

Effectiveness of an Infant Oral Care Educational Intervention on Knowledge of Dental Students

Fouad Salama¹, Waad Alamri², Shahad Albader², Rawan Alammari²,
Rasha Al-Dabaan¹, Rehab Allam¹

¹Department of Pediatric Dentistry and Orthodontics, College of Dentistry, King Saud University, Riyadh, Kingdom of Saudi Arabia

²Dental Interns, College of Dentistry, King Saud University, Riyadh, Kingdom of Saudi Arabia

Running Title: Effectiveness of an infant oral care educational

Correspondence address: Professor Fouad Salama

Abstract

Purpose: This study assessed the effectiveness of a video and a PowerPoint presentation educational intervention about infant oral health care on the knowledge and learning of female dental students at King Saud University in Riyadh, Saudi Arabia.

Methods: Two hundred eighty-four students from five levels of dental school (D1, D2, D3, D4, and D5) participated in this study. A self-administered questionnaire was distributed and completed by students immediately before and after the educational intervention, which was in the form of a video and a PowerPoint presentation on oral health care of infants. The 14-item multiple-choice questionnaire was based on information presented in the educational intervention to measure short-term recall of knowledge. The presentation educated students about infant oral health care, the first dental visit, correct position of examining the infant and anticipatory guidance.

Results: There was a significant difference between the total pre-test and post-test scores ($P < 0.0001$). The mean \pm SD scores of the pre- and post-test scores respectively were 4.96 ± 2.33 and 11.56 ± 1.76 . The students reported their minimal knowledge of infant oral health care as 50.7% before watching the educational intervention compared to 7.4% after watching it. Moreover, 78.2% students reported that the educational intervention was very effective in teaching them about infant oral health care. About 77.5% and 22.5% of the students were very or somewhat satisfied with the educational intervention respectively and 96.5% of participants reported that it was helpful in improving their understanding of infant oral health care, and 65.8% and 28.9% were very or somewhat likely to use the information presented in the educational intervention respectively.

Conclusion: The video and a PowerPoint presentation educational intervention on oral health care of infants used in this study was effective in teaching basic information about infant oral health care and improved the knowledge of dental students.

Keywords: Infant Oral Health, Pediatric Oral Health, Dental Students, Dental Education, Preventive Dentistry

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I. Introduction

Dental caries is a major public health problem and the national prevalence of dental caries and its severity in children in Saudi Arabia was estimated to be approximately 80% for the primary dentition with a mean dmft of 5.0.¹ High prevalence of dental caries in preschool children in Saudi Arabia in the city of Riyadh was also reported in 269 (69%) out of 388 children with a mean dmft score of 3.4.² Another study in Aseer (Southern part of Saudi Arabia), also reported a high percentage (77.7%) of caries in preschool children.³ Early childhood caries (ECC) is defined as the presence of one or more decayed (non-cavitated or cavitated lesions), missing (due to caries), or filled tooth surfaces in any primary tooth in a child under the age of six.⁴ Although caries is in fact a multifactorial disease, children are most likely to develop dental caries in families of low socioeconomic backgrounds.⁵ Furthermore, the occurrence and severity of ECC in children was found to be co-related to the education level of parents where the higher the level of parental education, the lower prevalence of dental caries in their children.⁶ Several studies in Saudi Arabia reported high prevalence of ECC in preschool children; a study in 2008 reported caries prevalence of 74.8% with a mean dmft score of 6.1 in 789 preschool children in Riyadh city.⁷ Another study in 2013 in the city of Jeddah, Saudi Arabia also reported high caries prevalence of 89% among preschool children.⁸

The American Academy of Pediatric Dentistry (AAPD) recognizes that infant oral health is the foundation upon which preventive education and dental care must be built to enhance the opportunity for a lifetime

free from preventable oral diseases.⁹ Consequently, there is a need to establish early on a dental home, which is an ongoing relationship between the dentist and the patient, inclusive of all aspects of oral health care delivered in a comprehensive, continuously accessible, coordinated, and family-centred way.¹⁰ It is recommended by the AAPD that the first dental examination should be done at the time of the eruption of the first primary tooth and no later than 12 months of age.¹¹ Creating an early dental home for children, not only will reduce or eliminate oral disease, but also creates awareness in parents about the importance of oral care and oral disease prevention, especially since parents and guardians' oral health beliefs and practices directly influence children's dental health.^{12,13}

