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DIFFERENCES IN PLAQUE INDEX AND NUMBER OF BACTERIAL COLONIES OF ORAL CAVITY BEFORE AND AFTER BEING EDUCATED WITH MODEL STUDY AND VIDEO

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ABSTRACT

Background: Based on the results of Riskesdas in 2018, the 10-14 years old group had a prevalence of daily brushing behavior of 96.5%. However, only 2,1% brush their teeth correctly. The ability of brushing teeth can be improved by providing an oral health education. **Aim:** Was determined the differences of plaque index scores and the number of bacterial colonies growing in oral cavity before and after being educated using study model and video. **Methods:** This study was a *true-experimental* research with *pre-test* and *post-test* study design with a subject of 20 students. The students devided into 2 groups, 10 students with study model and 10 students with video. The results of plaque index scores and the number of bacterial colonies were taken before and after the students being educated. This study used the Paired T Test and Wilxocon statistical tests. **Results:** There were significant differences of plaque index scores and the number of bacterial colonies growing in oral cavity before and after being educated using study model and video. ($p < 0,05$). **Conclusion:** An oral health education using study model and video were able to decrease plaque index scores and the number of bacterial colonies growing in oral cavity. The video method was more effective than the study model.

Keywords: *plaque, bacterial colonies, health education, study model, video*

INTRODUCTION

The results of the Basic Health Research (Riskesdas) in 2013 showed that the prevalence of dental and oral health problems that occurred in children aged 10-14 years was found to be 25.2%.[1] Whereas in the 2018 Riskesdas results there was an increase in the prevalence of oral and dental problems at that age, which was 55.6%.[2] This shows that the prevalence of dental and oral health problems has increased quite significantly within 5 years.[1,2]

One of the most common dental and oral health problems is dental caries. The incidence of dental caries in Indonesia is still quite high, with a prevalence of 88.8%.[2] The high incidence of caries in elementary school children is thought to occur due to changes in dietary habits, oral cavity hygiene, tooth structure, and salivary composition.[3] Dental caries is a complex and multifactorial disease caused by pathogenic factors and can cause tooth decay.[4] Caries is characterized by demineralization of tooth hard tissue, but this process is preceded by the presence of biofilm bacteria (dental plaque) covering the tooth surface.[5]

In the human oral cavity, there are various microorganisms in regular numbers, which are called normal flora. The existence of normal flora has a vital role in the body's defense because it can produce substances that inhibit the growth of other microorganisms.[6] According to the theory, if the number of microorganisms exceeds the standard limit and the relationship between the host, agent, and the environment is disturbed, the normal flora can turn into pathogens.[6,7] This can occur if the environment in the oral cavity changes in one of the predisposing factors, namely oral cavity hygiene.[7] Several dental and oral health problems that can occur due to poor oral cavity hygiene are dental plaque, dental caries, periodontal disease and focal infections.[8,9]

One way to improve the hygiene status of the oral cavity is to make efforts to maintain health through counseling. Efforts to maintain dental and oral health should be made from an early age. Primary school age is an ideal time because this age is the beginning of the development of permanent teeth and is a high-risk group for caries and mucosal disorders.[10]

Based on the results of Riskesdas in 2018, the age group 10-14 years has a prevalence of daily brushing behavior of 96.5%. However, only 2.1% brushed their teeth at the right time.[2] The ability to

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brush teeth properly can be an important factor for maintaining dental and oral health. The ability to brush teeth can be improved by providing dental and oral health education. Education on how to brush teeth for primary school children should be made as attractive as possible, such as through attractive education, live demonstrations, audio-visual programs, or through controlled mass toothbrushes.[11]

In addition to attractive education methods, the use of assistive devices in changing children's behavior is crucial. Educational assistive devices are tools used by educators to deliver educational materials. This tool is more often called a model study because this tool serves to help demonstrate something in the educational process. The existence of various model study as media for counseling such as modeling and videos can be used as a means of conveying information messages to children so that they are easy to understand.[12]

Grade V students have an age range of 10-12 years. This age is an effective age to provide information that leads to the cognitive and motor development of children.[13] At the age of 10-12 years, children can understand and explain material and can brush their teeth systematically when compared to the age group below.[14]

Based on the above background, the researcher wanted to know the effect of providing education on dental and oral health with model study and videos to children aged 10-12 years on changes in plaque index and the total number of oral cavity bacterial colonies. This research will be conducted at SD Negeri Bulusan, Tembalang, because, based on a preliminary study, it is known that dental health education in this school lacks because UKGS is not active.

