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PROMOTION OF DENTAL AND ORAL HEALTH THROUGH THE GIGIKU SEHAT APPLICATION AND HEALTHY DENTAL GYMNASTICS WITH TEACHER ASSISTANCE ON TEETH CLEANING ACTIONS TO PREVENT CARIES IN CHILDREN AGED 10-13 YEARS

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Abstract

BACKGROUND: Caries is one of the chronic diseases experienced by 2.4 billion or 36% of the world's population. Globally, school children who experience caries account for 60%-90% due to lack of health promotion. Mobile mobile is one of the health promotions that can improve the degree of public health.

AIM: Knowing the effect of the application of healthy teeth and healthy dental gymnastics with teacher assistance on the act of cleaning teeth to prevent caries in children aged 10-13 years.

METHOD: The study was conducted at Makassar City Elementary School, South Sulawesi in September 2022 - March 2023. The type of research is a mixed method with two stages of research, stage 1 making healthy dental applications with qualitative methods and stage 2 educational model intervention for 3 (three) months with quasi-experimental methods with the design of the non randomized pretest postest control group design. The number of samples were students of SD Hang Tuah 64 people, SDN Ujung Tanah 54 people and SDN Cambaya 49 people. The research group was divided into 3 (three) with teacher assistance, namely First is SD Hang Tuah with a combination intervention of healthy dental application and healthy dental gymnastics. The second is SDN Ujung Tanah with the intervention of my healthy teeth application. The third is SDN Cambaya with healthy dental gymnastics intervention.

RESULTS: The level of oral hygiene at SD Hang Tuah was significantly different before and after the intervention, while at SDN Ujung Tanah and SDN Cambaya there was no significant difference but there was a difference in mean value. The DMFT scores in the three schools have significant differences, especially the mean value in the Filling aspect has increased which is an indicator of increased awareness to treat caries.

CONCLUSION: The effect of dental health education with the application of healthy teeth and / or healthy dental gymnastics with teacher assistance statistically had a significant effect on SD Hang Tuah, while SDN Ujung Tanah and SDN Cambaya did not have a significant effect but there was a difference in mean values on improving oral hygiene. The DMFT value before and after the intervention statistically has a significant effect, especially in the Filling aspect, there is an increase in the mean value which is an indicator of increased awareness to treat caries.

Keywords: Caries, oral health promotion, oral health behavior

INTRODUCTION

Caries is one type of chronic disease experienced by residents around the world. The disease occurs in the crown and root of the tooth, most often affects in early childhood. The risk of caries consists of physical, biological, environmental, poverty, behavioral, low salivary flow and poor oral hygiene (1,2).

Sugar is everything that is consumed both naturally and added to foods such as chocolate, syrup and so on. The term *sugar-free* food, according to the WHO is a sweet food or drink that is

not due to added sugar such as honey, fruit juice and natural syrup. Today's modern-day processed foods have the potential to cause caries. Eating foods that are low in sugar, will have a very low rate of caries. Caries is a disease mediated by food and acid-producing bacteria and other factors (3). The decrease in pH in dental plaque is caused by carbohydrate intake that takes a long time to return to normal pH. WHO has recommended reducing sugar consumption from 10% to 5% in 2014 to curb the prevalence of caries (4).

The prevalence of caries differs around the world, as in low-income countries there is an increase in caries due to the influence of consuming foods or drinks with high sugar content, in contrast to high-income countries occurs otherwise due to the influence of the use of fluoride as a prevention program. Such programs can be adopted by low-income countries to reduce caries with the effective and affordable use of fluoride toothpaste. It should be noted that the prevalence of caries in children with low socioeconomic family status is still high(5,6).

Western European countries and the United States have decreased the prevalence of caries by 90% in children aged 12 years as reported by the WHO in the first decade of this century. The decrease occurred due to the effect of using fluoride toothpaste which is quite effective, but caries still occurs in children around the world reaching 60-90%. The prevalence of caries is no longer prevalent in children in high- and middle-income countries, but still occurs in adulthood and old age (5,6).

The prevalence of caries in Indonesia according to Basic Health Research Data (RISKESDAS) in 2007 and 2013 increased from 23.2% to 25.9% (7). In 2018 the prevalence of caries reached 57.6%, the prevalence rate of caries in children aged 5-9 years reached 92.6% while children aged 10-14 years reached 73.4% (8,9).

Health behavioral factors such as eating habits can affect children's oral health so that oral health promotion through lectures and demonstrations with the help of teaching aids is a form of effort in providing knowledge about dental and oral health (10). Behavior change efforts can be made through oral health promotion. Therefore, early oral health promotion interventions are needed by providing understanding and motivation to maintain oral health through regular brushing and flossing activities (10,11).