Dental students could contribute greatly in improving oral health in infants by creating awareness among parents about the need for an early dental home, make suitable referral if needed as well as provide parents with anticipatory guidance that are appropriate for their children.¹⁴ Moreover, it has been reported that dental practitioners are more likely to examine the oral cavity of children who are younger than 3 years of age in their practice, if they had been previously exposed to infant oral health examinations during dental school.¹⁴ It has also been reported that practice patterns become rigidly establishes in health care providers after graduation, therefore education provided during residency training has been more successful.^{15,16} Studies done on educational interventions and programs in infant oral health care in the form of video is limited, consequently, an infant oral health care educational video for dental students was used, in addition to a PowerPoint presentation. Therefore, the purpose of this study was to assess the effectiveness of a video and a PowerPoint presentation educational intervention about infant oral health care on the knowledge and learning of female dental students at King Saud University in Riyadh, Saudi Arabia. The null hypothesis tested in this investigation was there is no difference in the effectiveness of a video and a PowerPoint presentation about infant oral health care as judged by assessing the knowledge and learning gained by dental students before and after the educational intervention.

II. Methods

This research project including the pre-test and post-test assessments self-administered questionnaires, the video and the PowerPoint presentation educational intervention were approved by the College of Dentistry Research Center Ethical Committee at King Saud University. The authors used the AAPD guidelines to develop and produce the educational intervention using the Microsoft Office Professional Plus 2013 suite (Microsoft Corporation, Tempe, AZ, USA) and the Windows Movie Maker 2016 software (Microsoft Corporation, Tempe, AZ, USA) to produce a final video with clear guidelines.⁹⁻¹¹ A self-learning video was filmed at the student clinic in the College of Dentistry. The PowerPoint presentation and video provided an informative and concise representation of infant oral health for health care professionals designed to instruct students on how to perform an infant oral screening; how to identify infants at increased risk for oral health problems; when to obtain appropriate referrals to oral health professionals; and how to provide parents with appropriate anticipatory guidance. The topics covered include how to perform an infant oral health exam; what to look for in an infant oral health exam; how to recognize incipient and gross carious lesions; when to obtain referrals for oral health; timing of the first dental visit; periodicity of dental screenings; appropriate use of fluoride supplementation; and emergency care for infant oral trauma. In addition, the presentation reviewed anticipatory guidance on appropriate feeding and proper oral hygiene for infants. The validity and accuracy of the presentation and video were evaluated and assessed by a professor in pediatric dentistry and modifications were made based on the given reviews.

Students were asked to complete a questionnaire before and immediately after watching the educational video intervention. A professor in pediatric dentistry reviewed the survey and questions and modifications of the questionnaire were made based on the given reviews. In addition, the questionnaire was pilot tested for reliability and clarity of the questionnaire by randomly selecting 10 of the target participants. Accordingly, revision of the questionnaire was performed to avoid misinterpretation of the questions. Students were asked not to put their name or any other information on the questionnaires that could identify it as theirs to maintain anonymity. The questionnaire included 14-item multiple-choice questions that measured participant's short-term recall of information presented in the training tool. Three questions were added at the beginning of the pre-test questionnaire only asking for the year of enrolment of the student, if they had any formal or informal training in infant oral health prior this educational intervention, and how participants rated their knowledge of infant oral health. On the other hand, six questions were added at the end of the post-test to evaluate students' opinions of the importance, effectiveness, and usefulness of the educational intervention in expanding their knowledge of infant oral health. Participants in this study were asked about their satisfaction with the video, they were asked to rate their knowledge of infant oral health after completing the presentation, if they would like to change or add anything to the educational video, and if they were likely to implement the information in their practice. Participants in this study were anonymous, and only identified by a unique number, which is not, linked to the student.

Statistical analysis of the data from resulting evaluations was performed to evaluate and compare the difference between the pre- and post-scores using independent t-test, Kruskal-Wallis test, and chi-square test.

Blank responses were scored as incorrect. All statistical analyses were set with a significance level of $p < 0.05$. The statistical analysis was carried out with SPSS V16.0 (Statistical Package for the Social Sciences, SPSS, Chicago, Illinois, USA).

