Animated Video Media Intervention on Dental Caries Prevention on Students' Knowledge SDN 01 Bandar Buat Padang City

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Abstract

Dental caries is a public health problem with a high prevalence among school-aged children. at SD Negeri 01 Bandar Buat, Padang City, there were 322 cases of dental caries recorded, so an attractive health promotion strategy is needed that is in accordance with the characteristics of the digital generation. To determine the effect of animated video-based health promotion on knowledge of dental caries prevention in fifth-grade students of SD Negeri 01 Bandar Buat, Padang City. This study used a pre-experimental design with a one-group pretest-posttest design. The sample consisted of 86 fifth-grade students selected using purposive sampling. The instrument was a dental caries prevention knowledge questionnaire that had been tested for validity and reliability. Media-based health promotion was carried out once through the screening of a 2–3-minute educational animated video. Data analysis used the Wilcoxon Signed-Rank Test with α=0.05. The average knowledge score increased from 14.38 (median 15) before media-based health promotion to 19.72 (median 20) afterward, with an average increase of 5.34 points or 37.10%. Before the media was provided, 54 students (62.8%) had sufficient knowledge, while after the media was provided, all students (100%) were in the good category. The Wilcoxon test showed a significant difference between the pretest and post-test scores (p<0.001; Z=-8.085). Health promotion based on animated video media not only increased knowledge but also has the potential to encourage student empowerment as peer educators and build collective awareness about dental health in the school environment. Animated video is an effective health promotion media in increasing knowledge of dental caries prevention and has the potential to be integrated into the School Dental Health Program (UKGS) as a relatively cost-effective, easily replicated, and appropriate strategy for the digital generation. These findings can be a basis for local health and education institutions to adopt animated media as an innovation in efforts to prevent dental caries more widely in the school environment.

Keywords: Student Empowerment, Educational Videos, School Children's Oral Health; Media-Based Health Promotion, Knowledge, Dental Caries Prevention.

INTRODUCTION

The burden of dental caries in Indonesia remains a significant public health challenge, particularly among school-age children. Based on data from the 2023 Indonesian Health Survey (SKI), the prevalence of dental caries in children aged 5–9 years reached 84.8%, meaning only about 15.2% of children in that age range were free from cavities. This problem is also reflected at the local level, where the prevalence of dental caries in West Sumatra Province has increased from 43.87% to 48.2%. Untreated dental caries in children not only cause pain, pulp infection,

and premature tooth loss but also disrupt chewing function, reduce nutrition, and disrupt attendance and achievement. Academic performance in school, to the point of damaging children's self-confidence and overall quality of life (Afrinis et al., 2020; Alshehri & Nasim, 2015; Marthinu & Bidjuni, 2020). On the other hand, there is a wide gap in access to accurate and targeted dental health information for children and their families, thus perpetuating the chain of high dental health problems in the community.

The persistence of high dental caries burdens indicates that conventional health promotion interventions have not been able to deliver optimal impact. Current health promotion methods in schools generally rely on one-way lectures and static print media such as posters or leaflets. This approach is considered ineffective and less interactive for children of *the digital native generation* (Pranomo et al., 2020). Furthermore, the School Dental Health Program (UKGS) in many regions is still hampered by limited supporting resources and educational materials (Dewi et al., 2025). This condition is exacerbated by low health literacy among parents, which limits support for children's toothbrushing habits and dietary control at home (Febrianty et al., 2023; Notoatmodjo, 2015). Another fundamental weakness of conventional methods is the inconsistency *of* educational materials with children's cognitive developmental stages. Considering that elementary school-aged children are at the concrete operational stage, conveying information that is too abstract or purely verbal is difficult to digest and apply in everyday life (Bujuri, 2018; Santrock, 2019).

