

Comparison of the Effect of Two Oral Hygiene Education Approaches on the Gingival Health and Dental Plaque of Boarding School Students in Fariman, Iran

Fatemeh Khorakian^{1,3}, Taraneh Movahhed^{1,3}, Ali Arabpoor²,
Zahra Mohammadzadeh³

¹Oral & Maxillofacial Diseases Research Center, Mashhad University of Medical Sciences,
Mashhad, Iran

²General Dentist

³Dental Materials Research Center, Mashhad University of Medical Sciences, Mashhad, Iran

Received 30 July 2018 and Accepted 24 December 2018

Abstract

Introduction: The school-based oral health programs are an opportunity to inspire positive attitudes and proper oral health behavior in students. The purpose of this study was to compare the effects of two oral health education methods on the oral health of boarding high school students in Fariman, Iran. **Methods:** In this interventional study, 345 students were randomly divided into three groups, namely self-led (control), teacher-led (instructed by teachers), and peer-led (instructed by students). All students were subjected to Simplified Oral Hygiene Index (OHI-S), Gingival Index (GI), Plaque Index (PI) measurements before and three months after the intervention. The data were analyzed using the paired t-test, the Kruskal-Wallis, and the Chi-square tests. The P-value less than 0.05 was considered to be significant.

Results: The results of the study showed a significant decrease regarding the scores of all three indices ($P < 0.001$) in the peer-led group, compared to the self-led intervention. According to the paired sample t-test analyses following the intervention, there was a significant decrease in the mean OHI-S, GI, and PI in all three groups ($P < 0.001$), peer-led group ($P < 0.001$), and peer-led and self-led groups ($P < 0.001$), respectively.

Conclusion: Due to the significant decline in all three indices of the peer-led group compared to the other two groups, using talented students as “oral and dental health assistants” may be an effective approach for promotion of oral and dental hygiene among teenagers. However, there is a need to conduct more research in this field of study.

Keywords: Education, Student, Oral Health.

Khorakian F, Movahhed T, Arabpoor A, Mohammadzadeh Z. Comparison of the effect of two oral hygiene education approaches on the gingival health and dental plaque of boarding school students in Fariman, Iran. *J Dent Mater Tech* 2019; 8(1): 33-8.

Introduction

Oral health education plays a key role in oral health promotion (1, 2). Education is a successful approach to improve oral health of adolescents (3, 4). Adulthood behavior is mainly established in adolescence, during which individuals seem more receptive to learning, performing health-related behaviors, and maintaining a positive attitude (5, 6).

There are three main models for oral health education, namely verbal, written, and audiovisual. Audiovisual method seems to be particularly appropriate in adolescents (7). School-based oral health interventions have positively improved oral hygiene, gingival health, and knowledge about oral health (7). Accordingly, schools are settings suitable for assessing the efficacy of different programs of oral health education. Previously, oral health education was mostly provided by dentists and hygienists. However, the cost-effectiveness and durability of this method is questionable (8).

Evidence shows that teachers can more easily and effectively provide and reinforce hygiene content (9, 10). Nevertheless, the lack of time and overload of school assignments are likely to diminish the influence of the oral health education provided by teachers (10). Students can also be employed as a potential resource for school-based health education (11). Moreover, the effects of peer-education can sometimes be more than those of lessons given by trained teachers, hygienists, and even, in some cases dentists (12, 13).

Abdul Haleemet al. (11) reports the higher level of health-improving behavior in peer-led groups compared to that of other groups. Oral health can be considerably improved through student-centered projects. Several studies showed that the oral health education provided by dentists, teachers, and parents exerts more influence than self-led approaches (14, 15). It has also been noted that multidimensional education provided by parents, teachers, and students is far more effective (16). Yazdani et al. (7) observed that school-based interventions can highly improve adolescent's oral hygiene and gingival health in the short-term, particularly in countries with a developing oral health system.

Although oral diseases are preventable, they still impose great costs on patients and society. No comparisons have yet been made among different approaches for oral health education, particularly in Khorasan Razavi province, Iran. Studies about oral health status of adolescent in Iran are so rare. A study on oral health knowledge, attitude, and practice in adolescents showed that these items obtained the lowest score in Khorasan, compared to the other five provinces of Iran (17).

