



# Effect of Traditional and Virtual Oral Hygiene Instruction to School Health Instructors on Plaque Index of Elementary Schoolchildren

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## Abstract

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**AIM:** This study compared the effect of traditional and virtual oral hygiene instruction to school health instructors on plaque index (PI) of elementary schoolchildren.

**METHODS AND MATERIALS:** In this descriptive, analytical study, 66 elementary schools in Kermanshah city were selected by cluster sampling. The school health instructors first participated in a pretest and filled out a questionnaire. The O'Leary's index of 339 elementary schoolchildren was measured at baseline. Next, the school health instructors received oral hygiene instructions in two groups (n = 33) of virtual instruction through an online course and traditional classroom setting. After 3 weeks, a post-test was held and school health instructors filled out the same questionnaire for the 2<sup>nd</sup> time. After 3 months, the PI of students was measured again. Data were analyzed using the Chi-square test, t-test, Mann-Whitney U-test, and ANOVA.

**RESULTS:** Both instruction methods significantly enhanced the oral hygiene knowledge of instructors (p < 0.001) but virtual instruction was significantly more effective (p = 0.02). No significant association was noted between age, work experience of instructors, or their level of education with their knowledge level in the virtual group (p > 0.05). An inverse correlation was noted between age and work experience of instructors with their knowledge level in the traditional instruction group (p < 0.05). Both instruction methods caused significant improvement of PI of students (p < 0.001) but virtual instruction was more effective (p < 0.001).

**CONCLUSION:** Correct oral hygiene instruction to school health instructors (preferably by virtual instruction) can reduce PI elementary schoolchildren.

## Introduction

Dental caries and periodontal disease are the most common oral and dental health conditions worldwide [1]. The time of eruption of molar teeth, especially first molars at the age of 6–7 years, corresponds to a period when children have high risk of caries. Oral hygiene measures are highly important during this particular time period, and tooth brushing at least once a day is imperative to prevent dental caries and periodontal disease [2], [3]. Oral hygiene plays a fundamental role in prevention of gingival inflammation and dental caries [3], [4]. Thus, preventive dentistry always emphasizes on oral hygiene maintenance. Oral hygiene instruction in elementary schools usually focuses on oral hygiene knowledge enhancement [3]. Correct instruction of oral hygiene measures to students plays an important role in promotion of oral health. Since children spend a lot of time at school, health care instructors play a key role in oral hygiene instruction to students. Instruction of topics related to oral and dental health and preventive measures to school health instructors can also play an important role in oral health promotion of students [5].

Lai *et al.*, [1] in an interventional study, showed that implementation of an oral hygiene education program on 10–13 years old for one semester had a long-term positive effect on their oral health and oral hygiene status, oral habits, calculus formation, and periodontal status [1]. A descriptive, analytical study by Livny *et al.* [3] evaluated the efficacy of oral health promotion with an applicable approach on elementary schoolchildren emphasizing on tooth brushing skills and concluded that the mean number of tooth-brushed area increased from 2.8 to 5.7 (out of 8) after the intervention.

Virtual instruction is becoming increasingly popular worldwide. Many studies have shown its comparable or even superior efficacy compared with the traditional classroom-based education [6], [7]. Virtual instruction has advantages such as easy accessibility to the educational content anytime and anywhere, and the ability to repeat and review the taught content as desired [8]. Thus, it is growingly employed for more efficient education worldwide [9].

The plaque index (PI) like O'Leary index [10] appears to be a commonly used oral hygiene index for assessing oral health skills and can provide sufficient information for patient education [11].

Considering the PI as an indicator of oral hygiene and the key role of school health instructors in oral hygiene instruction to elementary schoolchildren [1], this study aimed to compare the effect of traditional and virtual oral hygiene instruction to school health instructors on the PI of elementary schoolchildren. The null hypothesis was that there would be no significant difference in the efficacy of virtual instruction and traditional classroom instruction of enhance the knowledge level of school health mentors and their effect on PI of elementary schoolers.

## Subjects and Methods

This descriptive, analytical study was conducted in elementary schools of Kermanshah city. The study was approved in the ethics committee of Kermanshah University of Medical Sciences (ir.kums.ac.1397.067). The study population comprised two groups. The first group comprised 66 school health instructors of elementary schools in Kermanshah city who were selected by cluster sampling. For this purpose, elementary schools of Kermanshah city were divided into three clusters based on the three educational districts of Kermanshah city. Next, the sample size for each cluster was calculated according to a previous study [5], assuming  $\alpha=0.05$  and study power of 90%. Considering 30% dropouts, minimum sample size was calculated to be 22 individuals. The second group comprised elementary school students. Sample size for the students was calculated to be 113 students considering 10% dropouts. A total of 339 students between 7 and 11 years were randomly selected and evaluated in this study.