As a solution to the limitations of traditional interventions, the use of animated video media aligns with the principles of health literacy and *edutainment* (a combination of education and entertainment). Animated videos combine moving audio and visual elements that can simplify technical/complex material into engaging, concrete, and easily understood illustrations for children (Koch et al., 2024; Zahra et al., 2023). Through dual-*coding theory*, stimulating simultaneous attention to the senses of hearing and sight has been shown to improve understanding of the material, attract attention/learning motivation, and strengthen children's long-term memory retention (Lestari et al., 2020; Mayer, 2014; Paivio, 1986). This increase in understanding, motivation, and information retention are three key components in individual empowerment (self-*empowerment)* to form an independent awareness of healthy living (Nurjumiati et al., 2024; Putra et al., 2024).

Improving basic knowledge is the main foundation in the self-*empowerment* process. When elementary school students understand the importance of preventing dental caries and are able to practice correct toothbrushing techniques, they are not only passive recipients of health information, but also have the potential to act as agents of change *(Gente* & Adam, 2025;

Theresia et al., 2024). Empowered students can disseminate knowledge and instill healthy habits in their peers at school and with family members at home, thus creating a domino effect in increasing health literacy in the wider community (Purbasari et al., 2023; Rizwan et al., 2024; Smith et al., 2015).

Most previous studies on dental health education for schoolchildren have generally focused solely on measuring short-term knowledge *acquisition without assessing changes in attitude,* intention to share information, or self-care *practices* (Febriani et al., 2021; Wardani et al., 2024). This gap *is* the originality of this study. This study was designed not only to "examine the impact" of animated media interventions on knowledge scores, but also to "assess the potential of animated videos to empower students as agents of healthy behavior change in schools" and their surrounding environments.

The research was conducted at SD Negeri 01 Bandar Buat, Padang City. According to data from the Padang City Health Office, conducted through the Lubuk Kilangan Community Health Center, SD Negeri 01 Bandar Buat recorded a very high incidence of dental caries, with 322 cases among its students. Furthermore, the school still has limited exposure to modern technology-based health education interventions. These characteristics make SD Negeri 01 Bandar Buat a very suitable and ideal environment for testing and evaluating a student empowerment model based on digital animated video media.

METHOD

This research is quantitative research with a pre-experimental design using *a one-group pretest-posttest design.* The research was conducted on fifth-grade students of SD Negeri 01 Bandar Buat, Padang City, in October–November 2025. The research population was all fifth-grade students totaling 109 people, while the sample numbered 86 students, determined using the Slovin formula with a 5% error rate and selected through a *purposive sampling technique.* In the initial research, the inclusion criteria included fifth-grade students who were present, cooperative, and willing to participate in the entire series of research, while the exclusion criteria included students who had received similar interventions in other studies, had hearing or visual impairments or other conditions that hindered the acceptance of audiovisual media, and did not participate in the research until completion.

To control for the possible influence of prior exposure, the inclusion criteria were expanded to require that students had not received dental health education or health promotion with similar material within the past three months. Information regarding exposure history was obtained through screening questions prior to data collection. Students who had previously

participated in educational activities with similar material during the period were not included in the main analysis.

The main variables of the study were animated video-based health promotion as the independent variable and knowledge of dental caries prevention as the dependent variable. A 2–3-minute animated video was developed with material tailored to the characteristics of students aged 10–11 years and included the correct way to brush teeth, frequency and time of brushing, selection of dental care tools and materials, and habits and risk factors related to dental caries. To strengthen the empowerment approach, media development involved input from teachers and/or school health administrators as well as student representatives regarding language, presentation format, and the suitability of the material to school conditions. A dental health expert then validated the video material and content to ensure accuracy. substance and by media experts to assess aspects of appearance, language, readability, audio, visuals, and the suitability of the media to the characteristics of school-age children.