METHODS

This research is true experimental research with pre-test and post-test design by observing the experimental group before and after being given the treatment. The research subjects were female students in grade V (aged 10-12 years). The inclusion criteria of this study were willing to participate in the study, having a DMF-T/def-T index of at least 2, not wearing orthodontic appliances and criteria for the teeth is good-mildly congested teeth.

The selection of research subjects was carried out using the simple random sampling method. Based on the sample size formula, a minimum of 10 samples were obtained in each group. Data were collected by measuring the plaque index and the total number of oral cavity bacterial colonies before and after being given education using model study and videos.

The independent variable of this study was an education about teeth and oral health with model study and videos, and the dependent variable of this study was the plaque index and the total number of oral cavity bacterial colonies.

In this study, the data normality test was carried out using the Shapiro-Wilk test. The difference in plaque index before and after giving education was normally distributed, so the paired T-test was then performed. Whereas the difference in the total number of oral cavity bacterial colonies before and after the education was distributed was not normally distributed, so the non-parametric Wilxocon test was then performed.

RESULTS

In this study, the research subjects were female students who were in grade V SD Negeri 1 Bulusan Tembalang with an age range of 10-12 years with a total number of subjects was 20 students.

Table 1. *DMF-T* Index Overview on Subjects

Category	*DMF-T* Index	Total (n)
Very Low	0 – 1,1	0
Low	1,2 – 2,6	10
Medium	2,7 – 4,4	5
High	4,5 – 6,5	4
Very High	>6,6	1
Total		20

Based on table 1 regarding the description of the DMF-T index in research subjects, it was found that the DMF-T index was 0 subject in the very low category, 10 subjects in the low category, 5 subjects in the medium category, 4 subjects in the high category and 1 subject in the very high category.

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Table 2. Plaque Index Examination Results

Category	Plaque Index	Model Study		Video	
		Pre-test	*Post-test*	*Pre-test*	*Post-test*
Good	0 – 20%	8	10	7	10
Moderate	21 –40%	2	0	3	0
Poor	41 –60%	0	0	0	0
Very Poor	>60%	0	0	0	0
Total		10	10	10	10

Based on table 2 regarding the results of examining the plaque index in research subjects, it was found that the plaque index of the subjects at the time before being given education with model study there were 8 subjects in the good categories and 2 subjects in the moderate categories. While the plaque index in the subjects before being given education with video, there were 7 subjects in the good categories and 3 subjects in the moderate categories. Then, after being given education both with model study and video, the results showed that the plaque index on all subjects changed to a good category.

Table 3. The Number of Bacterial Colonies Examination Results

No.	Model Study		Video	
	Pre-test (×10^5 CFUs/ml)	*Post-test* (×10^5 CFUs/ml)	*Pre-test* (×105 CFUs/ml)	*Post-test* (×105 CFUs/ml)
1.	A	A”	K	K”
2.	B	B”	L	L”
3.	C	C”	M	M”
4.	D	D”	N	N”
5.	E	E”	O	O”
6.	F	F”	P	P”
7.	G	G”	Q	Q”
8.	H	H”	R	R”
9.	I	I”	S	S”
10.	J	J”	T	T”
Average	444,44	104,4	562,6	131

Based on table 3 regarding the examining results of the number of bacterial colonies in research subjects, it was found that the average number of bacterial colonies before being given education with the model study was 444.44, while the average number of bacterial colonies after being given education was 104, 4. The average number of bacterial colonies before being given education by video was 562.6, while the average number of bacterial colonies after being given education was 131. It can be seen that there are significant differences before and after education. The difference in the average number of bacterial colonies in the model study method was reduced by 340,04, while in the video method, it was reduced by 431,6. Therefore, it can be said that the counseling method using video is more effective in reducing the number of bacterial colonies that cause dental plaque compared to the counseling method using the model study.