This study had two phases. The first phase included assessment of the oral hygiene knowledge level of 66 school health instructors. The second phase included assessment and comparison of virtual and traditional oral hygiene instruction to instructors and their effect on PI of 339 elementary schoolchildren.

Written informed consent was obtained from the instructors before their participation in the study and they were ensured about the confidentiality of their information. A questionnaire was designed according to a previous study [5], which included 25 questions. The validity of the questionnaire was evaluated by five faculty members of Kermanshah University of Medical Sciences, School of Dentistry, who were experts in this field. Their comments were applied to the questionnaire. The validity of the questionnaire was evaluated by testing it on 10% of the study population. The validity of the first 14 questions of the questionnaire was calculated to be 0.90 according to the Kuder Richardson formula and that of the remaining 11 questions was calculated to be 79% using the Cronbach's alpha, which indicated moderate validity of the questionnaire [5]. The

questionnaire also asked for demographic information of school health instructors including their age, gender, work experience, and level of education. The main part of the questionnaire included basic questions regarding the level of knowledge of instructors about oral hygiene.

Next, they were randomly divided into two groups ( $n = 33$ ) and correct oral hygiene including correct tooth brushing, dental flossing, and healthy nutritional habits were instructed to school health instructors. The first group received these instructions online by watching a short film and some pictures of the process, while the second group received a traditional classroom education on dental models and written instructions. The both groups were requested to provide oral hygiene instructions that they were taught to students within three sessions (once a week).

After obtaining written informed consent from the parents or legal guardians of children, the PI of elementary schoolers was measured at baseline before the intervention using the O'Leary's index [10]. The school health instructors had 1 h of self-study by watching of the short film and process pictures or traditional education by reading the written instructions, depending on their group allocation. After 3 weeks, the same questionnaires were administered again among the same school health instructors and their responses were recorded and compared with their responses at baseline. After 3 months, the students were then divided into two groups of virtual instruction and traditional instruction, based on their school instructor education. Then, the PI of students was measured again to assess the effect of oral hygiene instruction.

Data were analyzed using SPSS version 25 (SPSS Inc., IL, USA). The Chi-square test was used to assess the correlation of level of education (qualitative variable) with knowledge score of instructors. The measures of central dispersion were reported for quantitative variables, namely, age and work experience. Normal distribution of data was evaluated using the Kolmogorov–Smirnov test, and the Levene's test was applied to assess the homogeneity of variances. ANOVA was used to assess the correlation of quantitative variables with the knowledge level. t-test and Chi-square test were applied to compare the effects of virtual and traditional instruction on PI of students.

## Results

Of 339 students, 7 did not show up for the second assessment. Thus, data of 332 students were statistically analyzed. Of 66 school health instructors, 40 (60.60%) were female and 26 (39.4%) were male. The mean age of school health instructors was  $42.82 \pm 6.34$  years (range 30–53 years). Regarding the level of education of school health instructors, 1.5% ( $n = 1$ )

had high school diploma, 18.2% (n = 12) had college degree, 72.7% (n = 48) had bachelor's degree, and 7.6% (n = 5) had master's degree. The school health instructors had a mean work experience of  $18.53 \pm 8.48$  years (range 3–38 years).

Of elementary students, 51.20% (n = 170) were female and 48.79% (n = 162) were male.

Table 1 presents the mean PI before and after oral hygiene instruction by instructors in the virtual and traditional instruction groups. As shown, virtual instruction had a positive effect on PI of children ( $p < 0.001$ ). Traditional instruction also showed a positive effect on PI of students ( $p < 0.001$ ). Comparison of virtual and traditional instructions by the Mann–Whitney U-test revealed that virtual instruction had a significantly greater positive effect on PI of students ( $p < 0.001$ ).

**Table 1: Mean PI before and after oral hygiene instruction by instructors in the virtual and traditional instruction groups (n=166)**

Group	Variable	Mean	Std. deviation	t	p-value
Virtual instruction (paired t-test)	PI before the intervention	36.28	17.03	8.096	<0.001
	PI after the intervention	26.57	9.58		
Traditional instruction (Wilcoxon test)	PI before the intervention	44.46	18.39	-9.45	<0.001
	PI after the intervention	30.16	15.80		

Table 2 presents the knowledge score of school health instructors before and after virtual and traditional oral hygiene instructions. As shown, both virtual and traditional instructions significantly enhanced the knowledge of school health instructors about oral hygiene ( $p < 0.001$ ). However, according to the Mann–Whitney U-test, virtual instruction was more effective than traditional instruction ( $p = 0.02$ ).