Instrument was a dental caries prevention knowledge questionnaire that had undergone validity and reliability testing. The knowledge questionnaire used the Guttman scoring system and measured toothbrushing method, frequency, time, and toothbrush type. The knowledge category was defined as good if the score was >76%, sufficient if 56–75%, and poor if <55%. In addition to the primary variables, the study was expanded by measuring secondary variables such as self -efficacy in maintaining dental and oral health, intention to invite family members to brush their teeth together, and early indicators of behavioral change. Behavioral indicators in *the posttest included toothbrushing* frequency over the past seven days and use of fluoride toothpaste. These secondary variables were used as early indicators of the possibility of adopting behavior after receiving health promotion and did not replace the primary measurement of knowledge.

The research procedure began with obtaining research permits and ethical approval, followed by coordination with the school. Before data collection, the researcher explained the objectives, procedures, benefits, and rights of participants to parents/guardians and students. Student participation was carried out after obtaining informed consent *from* parents/guardians and verbal approval (assent*)* from students. The research file contained an ethical clearance certificate No. A.082/KEPKFKGUNBRAH/XII/2025, a research permit letter to the Padang City Education Office No. B.311/KM/UNBRAH.2/XII/2025, a research permit letter to SD Negeri 01 Bandar Buat, Padang City No. 421/7DIKBUD.PPMP.01/XII/2025, and an *informed consent form* for respondents. Parental consent and *student assent:* oral data needs to be stated explicitly if it has been obtained during the research process.

In the first stage, all participants who met the criteria filled out a questionnaire. *A pretest* was used to measure prior knowledge. After *the pretest*, students participated in media-based health promotion by showing a 2–3-minute educational animated video using a laptop, projector, and speaker. Following the video, the activity continued with an interactive discussion. The researcher allowed students to ask questions and discuss any material they did not understand. Students were then asked to practice proper toothbrushing techniques based on the material presented in the video. As part of the empowerment approach, students were also encouraged to make a commitment to be "Dental Health Ambassadors," which involves conveying dental health messages to their peers and encouraging healthy dental habits in the school environment. If this commitment was not formally recorded or measured in the original research, this aspect should be reported as an empowerment activity, not as an outcome variable.

After the health promotion activities were completed, *a posttest was conducted* using the same questionnaire to assess changes in knowledge. At this stage, data on self -efficacy, intention to encourage family members to brush together, frequency of brushing during the past week, and use of fluoride toothpaste were also collected. This behavioral data collection was intended to serve as an early indicator of behavioral change and to complement the interpretation of knowledge gains.

Data were analyzed descriptively and analytically. Univariate analysis was used to describe the characteristics of respondents based on age and gender as well as the distribution of knowledge before and after health promotion. The characteristics of respondents in the study consisted of ages 10–11 years and male and female genders. Bivariate analysis was used to determine the differences in knowledge scores before and after health promotion. Based on the results of the normality test in the study, the pretest and posttest data were not normally distributed, so the difference analysis was carried out using *the Wilcoxon Signed-Rank Test* with a significance level of $\alpha = 0.05$.

As a supplementary analysis, changes in knowledge scores were analyzed by gender and baseline knowledge level to identify groups showing the greatest changes. This stratified analysis was used exploratively to provide an overview of target groups that could receive more attention in the school-based dental health empowerment program. Secondary variables, changes in self -efficacy, intentions, and behavioral indicators before and after the program, were analyzed descriptively and, where statistically feasible, using appropriate nonparametric tests. All analyses were conducted at a 5% significance level.

RESULTS

This study was conducted on students at SDN 01 Bandar Buat, with a total of 86 respondents who met the criteria. Data collected in this study included respondent characteristics and a general overview of students' level of knowledge regarding dental caries prevention before and after a dental health education intervention using animated video media.

Respondent Characteristics

Respondent characteristics in this study include age and gender. The frequency distribution of these characteristics is presented in the following table:

Table 1. Frequency Distribution of Students' Ages at SD Negeri 01 Bandar Buat, Padang City

Age	F	%
10 years	23	26.7
11 years old	63	73.3
Total	**86**	**100.0**

Referring to Table 1, of the 86 respondents, the majority were 11 years old (63 (73.3%), and 23 (26.7%) were 10 years old. This shows that the majority of respondents in this study were 11 years old.

