

## Efficacy of using Audiovisual Videos in School-based Online Learning to Improve Parental Knowledge of Children Oral Health: A Lesson from COVID-19 Pandemic

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### Abstract

The majority of dental clinics in Indonesia were closed for routine dental treatments during the COVID-19 pandemic. However, as the prevalence of dental caries in children <5 years of age in Indonesia was >92%, there was an increased risk of severe dental problems requiring urgent and emergency intervention. Using school-based online learning, audiovisual video was shared to parents of kindergarten students to inform about pediatric dental services during the COVID-19 pandemic. This approach was explored as a model that can be used in the future to perform oral health promotion for children.

To determine the effectiveness of using audiovisual videos to improve parental knowledge about dental services during the COVID-19 pandemic as a model for oral health promotion performed at school.

The current study was a randomised controlled trial carried out at kindergarten schools in Setiabudi sub-district, South Jakarta district, Indonesia. The study included 95 parents assigned to one of two intervention groups [audiovisual group (n = 50); visual group (n = 45)]. The participants completed pre- and post-intervention questionnaires, and the resulting scores were analyzed statistically. The proportion of participants who answered the questions as "expected" and "not expected" was compared before and after the intervention.

The post-intervention scores were significantly higher than the pre-intervention scores in both groups (Mann-Whitney Test,  $p < 0.0001$ ); however, the differences in the scores did not vary significantly by group (Mann-Whitney Test,  $p = 0.329$ ). The audiovisual video did significantly increase parental knowledge among non-university and university backgrounds.

Audiovisual videos can be used during school-based online learning to improve parental knowledge of dental services during the COVID-19 pandemic. This approach is promising to deliver oral health promotion to parents in school.

**Clinical article, (J Int Dent Med Res 2023; 16(3): 1141-1146)**

**Keywords:** Audiovisual Videos, Online Learning, Oral Health, Parental Knowledge, School-based.

**Received date:** 04 April 2023

**Accept date:** 18 May 2023

### Introduction

The outbreak of the COVID-19 pandemic in early 2020 proved to be a significant challenge for dental health services globally as aerial

droplets and direct contact were identified as the main routes of coronavirus transmission of the coronavirus affecting the upper respiratory system. To reduce the risk of COVID-19 transmission, dental health services were suspended in many countries including Indonesia, with only provision of urgent and emergency dental care being allowed to continue.<sup>1,2</sup> In March 2020, the Indonesia Dental Association urged dentists to postpone any non-symptomatic, elective, and aesthetic dental treatment procedures. The consequences was an increase in pediatric dental emergency visits for severe pain, swelling, or dental trauma requiring

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complex treatments.<sup>3,4</sup> However, in general, parents preferred to postpone dental visits for their children and only sought treatment in case of severe pain.<sup>5</sup>

To prevent transmission of COVID-19 in the dental setting, emergency dental treatments were carried out in accordance with strict safety protocols including appointment-based dental visits; patient screening; good hand hygiene; use of personal protective equipment among operators (e.g., N95 respirator masks and face shields) and patients (e.g., surgical or cloth mask); decontamination and sanitation of the treatment rooms; disinfection and sterilization of all equipment; and good ventilation of dental offices and treatment rooms using extra-oral air filters (pdgi.org). Furthermore, dissemination of information on the health safety protocols being implemented in dental settings during the COVID-19 pandemic among parents or caregivers was essential in order to ensure that they accessed can obtain dental treatment for their children when necessary.<sup>6</sup>

During this period, the Indonesian government also implemented the “stay at home” policy which included “learning from home” (LFH) and “working from home”(WFH). Kindergarten learning activities were carried out online using conference platforms (e.g., Zoom™, WeBex) and/or Learning Management Systems such as Google Classroom and MS Teams and, as a result, parents, and caregivers played a crucial role in their children’s learning process. This also presented an opportunity to deliver information about dental services during the COVID-19 pandemic to the parents or caregivers. The World Health Organization previously proposed implementation of school-based oral health programs to improve the oral health of children,<sup>7</sup> and a recent Chinese study explored the effects of school-based oral health promotion interventions over a period of two years reported a significant improvement in the oral health status of kindergarten students and an increase in the oral health knowledge of their parents.<sup>8</sup>

The current study aimed to explore the efficacy of school-based online learning techniques in improving parental knowledge on dental services available for kindergarten students during the COVID-19 pandemic. Furthermore, the most effective tools (e.g., visual only: videos including images and written text; audiovisual: videos including images and

narrative audio) for delivering information to the parents of kindergarten students during LFH were also analyzed as the brain is known to respond differently to visual and audiovisual stimuli, with the latter tool activating more brain regions than the former. The efficacy of these tools has also been found to be influenced by the individual’s ability to simultaneously integrate audio and visual information.<sup>9</sup> In the future, oral health education can be provided virtually using the most effective dissemination tools to inform parents about their child’s oral health. These educational tools can also be incorporated in the early childhood education curriculum to reduce the prevalence of oral diseases such as early childhood caries and malocclusion among Indonesian children.