The results of the descriptive analysis regarding the plaque index and the number of bacterial colonies obtained the mean, standard deviation, median, maximum and minimum values, which can be seen in table 4.

Table 4. Descriptive Analysis Results

Group		*Mean* ± SD	Median (Min-Max)
Plaque Index Study Model	*Pre-test*	11,9 ± 6,0	11,15 (3,57-21,42)
	Post-test	6,88 ± 2,9	7,1 (3,0 – 12,5)
Plaque Index Video	*Pre-test*	13,12 ± 7,4	12,0 (1,78 – 23,21)
	Post-test	7,2 ± 3,9	7,5 (0 – 14,28)
Bacterial Colonies Model Study	*Pre-test*	$4\times10^7 \pm 2{,}2\times10^7$	5×10^7 ($9{,}2\times10^5$ – $5{,}8\times10^7$)
	Post-test	$10^7 \pm 5{,}7\times10^6$	$8{,}8\times10^6$ ($5{,}6\times10^6$ – $2{,}36\times10^7$)
Bacterial Colonies Video	*Pre-test*	$5{,}6\times10^7 \pm 2{,}8\times10^6$	$5{,}7\times10^7$ ($4{,}96\times10^7$ – $5{,}92\times10^7$)
	Post-test	$1{,}3\times10^7 \pm 1{,}2\times10^7$	$9{,}3\times10^6$ (10^6 – $3{,}56\times10^7$)

The measurement results of the plaque index score and the number of oral cavity bacterial colonies were analyzed, and the Shapiro-Wilk normality test was performed to determine the distribution of the data.

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Table 5. *Shapiro-Wilk* Normality Test Results

Group		Sig.
Model Study	*Pre-test*	0.427*
	Post-test	0.662*
Video	*Pre-test*	0.406*
	Post-test	0.913*

Note: * there is a significant result (p > 0,05)

Based on the normality test in Table 5, it was found that the plaque index score in the model study and video groups was normally distributed with a significance of p > 0.05. The data analysis was continued with the parametric test, namely the paired T-test. A paired T-test was performed to compare the initial plaque index score with the plaque index final score in each group.

Table 6. Paired T-Test Results

Group		Sig. (2-tailed)
Model Study	*Pretest-Posttest*	0.012*
Video	*Pretest-Posttest*	0.004*

Note: * there is a significant result (p < 0,05)

Based on Table 6, it can be seen that there is a significant difference between the initial and final scores of the plaque index in the model study and video groups with p < 0,05.

Table 7. *Shapiro-Wilk* Normality Test Results

Group		Sig.
Model Study	*Pre-test*	0.008
	Post-test	0.025
Video	*Pre-test*	0.054
	Post-test	0.013

Based on the normality test in table 7, it was found that the number of bacterial colonies in the model study and video groups was not normally distributed with a significance of p < 0,05. Data analysis was continued with the Wilcoxon non-parametric test.

Table 8. Wilcoxon Non-Parametric Test Results

Group		Sig. (2-tailed)
Model Study	*Pretest-Posttest*	0.028*
Video	*Pretest-Posttest*	0.005*

Note: * there is a significant result (p < 0,05)

Based on table 8, it can be seen that there is a significant difference in the number of initial and final bacterial colonies in the model study and video groups with p < 0,05.

DISCUSSION

In this study, it was found that there was a significant difference between the results of the plaque index after education using model study and video. The difference in plaque index was due to the provision of counseling in the right way and time to brush teeth to the study subjects. The provision of education led to changes in behavior regarding how and when to brush teeth that were previously less precise.