III. Results

A total of 284 female dental students participated in this research. Sixty students (21%) belonged to D1, as well as D2 and D3, while 55 students (19%) belonged to D4 and 49 students (17%) were in D5. The first two groups (D1 and D2) had no previous formal or informal training in pediatric dentistry, while the other three groups (D3, D4 and D5) had previous pediatric dentistry courses; 1 year for D3, 2 years for D4, and 3 years for D5. The average total score (Mean \pm SD) in the pre-test was 4.96 (± 2.33); it increased to 11.56 (± 1.76) in the post-test. There was a statistically significant difference ($P < 0.0001$) in knowledge before and after completing the training educational intervention. In addition, comparing the average individual scores of each study year on the pre-test to the post-test scores for all the groups (D1–D5) were significantly different ($P < 0.0001$) as shown in Table 1 and Figure 1. Using a paired sample correlation, a significant correlation was found between the average score on the pre-test and post-test for D4 and D5, while no correlation was found between the pre-test and post-test average score for the two other groups (D2 and D3). Table 2 shows frequency and percent of the pre- and post-test correct answers and the statistical significance.

Students belonging to D2 had the highest percentage of improvement in the post-test survey as compared with the pre-test survey, followed by D1, D3, D5 and D4. The groups with previous training in infant oral health (D3 = 4.58 ± 2.12), (D4 = 6.53 ± 1.654), and (D5 = 6.10 ± 1.262) had significantly higher pre-test average scores when compared to groups with no previous training (D1 = 4.05 ± 2.62 , D2 = 3.90 ± 2.312). As for the average post-test scores, D2 and D5 students had higher scores (11.23 ± 1.817 and 13.33 ± 0.747) when compared to D3, D4, and D1, which had comparable scores. Group D5 had a significantly higher a post-test score when compared to the other three groups ($P < 0.0001$).

The majority ($n=275$, 96.5%) of study participants found the presentation helpful in improving their understanding of infant oral health, and 221 (77.5%) participants were very satisfied with the presentation. Moreover, 222 (78.2%) participants reported that the presentation was very effective in teaching them about infant oral health, 187 (65.8%) participants were very likely to incorporate this information into their daily practice, 82 (28.9%) participants were somewhat likely, and 15 (5.3%) participants were not likely to use this information in their practice. When the students were asked to rate their knowledge of infant oral health before the presentation, 115 (40.5%) participants said their knowledge was general, 25 (8.8%) participants said it was extensive, while 144 (50.7%) participants had minimal knowledge. When the students were asked to rate their knowledge after the presentation, 264 (57.7%) said it was general, 99 (34.9%) said their knowledge was extensive, while 21 (7.4%) participants reported minimal knowledge. Regarding the question about the items they would like to change in the presentation; only 29 (10.2%) said they would make changes to the educational intervention such as presence of music in the video and the number of words written in some slides.

The highest correct answers in the pre-test were for the questions about what procedure should be done by the dentist at the infant's first dental visit (62%), and when the last primary tooth exfoliates (61.3%). While the lowest correct answers were for the questions about what is false regarding fluoride varnish (10.6%) and how should a child, under thirty months be positioned in infant oral examination (12.3%). For the post-test, the highest correct answers were to questions about when should the first oral health examination by dentist take place (96.5%) and how should a child under thirty months be positioned in infant oral examination (95.8%), while the lowest correct answers were to questions about the results of prolonged thumb sucking more than age 2 years old (65.1%) and the maximum amount of juice a child less than 6 years old should consume per day (71.8%).

IV. Discussion

The null hypothesis tested in this investigation was rejected as there was a difference in the effectiveness of a video and a PowerPoint presentation about infant oral health care as judged by assessing the knowledge and learning gained by dental students before and after the educational intervention. In the present study, all female ($n=284$) dental students, from first to fifth year of college of dentistry were included in this study. As dental students in D3–D5 had previous training in infant oral health in pediatric didactic courses, they had significantly higher pre-test average scores when compared to D1 and D2 whom did not have any previous training in pediatric dentistry. All the scores were improved after the intervention when compared to the pre-test scores and a significant difference was reported in all the dental groups/levels scores.

Every infant should receive an oral health risk assessment from his/her primary health care provider or qualified health care professional and the first dental visit should occur within six months after the first primary tooth appears, but no later than one year old.¹⁷ Education of infant oral health in academic institutions and examining models to educate dental students on how best to address the oral health needs of infants is therefore necessary, particularly since a study reported that only one in four dental schools provided hands on experience

