attitude and habits are pointed out by the coordinator that should facilitate de discussion so that the key message be well understood by the participants: the dental services utilization should be based on prevention, early detection of the disease and treated in a safe and comfortable environment.

Table 1. Questions/Statements

	Question/statement	**Answer**
1.	How often do I need to go to the dentist?	
2.	Why visits to the dentist are important?	
3.	What are the signs that tell me that I should go to the dentist?	
4.	I have no problem with the teeth, must I go to the dentist?	
5.	What happens to me if I go to the dentist?	
6.	What can I do if a tooth hurts?	
7.	I have bleeding gums, just the tooth brushing solves the problem?	T/F
8.	I want to have whiter teeth, will I use sodium bicarbonate?	T/F
9.	With eating an apple, tooth brushing is no longer needed	T/F
10.	Dental floss does not help me to reduce the risk of cavities	T/F
11	Every dental procedure is painful	T/F
12	Hard food such as seeds or nuts reduces tooth decay	T/F
13	Chewing gum reduces tooth decay	T/F
14	My teeth hurt because I fired power	T/F

15	If I brush my teeth properly, there is no need to floss	T/F
16	Scaling and professional brushing at dentist damage my tooth enamel	T/F
17	An expensive toothpaste is much better	T/F
18	If I do not notice any cavity with the naked eye, I do not have to go to the dentist	T/F
19	Hot or cold foods damages my teeth	T/F
20	If my family members don't have dental problems It means that I will not have, either	T/F
21	Treatment of caries detected at early stages is not painful.	T/F
22	Cavities and gum inflammation might be reversible if going to regular check-ups.	T/F
23	Detected in time, decays are reversible by fluoridation and sealing.	T/F
24	Bleeding gums are present because of the incorrect brushing	T/F
25	Regular check-ups can diagnose diseases in their early stage, and treatment is tolerable and cheaper.	T/F

DISCUSSIONS

The aforementioned and described activities intrigued the participants who were interested and engaged in the discussions. However, taking into consideration that these activities were part of the last lesson from the program for which the final assessment of subjects' changes in knowledge, attitude and behavior was performed at only few weeks after the final lesson, and also that habits such as smoking need long periods to change, it would be apposite to assess the long term results as part of a longer follow-up of the study.

CONCLUSIONS

Engaging adolescents in the process of oral health education using experiential learning increases their interest in the subjects' approach and have higher results compared to traditional educational methods. The activities described in the present article are tested in the community and offered as a model for future oral health promotion initiatives targeted to teenagers.

Acknowledgement

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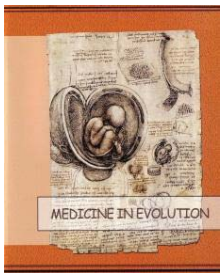
Evaluation of fluoride release into saliva after topical application: an in vitro experiment



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Abstract

Fluoride is the most important element in caries prevention and control. Topical fluoride therapies, self-applied or professional procedures, are frequently used such as dentifrices, mouthwashes, varnished, gels etc. The most important thing for a topical fluoride therapy irrespective of type of substance, method, concentration or frequency of application is fluoride concentration in oral fluid or in dental plaque. This study is an in vitro experiment developed on extracted teeth. Teeth were fluoridated with tin fluoride gel (0.4%) after they were cleaned with an ultrasonic scaler, water and immersed in a hypochlorite solution for 10 minutes. Afterward, the concentration of fluoride released from the teeth enamel was measured at 24, 48, and 72 hours using HI-729 Fluoride Low Range Handheld Colorimeter device. The amount of fluoride released between 48 hours and 24 hours from fluoridation (0.22 – 0.37 ppm) was a higher than the one released between 72 and 48 hours from fluoridation (0.15 – 0.18 ppm). The amount of fluoride released from the teeth enamel decreases in time after the topical fluoridation.

Keywords: fluoride release, topical applications, in vitro evaluation

INTRODUCTION

The use of fluorides is the most common and effective method for caries prevention. The fluoride is involved in mineralisation, maturation and preeruptive stages of tooth development, improves enamel remineralisation and has antibacterial effect. Fluoridation can be systemic (water, salt, milk) or topical (self-applied or professional procedures) [1,2,3]. Fluoride is present in saliva and on teeth surfaces after topical therapies were used. Thereby, the fluoride will be adsorbed on the enamel surface, it will reduce the demineralization when the pH rises above the critical level (5.5), and forms fluorhydroxyapatite. The fluoride can also interfere with the physiology and several bacterial mechanisms, such as enzymes activity (ex: glycolytic enzymes, H+ATPases). This is one of the fluoride antibacterial effects [4].