The use of mobile cellular as a promotional medium for dental health that can improve public health was carried out by Alqarni et al (2018) with the intervention method of mobile cellular-based applications, showing that the promotion method is effective for increasing oral health knowledge in children through increasing parental knowledge after using mobile-based applications (12).

Research conducted by Berniyanti et al (2019) with intervention methods through the use of the WhatsApp application, shows that the number of visits by elementary school students to dental health service facilities has increased (13). Another study conducted by Zolfaghari et al (2021) with intervention methods through smartphone applications, shows that oral health promotion methods through smartphone applications are effective in increasing knowledge and behavior in maintaining oral health in early childhood parents (mothers) (14).

Teachers are people who can play a role in promoting oral health to elementary school students, because these students are obedient and trust their teachers very much. Teachers have a role in developing various activities related to oral health promotion through activities in the Dental and Oral Health Business Unit (UKGS) in schools (15).

METHOD

This research is a mix method research which is divided into 2 (two) stages, namely phase I research on making dental and oral health education models for healthy teeth *applications* with skin research and phase II is a trial stage for the combination of healthy *teeth application models with* healthy dental gymnastics *and the evaluation is* quasi-experimental research *with* research designs are*:The Non Randomized Pretest Postest Control Group Design.*

The research subject is human and has obtained a research permit from the Ethics Committee with letter number 10970/UN4.14.1/TP.01.02/2022, dated September 20, 2022. The study was conducted at Makassar City Elementary School, South Sulawesi in September 2022 - March 2023. The duration of the educational model intervention with teacher assistance is 3 (three) months.

The research group was divided into 3 (three) intervention groups in this case represented by each school, namely the first group was SD Hang Tuah with intervention in the form of a combination of *healthy dental applications* and *healthy dental gymnastics*. The second group is SDN Ujung Tanah with the intervention *of my healthy teeth application.* The third group is SDN Cambaya with *healthy dental gymnastics intervention.*

The study population was all students aged 10-13 years (grades 4, 5 and 6) in selected elementary schools located in Ujung Tanah District, Makassar City with a total of 502 people with details of 170 students of SD Hang Tuah, 186 students of SDN Ujung Tanah and 146 students of SDN Cambaya. The number of samples in this study was 167 people who were selected based on inclusion and exclusion criteria.

RESULT

1. The results of the trial application of my teeth are healthy

The trial of the application of healthy teeth was carried out on students where two school locations were carried out, namely SD Hang Tuah and SDN Ujung Tanah. The trial was carried out by providing a website address https://gigikubersihdansehat.com then distributing a questionnaire to assess the application of My Healthy Teeth.

The results of the trial assessment *of the application of healthy teeth* conducted on 23 students of SD Hang Tuah who were randomly selected from the research sample. All respondents answered the dental *healthy application* assessment questionnaire which mostly rated in the GOOD category with a mean value of 69.5% in the aspect of content quality, 76.5 in the aspect of display quality, 76% in the aspect of usability, 76% in the aspect of integration, 75.9% in the aspect of balance, 78.3 in the aspect of form and 63% in the aspect of language.

The results of the trial assessment of the *application of healthy teeth* were carried out on 31 students of SDN Ujung Tanah who were randomly selected from the research sample. All respondents answered the healthy *teeth application assessment* questionnaire which mostly rated in the VERY GOOD category with a mean value of 53.7% in the aspect of content quality, 60.6% in the aspect of display quality, 74.1% in the aspect of usability, 66.1% in the aspect of integration, 64.5% in the aspect of balance, 70.9% in the aspect of form and 67.7% in the aspect of language.

2. Results of educational model interventions

a. Differences in oral hygiene levels before and after intervention in each school.

The results of statistical tests with *the Kruskal Wallis test* showed that in the three schools there was no significant difference in the level of oral hygiene before the intervention but there was a significant difference after the intervention. The difference in the mean value of oral hygiene aspects at SD Hang Tuah decreased after the intervention by -0.084 with a value of p = 0.030. Then at SD Ujung Tanah there was an increase in the mean value of +0.010 with a value of p = 0.992, while at SD Cambaya there was an increase in the mean value of +0.050 with a value of p = 0.427.

Table 1 shows that oral hygiene status with good category in Hang Tuah Elementary School students before intervention 51.6% and after intervention 54.7% included in good category. Good oral hygiene status in SDN Ujung Tanah students before the intervention was 33.3% and after the intervention was 51.9%. The oral hygiene status of the good category in students of SDN Cambaya before the intervention was 44.9% and after the intervention 57.1% was included in the good category. From these results, it can be concluded that SD Hang Tuah has decreased the mean value, which means that the level of oral hygiene has increased. SD Ujung Tanah and SD Cambaya experienced an increase in the mean value, which means a decrease in the level of oral hygiene.

Table 1. Differences in oral hygiene levels before and after intervention in each school.