for dental students in related procedures.¹⁸ Moreover, rotations among dental students with young patients increased the number of dental students who recommended a first dental visit by 12 months of age from 3% to 30%.¹⁹ The present study reported that 50.7% of students had minimal knowledge before the intervention, while only 40.5% participants said their knowledge was general. These ratings improved after the training program, where 34.9% of students reported that their knowledge was extensive, 57.7% reported it was general, and only 7.4% reported minimal knowledge in infant oral health. Different self-reported improvements by students were previously reported in a study completed on all levels of dental students where knowledge of infant oral health after the training intervention was rated minimal in 14.8%, general in 75.8% and extensive in 9.4%.²⁰ These results indicated that participants reporting formal training in infant oral health correlated highly with reported knowledge of infant oral health, but those reporting no previous training in infant oral health correlated less with reported knowledge of infant oral health.²⁰ There was also significant correlation between post-test and formal training, but no correlation between post-test and no previous training.²⁰ The same study reported a positive correlation between class/year in dental school and knowledge of infant oral health.²⁰ In contrast another study found that first-year dental students were more likely than fourth-year dental students to rank the first dental visit as important.²¹ A study on freshman dental students also reported knowledge after similar intervention to be minimal in 5%, general in 90% and extensive in 5%.²² In the present study, a significant correlation was found between the average score on the pre-test and post-test for D4 and D5, while no correlation was found between the pre-test and post-test average score for the two other groups (D2 and D3). Another study reported significant correlation between class and score on the pre-test and post-test and the higher the dental class, the higher the score.²⁰ The authors attributed the differences between D2, D3, D4, and D5 students to a reflection of the greater clinical experience of D4 and D5 students. If so, the clinical experiences in dental school may modify students' beliefs and attitudes about infant oral care. The differences between years may also be due to cohort differences instead of differences in educational level. In addition, the authors claimed that influences of unmeasured variations in class composition and the background of students might have confounded the findings.

In the present study, 96.5% of the dental students found the intervention to be helpful in improving their understanding of infant oral health. Similar findings were reported in previous studies, where 98.4% and 95% of dental students found the presentation about infant oral health improved their understanding.^{20,22} In the present study, 77.5% of students were very satisfied with the presentation and 78.2% reported that the educational intervention was very effective in teaching infant oral health. Interestingly, the results of this study show better rating of the educational intervention when compared with previous similar studies that reported 60.2% and 60% on satisfaction and 51.6% and 55% on effectiveness respectively.^{20,22} In the present study, the highest correct answers in the pre-test were for the questions about what procedure should be done by the dentist at the infant first dental visit (62%) which was much higher (90%) in another study.²⁰ For the post-test, the lowest correct answers were to question about the maximum amount of juice a child less than 6 years old should consume per day (71.8%) which was much lower (16%) in another study.²⁰

The findings of this study resonate with previous studies, which evaluated the change in dental students' knowledge, opinions, attitudes and behaviors following a training intervention for infant oral health using a pre-test and post-test study design. These studies reported 67.5%, 65% and 88% of dental students would very likely incorporate the information learned into their daily practice,^{20,22,23} compared to 65.8% of participants in this study. Although, 5.3% of students in this study reported they were unlikely to use the information taught in their practice, yet the significant increase in post-test scores compared to pre-test scores indicate an increase in knowledge in infant oral health for all participants. Moreover, in the present study, only 10.2% students reported that they would like to make some changes to the presentation such as presence of music in the video and the number of words written in some slides. This echoes student satisfaction with the educational intervention in infant oral health. Another study reported that students would like to make changes in the presentation such as to slow it down and make it longer and provide more information.²² This study also echoes previous similar studies done on family medicine residents, which reported improved knowledge in infant oral health and behaviors.^{17,21,24}

The infant oral health educational intervention is an effective tool in teaching dental students about basic information in infant oral health. This educational intervention proved to have increased knowledge of dental students. Therefore, this educational tool indicated its effectiveness in this study. It would be stimulating to have additional follow-up investigations that answer some of this study's limitations, such as a follow-up survey and open-ended qualitative interviews regarding actual behavior change rather than just knowledge change. Furthermore, to follow these students into their future jobs and see if they really do act upon their knowledge. Additionally, these results cannot be generalized due to its use in one institution and on one gender and are based on a self-reported questionnaire and dental students may not have answered honestly. In addition, in this study, students completed pre- and post-surveys in one sitting, therefore there was no assessment of long-term retained knowledge and behavior change from the educational intervention.

V. Conclusions

Based on this study's results, the following conclusions can be made:

- 1) The infant oral health care educational intervention in the form of a video and a PowerPoint presentation tested in this study increased knowledge and learning of female dental students at King Saud University in Riyadh, Saudi Arabia.
- 2) Participants reported great interest on the infant oral health and that the information given will change their daily practice for infant oral health.
- 3) Dental students lack knowledge in infant oral health, therefore there is a need to address gaps in dental curriculums, and the need to promote education and involvement of dental students in the care of infants and toddlers. Moreover, there is a need to find best tools to deliver information on infant oral health to dental students.