Different types of fluoride agents are used and reported to be effective in preventing dental caries, namely remineralsing early caries lesions and arrest dentine caries. There are various methods, concentrations, frequencies of applications and fluoride substances used in the topical therapies such as sodium fluoride, tin fluoride or acidulated phosphate fluoride (APF) [3,5,6].

Fluoride concentration in dental plaque and oral fluid is very important for topical therapies. The remineralization process and the antibacterial effects of fluoride are present when the fluoride concentration is optimal.

Aim and objectives

The scope of this study is to find how fluoride is released from teeth enamel after topical application using an in vitro experiment developed on extracted teeth and in which a special device is used.

MATERIALS AND METHODS

12 extracted teeth, 6 lateral and 6 frontal were used in this experiment. First, the teeth were cleaned using an ultrasonic scaler. All calculus deposits and extrinsic discolorations were removed in order to obtain cleaned enamel surfaces for a maximum fluoride uptake (figure no. 1). Afterward, the teeth were immersed in a hypochlorite solution for 10 minutes. The rationale of this experiment is to evaluate the fluoride released from the enamel only. Therefore, to exclude the cemetum, the teeth roots were covered with nail polish (figure no. 2, a & b).

Figure 1. Cleaning the extracted teeth with ultrasonic scaler

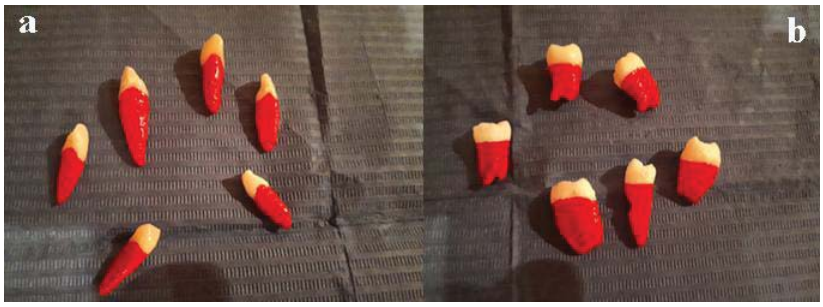

Figure 2. Extracted teeth with roots cover with nail polish; a – frontal teeth, b – lateral teeth

An amount of approximate 0.3 ml of 0.4% tin fluoride gel were put on teeth crowns using a small brush (applicator). After 1 minute, the excess of gel was removed and the teeth were washed with clean water. Then, the teeth were put in two plastic sterile bottles full with deionized water, one for lateral teeth and one for frontal teeth (figure no. 3, a & b, and figure no. 4).

The fluoride released from the teeth was measured using HI-729 Fluoride Low Range Handheld Colorimeter, Checker®HC device (figure no. 5). The device uses SPANDS method and it has:

- range 0.00 to 2.00 ppm
- ± 0.05 ppm ± 5% of reading
- 0.01 ppm resolution
- light source – LED 575 nm
- light detector – silicon photocell
- environment: 0 to 50°C (32 to 122°F); RH max 95% non-condensing
- 2 sample cuvettes with caps
- reagents for 6 tests (re-ordering information HI-729-26 x 20 tests)
- syringe with tip
- 1 x 1.5V AAA battery

Figure 3. Teeth in plastic containers
a – frontal teeth, b – lateral teeth


Figure 4. Teeth in deionized water

Figure 5. HI-729 Fluoride Low Range Handheld Colorimeter, Checker®HC device

2 ml of special reactive was combined with 8 ml of deionized water for each measure. It was 3 measurements of fluoride concentration: at 24, 48, and 72 hours for both containers.

RESULTS

The results for the 6 measurements were graphically exposed in the figures no. 6 and 7, and in table no. I.