## Materials and methods

This quasi-experimental study used a pre- and post-test design and included 95 parents of pre-school children in a sub-district located in one of five districts in DKI Jakarta, the capital city of Indonesia. The participants were selected using a simple randomized sampling method, and informed consent was collected using a Google form (Google Inc.) prior to commencement of data collection. The participants attended an online meeting (Zoom™) where they were asked to complete an initial test (pre-test), watch relevant learning material (intervention), and then complete another test (post-test) thereafter. The online tests were created using Google forms (Google Inc.). This study was approved by the Ethics Committee of the Faculty of Dentistry, Universitas Indonesia (No. 71/Ethical Approval/FKGUI/XI/2020; Protocol Number: 090801120).

The sample size to detect differences in parental knowledge scores before and after intervention with 90% power and 95% confidence level was calculated. An initial pilot study including 31 voluntary participants with a non-medical background showed that the mean pre-intervention knowledge score was 6.02 (standard deviation:  $\pm 1.2$ ). For achieving at least 1 point improvement due to intervention, we expected mean $\pm$ SD of post-intervention knowledge score was  $7.8 \pm 2.2$ . Therefore, the minimum sample size required to detect a difference in parental knowledge scores was found to be 84.

The study was conducted in several

preschools in the Setiabudi sub-district, South Jakarta district, DKI Jakarta, Indonesia. Initially, 80 preschools located in the selected area were contacted and asked whether they performed distance learning for their pupils during the pandemic. Of these, ten preschools agreed to participate in the study and relevant study information was disseminated to the parents via the school office. After collecting informed consent from the parents interested in participating in the study, an online learning session was scheduled.

The learning material provided in this study included an animated cartoon video using Bahasa Indonesia. The video was started with the story of COVID-19 transmission; continued with signs and symptoms of COVID-19, including the severe stage; the transmission risks in the dental offices; the emergency oral condition of the children health and safety protocols during pre-appointment and at the dental office. It was disseminated both visually (V) and audio-visually (AV), and the key difference between the two methods was that the audiovisual tool also included verbal narration of the captions for each scene. Both videos were 3 minutes and 30 seconds long, and the participants were divided into two groups (V and AV) based on the educational tool used.

Parental knowledge before and after the distance learning session was assessed using seven questions covering the essential information, with each question including four options (one correct answer; two incorrect answers; and one "I do not know"). The web link for the online pre-test was sent to the participants via WhatsApp, text message, or the chat feature in Zoom once they had attended the online meeting and just before the online learning session started. The pre-test took approximately 10 minutes to complete, and the participants then watched the learning material for a duration of 3 minutes and 30 seconds. They were then given a break of about 10 minutes before the web link for the post-test was sent. Both tests used a similar set of questions.

Normally distributed data (assessed using the Kolmogorov-Smirnov test,  $p > 0.05$ ) were analyzed using parametric tests (one-way ANOVA test) and post-hoc analyses, while non-parametric tests (Kruskal-Wallis Wilcoxon signed-rank test and Cochran's Q test) were used for data that were not normally distributed.

The level of statistical significance was set at  $p < 0.05$ .

## Results

A total of 100 parents of the same number of kindergarten students agreed to participate, of which five parents dropped out as they were unable to attend the full learning session due to internet connectivity issues. The final study sample included 95 participants who were randomly divided into the V ( $n = 45$  participants) and AV ( $n = 50$  participants) groups based on the intervention method used, with each participant receiving only one video (either visual or audiovisual). In this study, there were more females participants than males, suggesting mothers were more involved in their children's school activities than the fathers. The participants' age, gender, occupational backgrounds seemed to differ between the twointervention groups. More than half of the participants in both groups reported that they have receiveinformation about the risk of COVID-19 at the dental office (Table 1).

Characteristic	Visual n(%)	Audiovisual n(%)
Age	<25-29	8(17.78)
	30-34	22(48.89)
	35-39	11(24.44)
	40->44	4(8.89)
Gender	Male	4(8.89)
	Female	41(91.11)
Educational Background	Non-University	28(62.22)
	University	17(37.78)
Occupational Background	Employed	32(71.11)
	Non-employed	13(28.89)
Previous information on COVID-19 infection at dental office	Yes	26(57.78)
	Never	19(42.22)

**Table 1.** Demographic characteristic of subjects ( $n=95$ ) divided into visual group ( $n=45$ ) and audiovisual group ( $n=50$ ).