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Table 1. Comparing the average individual scores and range of each study year on the pre-test to the post-test scores for all the groups (D1–D5) and the statistical significance

Level of Students	Total Scores		P-value
	Before Mean ± SD Median (Min – Max)	After Mean ± SD Median (Min – Max)	
Level 1 (n=60)	4.05 ± 2.62 5.0 (0 – 8)	11.15 ± 1.538 11.0 (8 – 14)	P<0.0001*
Level 2 (n=60)	3.90 ± 2.312 4.0 (0 – 8)	11.23 ± 1.817 11.0 (7 – 14)	P<0.0001*
Level 3 (n=60)	4.58 ± 2.118 5.0 (0 – 8)	11.20 ± 1.725 11.50 (8 – 14)	P<0.0001*
Level 4 (n=55)	6.53 ± 1.654 7.0 (2 – 10)	11.18 ± 1.701 11.0 (7 – 14)	P<0.0001*
Level 5 (n=49)	6.10 ± 1.262 6.0 (4 – 9)	13.33 ± 0.747 13.0 (12 – 14)	P<0.0001*
P-value	P<0.0001	P<0.0001	

*Significant - Using Kruskal-Wallis test

Table 2. Frequency and percent of the pre- and post-test correct answers and the statistical significance

Question No.	Correct Answer Pre-test Frequency (%)	Correct Answer Post-test Frequency (%)	P-value
Q1	35 (12.3 %)	272 (95.8 %)	P<0.0001
Q2	65 (22.9 %)	232 (81.7 %)	P<0.0001
Q3	107 (37.7 %)	185 (65.1 %)	P<0.0001
Q4	91 (32.0 %)	238 (83.8 %)	P<0.0001
Q5	48 (16.9 %)	204 (71.8 %)	P<0.0001
Q6	131 (46.1 %)	216 (76.1 %)	P<0.0001
Q7	161 (56.7 %)	274 (96.5 %)	P<0.0001
Q8	143 (50.4 %)	255 (89.8 %)	P<0.0001
Q9	174 (61.3 %)	233 (82.0 %)	P<0.0001
Q10	60 (21.1 %)	259 (91.2 %)	P<0.0001
Q11	115 (40.5 %)	242 (85.2 %)	P<0.0001
Q12	176 (62.0 %)	235 (82.7 %)	P<0.0001
Q13	74 (26.1 %)	211 (74.3 %)	P<0.0001
Q14	30 (10.6 %)	227 (79.9 %)	P<0.0001

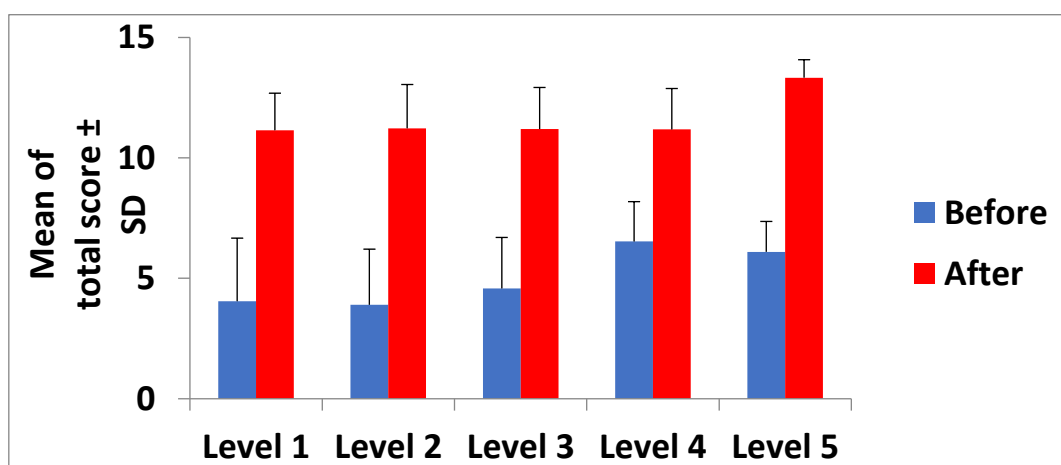


Figure 1. Comparing the mean (\pm SD) individual scores of each study year on the pre-test to the post-test scores for all the groups (D1–D5)

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