**Table 2: Knowledge score of school health instructors before and after virtual and traditional oral hygiene instruction (n=33)**

Group	Variable	Mean	Std. deviation	t	p-value
Virtual instruction (Wilcoxon test)	Knowledge score before the intervention	17.18	2.66	-3.66	<0.001
	Knowledge score after the intervention	19.29	3.20		
Traditional instruction (paired t-test)	Knowledge score before the intervention	14.79	3.31	-5.92	<0.001
	Knowledge score after the intervention	19.00	2.22		

The Spearman's correlation test revealed no significant correlation between work experience of instructors and the knowledge score in virtual instruction group ( $p = 0.16$ ). However, work experience of instructors had an inverse correlation with the knowledge score in traditional instruction group ( $p = 0.01$ ).

The Spearman's correlation test revealed no significant correlation between the age of instructors with their level of knowledge in the virtual instruction group ( $p = 0.35$ ). However, age of instructors had an inverse correlation with knowledge level in traditional instruction group ( $p = 0.002$ ).

Level of education of instructors had no significant correlation with their knowledge level in

virtual or traditional instruction group (one-way ANOVA,  $p > 0.05$ ).

## Discussion

This study compared the effect of traditional and virtual oral hygiene instruction to school health instructors on PI of elementary schoolchildren. The results showed that both instruction methods significantly enhanced the oral hygiene knowledge of instructors ( $p < 0.001$ ) but virtual instruction was significantly more effective ( $p = 0.02$ ).

As shown, oral hygiene status of elementary schoolchildren was not favorable, which calls for implementation of some educational programs in this respect. Oral hygiene promotion in elementary schools should be based on knowledge enhancement and instruction of oral hygiene measures [3]. School health instructors can play a key role in this process. Our study showed poor knowledge level of school health instructors regarding oral hygiene. Most school health instructors had not participated in any course regarding oral hygiene and had not received any education in this respect. Thus, it is imperative to hold some educational courses for school health instructors to enhance their level of knowledge in this respect.

Our results showed significant effect of both virtual and traditional instructions on knowledge score of instructors; however, this effect was greater in the virtual instruction group. This finding was in agreement with that of Bassir *et al.* [5] Hartshorne *et al.* [12] reported that implementation of oral hygiene programs in schools can effectively improve oral hygiene. Bassir *et al.* [13] evaluated the effect of oral health education on PI of children in Ahwaz and reported that oral health education decreased the DI-S index of students. Our results were in line with their findings. Halonen *et al.* [2] and Lai *et al.* [1] evaluated oral health behaviors of children and reported the positive effect of education on knowledge level of oral health instructors and its consequent effect on promotion of oral health of students, which was in agreement with our findings. Jabari *et al.* [14] compared three methods of oral hygiene instruction to students in Ahwaz and reported that although oral hygiene of students was better in the virtual education group, OHI-S index was higher in the traditional instruction group, which was in contrast to our findings since our study showed that virtual instruction had a significantly greater positive effect on PI of children. This difference between the results of the two studies can be due to different methodologies. Basir *et al.* [15] showed significant effect of oral hygiene instruction on oral hygiene improvement of students. However, they provided traditional oral hygiene instruction using a dental model, which was different from our methodology.

Our study showed no significant correlation between level of education of school health instructors and their knowledge level in virtual or traditional instruction groups, which was in line with the results of Bassir *et al.* [5], [13] However, in our study, work experience and age of instructors had no significant correlation with their knowledge level in the virtual instruction group, which was in line with the results of Bassir *et al.* [5].

This study had some limitations. The effects of instructions were evaluated after 3 months, which is not long enough for the assessment of long-term effects of instructions. Thus, further long-term studies are required to assess the effect of such instructions in long term. Furthermore, the process of instruction should be continuous [16]. There is a possibility that instructors did not provide oral hygiene instructions to students in a regular weekly basis. Furthermore, the number of male and female students was not equal in our study, which was another limitation, and thus, we could not compare male and female students.

Considering the significant role of school health mentors in oral hygiene of students, oral hygiene instructions should be included in the educational curriculum of health instructors. Role of parents is also highly important in oral hygiene of students, which should be addressed in future studies. Last but not least, considering the increasing interest of young generation in virtual social media, the social media can be used to promote oral hygiene of students and can be an interesting topic for future research.

## Conclusion

Correct oral hygiene instruction to school health instructors can enhance their knowledge level and reduce PI schoolchildren. However, virtual instruction was significantly more effective than traditional instruction.

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