	Pre-Test Median [Min-Max]	Post-Test Median [Min-Max]	p-value	$\Delta$ Median [Min-Max]	p-value
Visual	50.00 [41.67-66.67]	75.00 [66.67-91.67]	<0.001*	14.29 [-42.86-71.43]	0.329
Audiovisual	58.33 [50.00-68.75]	91.67 [75.00-91.67]	<0.001*	28.57 [-28.57-85.71]	

**Table 2.** Parental knowledge before and after intervention using visual and audiovisual educational media.

\*) Mann-Whitney, significance level at  $p < 0.05$ .

In general, parental knowledge on dental services during the pandemic increased significantly after intervention in both groups, as shown in Table 2. However, the difference in

parental knowledge before and after the intervention (i.e., difference between pre- and post-test scores) was not significant statistically between the intervention groups (Mann–Whitney Test,  $p = 0.3286$ ).

Educational Background	Visual		Audiovisual		p-value
	Pre-Test Med [Min-Max]	Post-Test Med [Min-Max]	Pre-Test Med [Min-Max]	Post-Test Med [Min-Max]	
Non-University	57.14 <sup>a</sup> [57.14-71.43]	85.71 <sup>a</sup> [71.43-100.00]	50.00 <sup>b</sup> [28.57-64.28]	85.71 <sup>b</sup> [82.14-100.00]	<0.001*
University	42.86 [42.86-57.14]	71.43 [50.00-71.43]	64.29 <sup>c</sup> [46.43-82.14]	85.71 <sup>c</sup> [71.43-100.00]	

**Table 3.** Parental knowledge before and after intervention using visual and audiovisual educational media based on their educational backgrounds.

\*) Kruskal-Wallis test, significance level at  $p < 0.05$ .

a, b, c) Post-hoc analysis Dunn's Method, significance level at  $p < 0.05$ .

Questions	Answer	Visual (n=45)		p-value	Audiovisual (n=50)		p-value
		Pre-test n(%)	Post-test n(%)		Pre-test n(%)	Post-test n(%)	
COVID-19 transmission risk in dental office	Not Expected	22(24.44)	16(17.78)	0.181	19(19.00)	10(10.00)	0.061
	Expected	23(25.56)	29(32.22)		31(31.00)	40(40.00)	
A potential COVID-19 transmission pathway in dental office	Not Expected	7(7.78)	5(5.56)	0.617	5(5.00)	1(1.00)	0.134
	Expected	38(42.22)	40(44.44)		45(45.00)	49(49.00)	
Effort to minimize the risk of COVID-19 transmission in dental office	Not Expected	6(6.67)	2(2.22)	0.221	12(12.00)	0(0.00)	<0.0001*
	Expected	39(43.33)	43(47.78)		38(38.00)	50(50.00)	
Firstline COVID-19 screening method in dental office	Not Expected	30(33.33)	13(14.44)	0.000*	31(31.00)	7(7.00)	<0.0001*
	Expected	15(16.67)	32(35.56)		19(19.00)	43(43.00)	
Infection control to prevent COVID-19 transmission from patient to the dentist and vice versa during dental treatment	Not Expected	11(12.22)	6(6.67)	0.228	9(9.00)	3(3.00)	0.077
	Expected	34(37.78)	39(43.33)		41(41.00)	47(47.00)	
A reason for longer exchange time between patients during COVID-19 pandemic	Not Expected	37(41.11)	21(23.33)	0.000*	31(31.00)	18(18.00)	0.044*
	Expected	8(8.89)	24(26.67)		19(19.00)	32(32.00)	
It is safe to bring our child to the dental office with strict safety protocol	Not Expected	23(25.56)	11(12.22)	0.014*	32(32.00)	12(12.00)	0.000*
	Expected	22(24.44)	34(37.78)		18(18.00)	38(38.00)	

**Table 4.** Proportion of “Expected” and “Not expected” responses before and after vieweing the visual (n=45) and audiovisual media (n=50).

Comparison by educational background [Non-university (NU) vs University (U)] showed that interventions using visual method significantly increased parental knowledge in the NU group (post-hoc analysis using Dunn's Method,  $p < 0.001$ ), while the audiovisual method had a similar effect in both NU and U groups (post-hoc analysis using Dunn's Method; p-values=0.007 and <0.001, respectively), as shown in Table 3. The increase in parental knowledge did not vary by age, occupation, or

prior information on dental services during the COVID-19 pandemic, irrespective of the intervention method used.