Table 2. Frequency Distribution of Gender of Students at SD Negeri 01 Bandar Buat, Padang City

Gender	F	%
Man	44	51.2
Woman	42	48.8
Total	**86**	**100.0**

Referring to Table 2, it can be seen that of the 86 respondents, the majority were male (44 students, 51.2%), and 42 were female (48.8%). This indicates a relatively balanced distribution of respondents by gender.

Univariate Analysis

Univariate analysis was conducted to describe students' knowledge levels regarding dental caries prevention before and after the animated video media intervention. The results of this analysis are presented in a frequency distribution format based on knowledge level categories.

Table 3. Frequency Distribution of Students' Knowledge Level Before Intervention Animated Video Media

Pre-test	F	%
Good	26	30.2
Enough	54	62.8
Not enough	6	7
Total	**86**	**100.0**

Referring to Table 3, it can be seen that of the 86 respondents, the majority of students had an adequate level of knowledge, namely 54 students (62.8%). Students with a good level of knowledge numbered 26 students (30.2%). Students with a poor level of knowledge were the smallest, namely 6 students (7%). These results indicate that before the media intervention, the majority of students still had an adequate level of knowledge.

Table 4. Frequency Distribution of Students' Knowledge Level After Intervention Animated Video Media

Post-test	**F**	**%**
Good	86	100.0
Enough	0	0
Not enough	0	0
Total	**86**	**100.0**

Referring to Table 4, it is known that all 86 students (100%) were in the good category. These results indicate an increase in the level of knowledge of students at SD Negeri 01 Bandar Buat, Padang City, after being given an animated video media intervention.

Normality Test

Before testing is carried out, it is necessary to carry out a normality test on each research variable, as follows:

Table 5. Normality Test

	Group	**Signature.**	**Significant Limits**	**Information**
Knowledge	*Pre-test*	<0.001	0.05	Abnormal
	Post-test	<0.001	0.05	Abnormal

Based on the results of the Kolmogorov-Smirnov normality test, the pretest and posttest significance scores were <0.001 (p <0.05), indicating that the data were not normally distributed. Hypothesis testing was performed using the nonparametric Wilcoxon signed-rank test.

Bivariate Test

The Normality Test distributes data that is not normally distributed, which is then tested using the Wilcoxon test.

Table 6. Wilcoxon test

Test Statistics[a]

	POSTTEST-PRETEST
Z	-8.085[b]
Asymp. Sig. (2-tailed)	<.001

a. Wilcoxon Signed Ranks Test
b. Based on negative ranks.

In this study, statistical tests using the Wilcoxon test on pre- and post-test knowledge obtained a sig. < 0.001 < 0.05. This indicates that providing intervention in the form of animated video media had a significant effect on increasing student knowledge.

DISCUSSION

The results of the study showed that animated video-based health promotion provided a significant increase in knowledge of dental caries prevention among fifth-grade students of SD Negeri 01 Bandar Buat, Padang City. Before being given the media, most students were in the sufficient knowledge category, whereas after being given the animated video, all students were in the good knowledge category. The results of the Wilcoxon test showed a significant difference between knowledge before and after being given the media ($p<0.001$). These findings indicate that audiovisual media can be an effective means of conveying dental health information to school-age children. The results of the study in the file also show that the increase did not only occur in knowledge scores, but there was a change in the distribution of knowledge categories towards the better.

This increase in knowledge can be explained through the perspective of Social Cognitive Theory (SCT). In social cognitive theory, the learning process occurs not only through receiving information, but also through attention, retention, behavioral reproduction, *and* motivation. *Animated videos combine visual elements, sound, narration, and movement to capture students* ' attention and help them retain the information conveyed. When information about toothbrushing techniques, brushing time and frequency, and caries prevention is presented through easy-to-understand visual and audio stimuli, students have a greater opportunity to remember and understand the health messages. This approach is in line with research showing that self -efficacy, family environment, and learning experiences are related to children's dental health behaviors (Cinar et al., 2009; Wang et al., 2025).