Furthermore, most of the oral health programs in Iran are implemented in primary schools (7). Therefore, the present study was conducted to compare the efficacy of student-led and teacher-led interventional approaches on the oral health education in order to improve the gingival health status and oral hygiene of high school students.

Materials and Methods

Three boarding all-boys schools were selected from Fariman located in Khorasan Razavi, Iran. The participants were socially, economically, and culturally similar. The students of three schools were randomly divided into self-led (control group), teacher-led, and peer-led groups. The sample size was determined based on a similar previous and the main goal of the study (11). Accordingly, the current study was conducted on a total of 345 students (i.e., 115 participants in each group).

The subjects were enrolled in the present study only after informed written consent forms were obtained from the students' parents. The exclusion criteria were any physical disability that could prevent satisfactory performance of oral hygiene tasks, as well as periodontitis, which interfered with the precise measurement of the gingival index. All of the students were unaware of the examination day.

In order to randomly determine the intervention method for each school, group names were written on three balls, one of these balls was blindly selected by an individual. Afterwards, the indices of oral hygiene status were measured and recorded for all the samples, including the Plaque Index (PI), Simplified Oral Hygiene Status (OHI-S), as well as the Gingival Index (GI).

The OHI-S was calculated through the sum of two other indicators (debris index and calculus index) on six specific teeth. The index was interpreted based on the intervals of final score, as follows: 0-1.2 (good hygiene), 1.3-3 (moderate hygiene), and 3.1-6 (poor hygiene). The GI was estimated through the computation of four surfaces of six specific teeth and was categorized according to the following intervals: 0 (normal gingiva), 0.1-1 (mild inflammation), 1.1-2 (moderate inflammation), and 2.1-3 (severe inflammation).

The PI is calculated by the computation of four surfaces of six specific teeth and was plotted regarding the following intervals: 0 (Excellent), 0.1-0.9 (good), 1-1.9 (moderate), and 2-3 (poor).

All the pre-and post-intervention examinations were performed by the same examiner, who utilized a mirror, explorer, and flashlight. The required equipment were prepared in separate sterile packages for each student.

Identical educational intervention was conducted by either the teachers or students depending on the kind of

group's intervention. The educational content included a brochure, a pamphlet, and a PowerPoint presentation. The pamphlet explained the correct technique of brushing and flossing, as well as their frequency and appropriate time of application. The brochure explained the significance of oral and dental health and its effect on the health of human body, such as the digestive system. It also included an introduction to deciduous and permanent teeth, intraoral components, and information about the parts of the tooth. In addition, healthy gum characteristics, gingival diseases (gingivitis and periodontitis), dental plaque and its role in developing dental and gingival diseases, the significance of nutrition on oral health, and dental caries were included in the brochure.

The PowerPoint slides presented the brochure content and incorporated interesting pictures for the purpose of training the teachers and the students in the role of educators. The slides were then used for training the subjects. In the teacher-led group, each teacher was assigned to train a group of students. In the student-led group, teachers selected a student from each class to undertake the oral health education. The selection was based on the student's educational status, interest in oral health education, social communication skills, and discipline. The selected trainers were taught about the intervention content and method during five 2-hour sessions.

The subjects of all three groups received an educational package consisted of the brochure and pamphlet, as well as a soft toothbrush, toothpaste, and dental floss. In the peer-led and teacher-led groups, the educational content was also orally presented by demonstrating a dental arch and toothbrush. The intervention was performed at the beginning of the study and 6 weeks later in 45-60 min sessions.

The trainer attended the classes in the fourth and eighth week and orally presented a summary of the educational content in 5-10 min. On the other hand, the subjects in the self-led group received no educational intervention. According to a similar study (7), the previously-measured indices were clinically re-examined after 3 months. Finally, the overall satisfaction with the oral health education was recorded by asking the students if they were satisfied with the educational program.

The collected data was analyzed in SPSS software (version 19). A paired t-test compared the pre- and post-intervention mean values of each group indices. In addition, the Kuskal-Wallis test compared the indices of three groups. To compare the satisfaction level, the Chi-square test was utilized. P-value less than 0.05 was considered statistically significant.