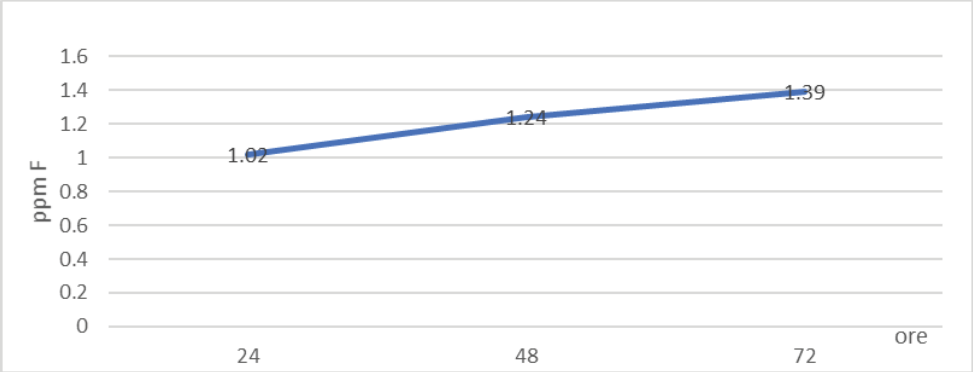

Figure 6. Fluoride concentration released from the anterior teeth

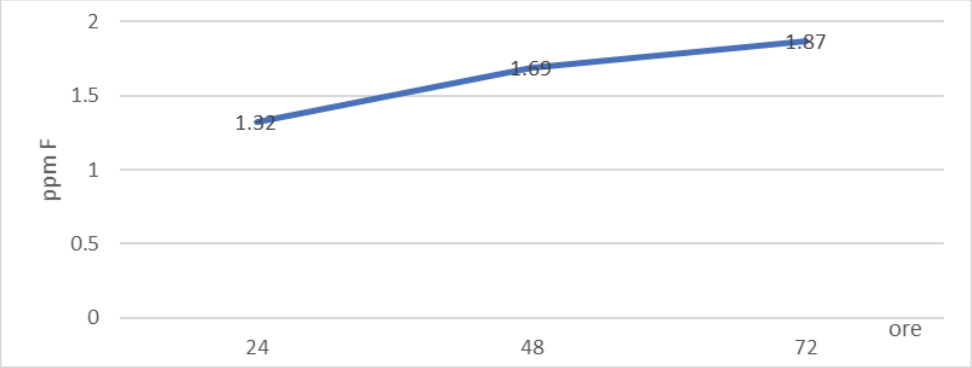

Figure 7. Fluoride concentration released from the posterior teeth

Table I. The amount of fluoride released from the teeth

Teeth	Fluoride released in the first 24 hours	Fluoride released between 48 and 24 hours	Fluoride released between 72 and 48 hours
Anterior	1.02 ppm	0.22 ppm	0.15 ppm
Lateral	1.32 ppm	0.37 ppm	0.18 ppm

DISCUSSIONS

Our study shows that the amount of fluoride released from the frontal teeth is lower than from the lateral teeth, which may seem logical given that they have thinner enamel. On the other hand, the amount of fluoride released from both lateral and frontal teeth is higher at 24 hours after fluoridation compared with that released between 48 hours and 24 hours after fluoridation, which is also higher than the amount of fluoride released in the last 24 hours (at the final point of the experiment – 72 hours after fluoridation). Thus, we can say that the amount of fluoride released from the enamel in a fluid is high at the beginning but decreases in time after the fluoridation.

The major limit of our study is that we used deionized water instead of saliva. Our study is an in vitro experiment and did not include human participants. We had in mind to create a mechanism of fluoride release similar to that in the oral cavity but oral fluoride

kinetics in the oral cavity depends on many factors such as saliva secretion, dietary fluoride sources or topic fluoride therapies [7]. Oral hygiene habit is also very important for fluoride level in saliva, especially brushing time and frequency or the amount of fluoride from the dentifrice, high fluoride toothpaste being considered to be responsible for a high saliva fluoride level as against regular toothpastes [7,8]. All these cannot be reproduced in an in vitro experiment.

Agents used in topical therapy provide different levels of fluoride in saliva. Sodium fluoride and aminofluorides for example, provide high concentration of fluoride in saliva [7]. Fluoride varnishes also release high amounts of fluoride in saliva. One study shows that even was added calcium glycerophosphate in some fluoride varnishes and therefore, the amount of fluoride in saliva increased, this did not lead to greater preventive effect against enamel demineralization [9].

Chewing gum is another donor of fluoride. The amount of fluoride released in saliva by the fluoride-containing chewing gum is almost ten times higher than in case of regular chewing gum [10].

CONCLUSIONS

Our experiment showed that fluoride is released in saliva at 24, 48, and 72 hours after topical fluoride therapy but the rate of release is decreasing. Even so, this is very important because the presence of fluoride in saliva is essential for caries prevention and control.

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