This mechanism can also be understood through the Health Belief Model (HBM). The HBM explains that health behavior is influenced by, among other things, perceptions of susceptibility, severity, benefits, barriers, *cues to action,* and self- efficacy. Educational videos can serve as *cues to action* by providing information about the risks of caries and how to prevent it. Increasing knowledge can be the initial stage in forming the perception that dental health needs to be maintained and that simple actions such as proper toothbrushing have benefits in preventing caries. Research by Sanaeinasab et al. (2022) shows that HBM-based education in school-aged children can increase various health belief constructs and improve several indicators of gingival health.

The findings of this study are consistent with several previous studies on the use of audiovisual media in dental health education. Dali et al.'s (2019) study used *a one-group pretest- posttest design* and reported an increase in dental health knowledge after using animated videos in elementary school students. Nurhamidah et al.'s (2024) study also showed

that education using animated videos on how to brush teeth was associated with an increase in knowledge and attitudes in elementary school students. Afdilla and Jelita (2024) found significant changes in dental health knowledge and toothbrushing skills after education using animated videos in elementary school students in Kendari. Putri et al.'s study also reported that using animated videos for dental caries material can improve elementary school children's knowledge. Furthermore, a recent study by Panjaitan et al. showed an increase in knowledge categories after dental health education using intelligence- based animated videos. artificial in elementary school students, with a statistically significant difference ($p<0.001$).

The similarity of these results reinforces the hypothesis that the characteristics of animated videos are suited to the learning needs of school-age children. The combination of moving images, sound, and narration allows abstract information about the process of caries and preventive measures to be translated into more concrete messages. In this study, the videos also included material on tooth- brushing techniques, brushing duration, habits that can cause caries, and other preventive aspects, so that the messages conveyed not only consist of disease definitions but also practical information about preventive measures.

Although student empowerment was not directly measured in this study, significantly increased knowledge can be seen as a prerequisite for enhancing students' ability to make decisions and take actions related to their oral health. Improved knowledge enables students to recognize risky behaviors and understand preventive measures they can take independently. This perspective aligns with SCT, which positions *self-efficacy,* learning experiences, and social environment as factors related to children's dental health behaviors (Wang et al., 2025).

In the context of empowerment, students are not only positioned as recipients of information but also have the potential to become agents of change in their immediate environment. Students who understand how to maintain dental health can convey this information to parents, siblings, and peers. Thus, knowledge gained in school has the potential to undergo a transfer process from the school environment to the family and community environment. The relationship between the family environment, learning experiences, and self -efficacy with dental health behavior supports the importance of expanding health education from students to their social environment (Cinar et al., 2009; Wang et al., 2025).

This aspect is important because most previous research on animated videos has focused on changes in knowledge, attitudes, toothbrushing skills, or oral hygiene indicators. Approaches that intentionally combine animated media with empowerment strategies, such as reflective discussions, peer leader formation, declarations of dental health commitment, or student-led health projects, are still relatively limited in the literature used in this discussion.

Research that combines animated videos, oral hygiene practices, and oral hygiene practices with empowerment strategies, such as reflective discussions, peer leader formation, declarations of dental health commitment, or student-led health projects, is still relatively limited in the literature used in this discussion. brushing teeth, and the formation of *Little Dentists* show a more participatory direction of development because students not only receive information, but are also given a role in dental health activities (Angelia et al., 2026).