The visual and audiovisual methods used in this study did not significantly improve parental knowledge on COVID-19 transmission pathway and risks, as shown in Table 4. Each question was analyzed (Cochrans' Q test;  $p$ -value <0.05) by comparing the number of respondents per group that selected the “expected” and “not expected” options. In general, the alteration from “not expected” to “expected” responses was statistically significant for items specific to dentistry in both V and AV groups. However, no significant post-intervention reduction in the number of participants selecting unexpected responses to the question focusing on ‘efforts to minimize the risk of COVID-19 transmission in the dental office’ was seen in the V group compared to the AV group (Cochrans' Q test,  $p < 0.0001$ ). The expected answer to this question was to book an online/phone appointment before visiting the dental clinic.

## Discussion

The video created for this study used a narrative story-telling technique that showed a mother and her son who needed dental treatment during the COVID-19 pandemic. Health safety protocols implemented during the pandemic were shown using a narrative approach to enable the parents to imagine themselves in a similar situation and influence their health-related knowledge, attitudes, beliefs, and behaviors.<sup>10</sup> School-based oral health promotion allows us to define the specific conditions for target audiences. In this study, parents of kindergarten students, can be addressed better in the video and may act as a model for the targeted parents. The school-based technique also allows dissemination of information among the students as well as their families and communities.<sup>7</sup>

The length of the video used in this study was found to be adequate for dissemination of information to the parents. A previous study assessed parental opinions on YouTube videos providing information on space maintainers and found a significant correlation between the length of the video and its usefulness.<sup>11</sup> However, a lengthy video may not be effective to engage the parents during online learning. In the current study, the length of the video was selected

considering the parents' activities, availability, and internet connectivity. A previous study reported that 3–4 minutes video was associated with better engagement and retention of information among the audience.<sup>12</sup>

The current study suggested that visual and audiovisual methods significantly increased parental knowledge about dental services during the pandemic. Auditory and visual stimuli from an audiovisual video triggered a multisensory response.<sup>13</sup> However, the efficacy of this method was also influenced by the individual's ability to simultaneously integrate both processes.<sup>14</sup> A more recent study reported there was a stronger connectivity between the auditory and visual cortices of the brain upon dissemination of information using visual-only and audiovisual methods, but not for auditory-only techniques.<sup>9</sup> This theory is consistent with the current study which demonstrated that the change in parental knowledge before and after intervention did not differ significantly between the visual and audiovisual groups. A previous study suggested that the efficacy of leaflets and audiovisuals in improving high school students' knowledge of oral cancer was not significantly different.<sup>15</sup>

Interestingly, we found that the parental knowledge inclined insignificantly in parents given a visual video with the university background, but it was not applied to parents with the non-university background. This suggests that parents with a university education may need to pay more attention to visual videos as it needs to be watched thoroughly to gather all the relevant information presented as images and written text. Whereas, a previous study found that parental knowledge on the use of lower fixed appliances did not vary before and after the intervention using written, verbal, and video-based oral hygiene instructions, irrespective of their educational background.<sup>16</sup>

The visual and audiovisual methods used in this study did not significantly improve parental knowledge of COVID-19 transmission pathway and risks. This could be assumed that the information has already been widely disseminated by the government, non-government institutions, communities, and individuals using electronic, and social media. The current study was conducted six months after the government announced a COVID-19 outbreak in Indonesia, suggesting that the methods used by the government to disseminate

information on COVID-19 transmission pathway and risks were effective. However, there was limited dissemination of information on dental services, particularly those for children, during the pandemic. This study showed a significantly higher number of correct responses to questions relating to dental services during the pandemic in both groups post-intervention (Table 4).

The main limitation of the visual video used in this study was that the information on efforts to minimize the risk of COVID-19 transmission in the dental office could have been performed better using more precise written text and captions. The number of correct responses increased insignificantly for the questions focusing on efforts to minimize the risk of COVID-19 transmission in the dental office. Furthermore, this information was presented through a series of scenes, when the audience was distracted and failed to watch thoroughly, they would miss the vital information. Loss of attention became the weakness of visual method compared with audiovisual method, where the audio can deliver the information without watching the video. Moreover, there was effective connectivity between the auditory and visual cortex in brains, which indicated an increase in functionally coordinated activity between primary sensory regions during the audiovisual speech perception.<sup>9</sup> This suggests that, compared to the visual-only video, the audiovisual method was more effective in improving parental knowledge, regardless of their educational background. Even though the differences of parental knowledge after the intervention using visual and audiovisual videos were not significant statistically.

## Conclusion

Audiovisual video can be used during school-based online learning to improve parental knowledge of dental services during the COVID-19 pandemic. This method is also more effective than the visual-only approach among parents with a university education. Therefore, audiovisual video is promising to deliver oral health promotion to parents at school through online learning.

## Acknowledgment

This research was funded by the Directorate of Research and Development, Universitas Indonesia under Hibah PUTI 2021 (Grant No. BA-926/UN2.RST/PPM.00.03.01/2021).

## Declaration of Interest

The authors report no conflict of interest.

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