OHI-S status	SD Hang Tuah		SD Ujung Tanah		SD Cambaya		Pvalue(2)	
	Pre-test (%)	Post-test (%)	Pre-test (%)	Post-test (%)	Pre-test (%)	Post-test (%)	Pre-test	Post-test
Good Middle Bad	51,6 46,9 1,5	54,7 45,3 0	33,3 62,9 3,8	51,9 48,1 0	44,9 53,1 2,0	57,1 42,9 0		
Mean	1,272	1,188	1,609	1,619	1,389	1,439	0,159	0,017
Δ Mean	-0,084		+0.010		+0.050			
Pvalue (1)	0,030		0,992		0,427			

P-value (1): pre-post difference test for each group (in pairs)

P-value (2): difference test between groups (unpaired)

b. Differences in DMFT scores before and after getting interventions in each school

Table 2 shows that the mean value of DMF-T (decay, missing, filling teeth*) of Hang Tuah Elementary School students before the intervention was 5.15 which was included in the high category with* the DMF-T value dominated by Decayed (D) which was 4.95, while the lowest *Filling* (F) was 0.02, then the mean value of DMF-T after intervention was 7.23 (very high) dominated by Decayed 6.01 while *Missing* as low as 0.61. DMF-T scores in Hang Tuah Elementary School students before the intervention were higher than after the intervention of +2.08 with a p value = 0.000. At SDN Ujung Tanah before the intervention was 7.25 which was included in the very high category with the DMF-T value dominated by Decayed *(D) which was 6.57*, while the *lowest Filling (F) was only 0.02, then the mean value of DMF-T after intervention was 7.81 (very high) dominated by* Decayed *6.50 while Filling* 0.50. DMF-T scores in SDN Ujung Tanah students before the intervention were higher than after the intervention +0.56 with p values = 0.000. At SDN Cambaya before the intervention was 7.26 which was included in the very high category with the DMF-T value dominated by Decayed (D) which was 6.55, while Filling (F) was *the lowest at 0.00 then the mean DMF-T after intervention was 7.51 (very high) dominated by* Decayed *6.33 while* Filling The lowest is 0.39. DMF-T scores in SDN Ujung Tanah students before the intervention were higher than after the intervention of +0.25 with a p value = 0.013.

From these results, it can be concluded that SD Hang Tuah experienced the highest increase in the mean value in the Filling aspect, which means that there is an increase in awareness to treat caries. In SD Cambaya, the lowest increase in the mean *filling* value means that there is an increase in awareness to treat the lowest caries. From these results, it can also be concluded that SD Hang Tuah has the highest DMFT value, while the lowest is SDN Cambaya.

In the difference test between groups in the three schools before the intervention, the normality test results were abnormal, so the *Kruskal Wallis test was carried out* with a value of 0.001 ($p<0.05$). From these results it can be concluded that the difference in DMFT values before the intervention is significant. The difference in DMFT scores of the three schools after the intervention, the normality test results were abnormal, so *the Kruskal Wallis test was carried out* with a value of 0.656 (p value>0.05). From these results it can be concluded that the difference in DMFT values after the intervention is not significant.

Table 2. Differences in DMFT scores before and after getting interventions in each school

DMF-T status	SD Hang Tuah		SD Ujung Tanah		SD Cambaya		P-value (2)	
	Pre-test	Post-test	Pre-test	Post-test	Pre-test	Post-test	Pre-test	Post-test
n	64	64	54	54	49	49	0,001	0,656
Decay (D)	317	360	355	351	321	310		
Mean (D)	4,95	5,63	6,57	6,50	6,55	6,33		
Missing (M)	12	39	36	44	35	39		

Mean (M)	0,19	0,61	0.67	0,81	0,71	0,79
Filling (F)	1	64	1	27	0	19
Mean (F)	0,02	1,0	0,02	0,50	0	0,39
DMF-T	330	463	392	422	356	368
Mean DMF-T	5,15	7,23	7,25	7,81	7,26	7,51
Δ Mean DMF-T	+2,08		+0,56		+0,25	
P-value (1)	0,000		0,000		0,013	

P-value (1): pre-post difference test for each group (in pairs)
P-value (2): difference test between groups (unpaired)

DISCUSSION

In table 1, statistical test results were obtained that the difference in the mean value of oral hygiene level at SD Hang Tuah decreased, at SDN Ujung Tanah and SDN Cambaya experienced an increase in the mean value after the intervention. From these results, it can be concluded that the level of oral hygiene at SD Hang Tuah has increased. At SD Ujung Tanah and SD Cambaya experienced a decrease in oral hygiene levels. The cause of the decrease in oral hygiene levels at SD Ujung Tanah and SD Cambaya even though there is a change in behavior for the better can be caused by how to brush teeth at home that is not in accordance with the knowledge gained about good toothbrush procedures. This can happen because this study did not involve parents to supervise their children at home. Another problem is the habit of snacking in the morning at school shortly after brushing teeth at home which allows oral hygiene conditions to be less good.