In terms of implementation, the relatively short duration of the video is a relevant characteristic for school-age children. Delivering messages through a combination of visuals and audio in a short time can help maintain students' attention and reduce the burden *of* delivering lengthy material. However, improvements found immediately after the intervention do not necessarily indicate that these changes in knowledge will be sustained long-term. Therefore, providing regular booster sessions can be considered to maintain health messages, particularly regarding toothbrushing frequency and technique. Research using HBM-based health education with several weekly sessions and follow-up evaluations demonstrates the importance of repeated education when the research objectives include changes in behavior and oral health conditions (Sanaeinasab et al., 2022).

Animated videos also have the potential to be developed not only as research intervention media but also as health education modules that can be used by teachers and health unit volunteers. After teachers or volunteers receive simple training on video use and key messages to emphasize, the media can be reused in health unit programs or routine health education. This approach can increase program sustainability because schools have a media resource that can be used independently and does not always depend on visits from health workers from the community health center. Research findings regarding the involvement of the school and family environment in dental health education support the importance of a social environment that supports the maintenance of healthy behaviors (Wang et al., 2025).

The research results need to be interpreted with design limitations in mind. The study used *a one-group pretest- posttest design* without a control group. This design allows researchers to compare conditions before and after the video presentation, but it cannot confirm that all observed changes are solely due to the animation media. Other factors such as student maturation, learning experiences at school, exposure to information from outside the study, or *the Hawthorne effect* may also influence the results. student responses. Therefore, causal relationships need to be interpreted with caution. Future research could use a quasi - experimental design with a control group, such as a group receiving health education using standard methods, so that changes can be compared between groups.

In addition to limited control over external factors, measurements taken immediately after an intervention often reflect short-term effects on knowledge. Increased knowledge does not necessarily automatically result in behavioral changes or decreased caries incidence. This is important because HBM-based research in children has shown that changes in constructs Psychological and behavioral changes can occur after education, but changes in clinical indicators require longer follow-up (Sanaeinasab et al., 2022). Therefore, further research should include measurements of toothbrushing behavior, fluoride toothpaste use, cariogenic food consumption, self -efficacy, and caries status over a longer follow-up period.

The results of this study support the use of animated videos as a health promotion medium to increase knowledge of dental caries prevention among schoolchildren. Future program development should shift from a solely knowledge-based approach to a more comprehensive empowerment approach. Videos can be combined with parent training sessions, discussions with teachers and school health workers, the formation of peer groups or *Dental Health Ambassadors,* and hands-on practice. Toothbrushing, regular reinforcement sessions, and long-term monitoring of caries status. This way, students not only gain information but also have the opportunity to build self -efficacy, practice skills, share health messages with family and peers, and participate in creating a school environment that supports dental health.

CONCLUSION

Animated video media significantly increased students' knowledge about dental caries prevention, as indicated by the Wilcoxon test results with a p value <0.001. After the intervention, all students (100%) achieved a good knowledge category, compared to the condition before the intervention which was still dominated by the sufficient knowledge category. The animated video intervention not only serves as a medium for conveying information, but also lays the foundation for the development of student independence in maintaining oral health as well as the potential for students to disseminate the knowledge gained to their families and surrounding communities. Thus, audiovisual media-based dental health education can be an approach that supports student empowerment in efforts to prevent dental caries.

The Departments of Education and Health are advised to consider adopting animated educational videos as part of the School Dental Health Program (UKGS) materials, along with training for teachers to facilitate discussions and reinforce health messages after the videos. This use of media is expected to support sustainability. dental health education in the school

environment. The research file itself recommends Integration of animated video media into the UKGS program as an alternative educational media for elementary school students.

Further research is recommended to not only measure changes in knowledge, but also assess practices. actual dental health maintenance, dissemination of information to families, use of fluoride toothpaste, frequency of toothbrushing, or changes in the index Dental plaque. These measurements are needed to more objectively assess the impact of interventions on empowerment and changes in oral health behavior. Appropriate technology-based health promotion, such as animated videos, can be a relatively simple investment in health education with the potential to have a broader impact in shaping a generation with greater awareness, knowledge, and independence in maintaining oral health.

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