Results

In the present randomized interventional study, a total of 345 male high school students of the same socioeconomic status were recruited from three boarding schools in Fariman, Iran. The missing data included the drop-out of 11 participants due to various reasons, such as changing the school. The subjects were examined before and after the intervention. The changes of measured indices in three groups were calculated to assess the effect of educational intervention.

As can be seen in Table I, the results of the paired sample t-test indicated that the intervention significantly affected the mean OHI-S, GI, and PI in all three groups ($P < 0.001$), peer-led ($P < 0.001$), peer and self-led groups, respectively ($P < 0.001$).

The Kolmogorov-Smirnov test showed that the indices were not distributed normally in all groups ($P < 0.001$). Therefore, the application of Kruskal-Wallis test revealed that the differences of indices were statistically significant among the three groups (Table II). The obtained results of the Mann-Whitney U test showed that there was no significant difference between the peer-led and teacher-led groups in terms of the decrease in the three study indices after the intervention. The scores of three indices were decreased significantly by the peer-led intervention compared to the self-led intervention. Teacher-led intervention decreased OHI-S ($P = 0.005$) and GI ($P = 0.007$) significantly, compared to the self-led intervention.

Finally, the overall satisfaction with the oral health education was reported to be 87.6%, which was the highest and lowest in the teacher and self-led groups, respectively. Moreover, the Chi-square test revealed no significant difference among the study groups in this regard ($P = 0.8$).

Table I. Comparison of mean and standard deviation among three indices in each group by paired t-test

Group	Index	N	Mean± SD	Mean± SD	P-value
			before intervention	after intervention	
Self-led	OHI-S	111	1.41±0.48	1.32± 0.41	0.00
	GI	111	0.85±0.45	0.83±0.41	0.00
	PI	111	1.13±0.35	1.06±0.34	0.00
Teacher-led	OHI-S	112	1.21±0.48	0.94±0.52	0.00
	GI	112	1.08±0.43	1.75±7.7	P= 0.36
	PI	112	1.03±0.35	1.72±8.17	P= 0.37
Peer-led	OHI-S	111	1.17±0.48	0.96±0.56	0.00
	GI	111	0.97±0.47	0.84±0.49	P= 0.60
	PI	111	1.00±0.32	0.83±0.47	P= 0.009

Table II. Comparison of mean differences of final and base line study outcomes among three groups

Differences in index	Group	Median	Mean	(Min, Max)	P-value
OHI-S	Self-led	-0.16	-0.92	(-1,0.4)	0.001
	Teacher-led	-0.16	-0.27	(-1.3,1)	
	Peer-led	-0.17	-0.21	(-1.5,1)	
GI	Self-led	-0.04	-0.01	(-0.5,1)	0.007
	Teacher-led	-0.13	0.67	(-1,82.1)	
	Peer-led	-0.16	-0.12	(-1.16,0.67)	
PI	Self-led	0.08	0.06	(-1,0.96)	0.036
	Teacher-led	-0.04	0.68	(-1.2,86)	
	Peer-led	-0.16	-0.165	(-1,1)	

Discussion

Oral hygiene education has been widely provided by dentists or oral hygienists; however, the cost-effectiveness and long-lasting impact of this intervention is questionable (18). Some reports have indicated that school teachers can effectively and practically educate and reinforce the oral health messages (9, 10). However, the lack of time and the heavy load of school assignments are the major causes undermining the effectiveness of teachers as oral health educators (19).

Trained students can be regarded as another potential human resource in oral health education. Recent researches have increasingly reported that trained student-led health education is much more successful than teacher-led education (12, 13), which can even be as effective as the training sessions provided by dentists (12). Nevertheless, few studies have compared different school-based methods of oral health education.

In the present study, there was a significant decrease in OHI-S in all the investigated groups, meaning that all behavioral centered interventions were useful for promotion of oral health outcome, especially at schools. The evaluation of the three different interventions revealed that peer, self, and teacher-led methods decreased significantly the scores of the three oral health indices, two oral health indices (OHI-S, PI), and just one index (OHI-S), respectively.