In this study, two counseling methods were used in different groups, that is model study and video. Model studies are educational aids that serve to help demonstrate something in the educational process. These model studies are structured on the principle that the knowledge that each child has can be received or captured through the five senses.[15] Model study have the advantage that the subject can try the procedures that have been taught on their own so that two-way communication occurs and the reception of information is maximized.[5]

Video is an audio-visual media that can display motion. The messages presented can be informative, educational, or instructional.[5] The video used in this research is an animated video entitled "Kalahkan Monster Makanan dengan Gosok Gigi". The video was used based on previous research conducted by Gigih Putriani in 2016.[16]

Based on the research results, there are differences in the results between the model study method and the video method. The counseling method using video was more effective in reducing the number of bacterial colonies that cause dental plaque compared to the counseling method using the model study. This can be seen from the difference in the average number of bacterial colonies in each study group. According to previous research, about 75-87% of human knowledge is obtained or transmitted through the eye, and the rest is channeled through other senses so that the use of video as a medium of education can facilitate information reception.[17] Another study conducted by Reny Dwy Rahayu stated that videos containing cartoons could help improve children's cognitive

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development seen from the test scores before and after being given the video. The video method can increase children's knowledge because it can increase children's motivation, interests, and actions when counseling takes place.[13]

The subject well accepted the model study and video methods that contained the correct way of brushing teeth. This is consistent with the research conducted by Mey Linda and Anurakul et al. that the demonstration method and video have an effect in reducing the plaque index after being given counseling with video media and illustrated books.[18,19]

Piaget said that the cognitive development stage of children aged 9-12 years had entered a concrete operational stage. At this stage, children can do logical reasoning, can classify things, and have started to think about experiences outside of their concrete experiences and think about them more abstractly, idealistically, and logically.[13] The development of the cognitive aspects of children shows that the learning process they receive through education on how to brush their teeth with the model study and videos can be well received by children so that they can increase their knowledge of brushing their teeth.

Increased knowledge of children to brush their teeth properly can affect the plaque index score because brushing is the mechanical plaque removal method and is the most effective way to reduce plaque accumulation.[20] This is reinforced by the results of the calculation number of colonies between before and after being given education with model study or videos. In this study, the results showed that the number of bacterial colonies in the model study and video methods decreased after being given an education. The number of bacterial colonies in subjects who were educated using video had fewer results than subjects who were educated using the model study. The decrease in the number of bacterial colonies can be caused by brushing the teeth, the pellicles formed and food scraps can be cleaned so that the buildup of bacteria can also decrease.[21] Bacteria will first adhere to the pellicle, and then after a few hours, bacterial colonization will form. This bacterial colonization within a few days will grow and develop if not cleaned with brushing the teeth.[22] The success of tooth brushing in removing food debris and plaque is influenced by the type of toothbrush and the efficiency of the brushing, such as the individual's skills, motivation and the quantity of direction given during education.[21]

The limitation in this study is that long-term behavioral monitoring has not been carried out on research subjects, so it is necessary to conduct further research by conducting post-tests within a specified period (days to weeks) after counseling to ensure that subjects still remember the educational material provided and are consistent in practice it.

CONCLUSION AND SUGGESTIONS

Conclusion

Based on research on the differences in plaque index and total colony count of oral cavity bacteria after education with model study and video, the following conclusions were obtained:

1. There is a significant difference in the plaque index score and the total colony count of oral cavity bacteria after education with model study and video.
2. Providing education using video media has a more effective result in reducing the number of bacterial colonies that cause dental plaque compared to the model study media.

Suggestions

In this study, it is known that providing education with model study and videos can reduce the plaque index score and the total number of oral cavity bacterial colonies. However, in this study, long-term behavioral monitoring has not been carried out in research subjects. Hence, further research needs to be carried out by conducting post-tests within a specified period (days to weeks) after counseling to ensure that subjects still remember the educational material provided and are consistent in practice.

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