Therefore, it can be concluded that peer-led intervention was the most efficient method. The final examination revealed that the GI and PI scores had a little increase in the teacher-led group. However, the obtained results of Post Hoc comparison between the outcomes of each indices before and after intervention showed no significant differences. The current study demonstrated that school-based peer-led educational intervention could decrease oral health indices numerically. However, it was not considered to be clinically efficient since the final

measured outcomes after the intervention were remained equal among the three groups at same range of indices categories.

Since the students in a class are of similar age, it can be generally concluded that employing students as healthcare co-providers effectively inspire their classmates both theoretically and practically, which can numerically improve the students' oral and dental health level. This approach also had inexpensive costs and students are more readily available than teachers. Furthermore, it seems that students were more responsible in the primary teaching of educational concepts than teachers.

In a study conducted by Yazdani et al.(7), the severity of dental plaque and bleeding upon probing decreased significantly among 15-year-old adolescents in Tehran after 12 weeks of intervention training by films and pamphlets, compared to those in the control group. These findings were in agreement with those of the present study which showed a significant decline in all indices, particularly the peer-led group. Within a 6-month period, Chandrashekar et al. (15) conducted a short-term prospective study in India on secondary school students. According to the results, OHI-S and PI decreased significantly in teacher-led and dentist-led groups compared to the control group. Although the current study did not consider dentist education, the results indicated that education resulted in the reductions of scores among the indices. In the present work, it is noteworthy that teachers and students in the role of educators were first trained by a dentist; i.e. the dentist was indirectly incorporated in the teaching educational content.

In 2012, Abdul Haleem et al. (11) performed a study in Pakistan on 1517 randomly selected students from 40 schools. The participants were divided into five training groups, namely self-, dentist-, teacher-, classmate-trained, and control. Various rating criteria were employed, including oral health knowledge, knowledge about gingivitis and oral cancer, oral health behavior, oral hygiene status, plaque, bleeding on probing, calculus, and oral hygiene status.

Significant improvements were observed in the health-related behavior of the peer-led group compared to the other criteria in other groups. There was no significant difference in terms of the dental health status within the study groups; however, the difference was significant compared to that of the control group. These findings were consistent with the present study results.

Yekani Nezhad et al. (16) conducted a controlled clinical trial within a 3-month period on 392 primary school students in Tehran. They observed that the simultaneous training of parents, students, and teachers improved oral health-related behavior and clinical oral

health indices, such as OHI-S, and CPI more effectively than the training of the students.

Studies have also investigated other factors contributing to the efficacy of student health education. Babaei et al. (20) in Iran and Shenoy et al. (21) in India reported that social level, gender, and the parental education level did not contribute to the impact of health-related educations.

Differences in the basic levels of oral and dental hygiene maybe result from factors, such as the trainer's socioeconomic status, gender, and the living area (urban or rural) in addition to the educational level of the parents.

However, based on the previous studies conducted, these factors did not play a role in the changes of knowledge, hygienic behavior, and clinical criteria. Therefore, it can be stated that paying attention to both home and school settings can exert a more positive effect on the student knowledge and health-related behavior.

This intervention was inexpensive and easy to organize; however, this study was not matched with theoretical communication behavioral models.

Conclusion

Due to the significant decline in all three indices of the peer-led group in comparison with the other two groups, using talented students as "oral and dental health educator" may be an effective approach to promote the oral and dental hygiene among teenagers. However, it is suggested that further studies adjust to the theoretical communication behavioral models for more effective clinical intervention.

Acknowledgements

The authors would like to thank the Research Council of Mashhad University of Medical Sciences, Mashhad, Iran. This study has been supported by the Research Council of Mashhad University of Medical Sciences, Mashhad, Iran. The authors would like to thank the Research Deputy of Mashhad University of Medical Sciences for their financial support. The Grant-in-Aid for Scientific Research was received by Dr. Fatemeh Khorakian.

Conflict of Interest

The authors declare that there is no conflict of interests regarding the publication of the article

References

1. Daly B, Watt R, Btchelore P, Treasure E. Essential Dental Public Health. Oxford: Oxford University Press, 2005.

2. Towner Eml. *The History of Dental Health Education: A Case Study of Britain*. Oxford: Oxford Medical Publication, 1993.
3. Biesbrock AR, Walters's PA, Bartizek RD. Initial impact of a national dental education program on the oral health and dental knowledge of children. *J Contemp Dent Part*. 2003; 4(2):1-10.
4. Ostberg AL. Adolescents views of oral health education. A qualitative study. *Acta Odontol Scand*. 2005; 63(5): 300-307
5. Honkala S, Honkala E, Rimpela A. Oral hygiene instruction and dietary sugar advised resaved by adolescents in 1989 and 1997. *Community Dent Oral Epidemic*. 2002; 30(2):124-132
6. Astron an, Samdal O. Time trends in oral health behaviors among norwegian adolescents 1986-97. *Acta Odontol Scand*. 2001; 59(4):193-200.
7. Yazdani R, Vehkalahti Mm, Nouri M, Murtomaa H. School-based education to improve oral cleanliness and gingival health in adolescents in tehran, iran. *Int J Paediatr Dent*. 2009; 19(4): 274-81.
8. WaatRg, Marinch.VI. Does oral health promotion improve oral hygiene and gingival health. *Periodontol 2000*. 2005; 37(1): 35-47
9. Craft M, Croucher R. A program of dental health education for adolescents in schools. *Int Dent J*. 1984; 34(4): 204-213
10. Petersen Pe, Peng B, Tai B, Fan M. Effect of a school – based oral health education program in wuhan city' people republic of china. *Int Dent J*. 2004; 54(1): 33-41
11. Hallem A, Siddiqui MI, Ali Khan AA. School – based strategies for oral health education of adolescents-a cluster randomized controlled trial. *BMC Oral Health*. 2012; 18: (12): 54
12. Mellanby AR, Rees JB, Tripp JH. Peer-led and adult-led school health education: a critical review of available comparative research. *Health Educ Res*. 2000; 15(5): 533–545.
13. Cuijpers P. Peer-led and adult-led school drug prevention: a meta analytic comparison. *J Drug Educ*. 2003; 32(2): 107–119.
14. Luo W, Hu DY, Fan X. Comparison between the effectiveness of two oral health education program for middle _ school student. *Hua Xi Kou Qiang Yi Xue Za Zhi*. 2007; 25(3): 266-8.
15. Chendrashekar BR, Sumas. Kcvan K. The use of school teaching to promote oral hygiene in some secondary school students at heydarabad 'andhrapradesh' india:a short term prospective pilot study. *J Family Community Med*. 2012; 19(3):184-189.
16. Yekani NejadMS, Eshraghian MR, Noourijelianh K. Effect of a school-based oral health education on Iranian children: results from a group randomized trial. *Eur J Oral Sci* .2012; 120(5): 429-437.
17. Rad M, Shahravan A, Haghdoost AA. Oral health knowledge, attitude, and practice in 12-year-old schoolchildren in iran. *J Int Soc Prev Community Dent*. 2015; 5(5): 419–424
18. Watt RG. Strategies and approaches in oral disease prevention and health promotion. *Bulletin of the World Health Organization* .2005; 83:711-718.
19. Nyandindi U, Palin-Palokas T, Milen A, Robison V, Kombe N, Mwakasagule S. Participation, willingness and abilities of school-teachers in oral health education in Tanzania. *Community Dent Health* .1994; 11(2):101–104.
20. Babae N, Kardan K, F Aghazade, Nooribayat SH. Effect of oral and dental hygiene education on the knowledge of caries preventive behaviors in the guidance school student's. *JBUMS*. 1390; 14(1): 83-87.
21. Shenoy RP ,Sequeiral PS .Effectiveness of a school dental education in program in improving oral health knowledge and oral hygiene practices and status of 12 to 13 – years old school children. *Indian J Dent Res*. 2010; 21(2): 253-9.

Corresponding Author

Zahra Mohammadzadeh

Assistant Professor of Pediatric dentistry, faculty of dentistry, Mashhad University of Medical Sciences, Mashhad, Iran

Tell: 09155193518

Email: mohammadzadehz@mums.ac.ir