The results of research related to the effect of dental health education and muut on the level of oral hygiene through mobile cellular conducted by Campos et al (2018) with the intervention method of game applications on mobile phones, show that there is a learning process in children in health promotion related to habits related to healthy diet and oral hygiene (16). Furthermore, research conducted by Marchetti et al (2018) with mobile application intervention methods, showed that the educational media was effective in improving oral hygiene in adolescents (17). Another study conducted by Marshman et al (2019) with the Short Message Service (SMS) Intervention method, showed that messages via SMS as a reminder to brush your teeth so as to improve dental hygiene (18).

In table 1, the results of the test of differences in the level of oral hygiene between groups in the three schools before the intervention, there were no significant differences while after the intervention there were significant differences. In table 2, statistical test results were obtained that

Hang Tuah Elementary School experienced the highest increase in DMFT value , while Cambaya Elementary School experienced the lowest increase in DMFT value.

The effect of dental health education on DMFT scores before and after the intervention was statistically significant. In the Filling aspect, there is an increase in the *mean* value which is an indicator of increased awareness to treat caries.

SD Hang Tuah, which received a combination intervention *of healthy dental application and* healthy dental gymnastics *with teacher assistance, experienced the worst caries condition can be caused by several factors, including the difference in the level of caries risk and the level of caries prevention where the school* has the highest risk factor for caries. In addition, the aspect of teacher support as a companion to help educate, supervise and motivate students during intervention is less optimal than other schools. SD Hang Tuah is a private school where the status of teachers in the school is not as a permanent teacher (honorary) who can quit or *resign* from school at any time . In addition, the accompanying teachers at the school are less than optimal because of other activities who are carrying out strata-2 (S2) learning tasks so they are not too focused on doing mentoring.

The results of research related to the effect of dental and oral health education through the use of mobile cellular on dental and oral health (caries) conducted by Jadhav et al (2016) with the intervention method of short message services (SMS) on mobile phones, showed that the educational method was effective for improving oral health (19). The research conducted by Al-ak'hali et al (2020) with an intervention method through WhatsApp Messages, showed that this education can improve dental and oral health in patients with gingivitis (20). Another study conducted by Ibrahim et al (2020) with an intervention method using the WhatsApp application also showed that this education can improve oral health and dental and oral health literacy (21).

In this study, it was found that the DMFT scores of the three schools after the intervention were no. The results of the same study were found in several other studies that stated that there was no difference before and after treatment or intervention using digital media on aspects of knowledge, attitudes, motivation, intentions, beliefs and parental support. Similarly, the results of research produced by Jahanfar et al., 2009, which stated that there was no difference before and after intervention with internet media in HIV-AIDS prevention education (22).

The results of different studies found that education using treatment or intervention with mobile health (e-helath) is effective in changing knowledge, attitudes, and motivation (23–26). Similarly, the results of research by Patton-Lopez et al., (2018) stated that there were significant differences in knowledge, family support of students before and after treatment or intervention using applications in education to improve student nutrition (27).

Research Implications

The application of a digital-based educational model, namely the *gigiku sehat* application website , has a positive impact on the parties involved. Therefore, here are some implications of the results of this study:

1) The results of this study are one of the new strategies with the concept of digital-based education through the gigiku *sehat application* which can be used as an educational medium for caries prevention in children aged 10-13 years.
2) The results of this study can contribute to the Makassar City Government's policy regarding caries prevention programs in elementary school-age children with a digital-based dental and oral health education approach.

Research Limitations

1) The COVID-19 pandemic has limited the interaction of researchers with research objects,
2) Healthy dental application intervention media can only be accessed when students use the internet (*online*). So that in the intervention process, researchers control and ensure that respondents have internet access.
3) The existence of student activities both routine learning activities in class, exam activities and other extracurricular activities causes student concentration to be somewhat disturbed in following this research.
4) The short intervention time is only 3 (three) months so that the effect of intervention on behavior change in the aspect of Action in students of SD Hang Tuah and SDN Ujung Tanah, changes in the level of oral hygiene are not significant.
5) Teacher assistance is less than optimal due to other activities (learning tasks) at Hang Tuah Elementary School so that the effect of intervention is low.
6) The effect of intervention is less optimal because there is no assistance by parents at home.

CONCLUSION

1. The design of educational media for the website-based *gigiku sehat application* is made based on the characters of children aged 10-13 years with interesting language and message characters as well as the content of text, videos and games.
2. The results of the trial of the application of healthy teeth in both schools, namely at SD Hang Tuah with the category "good" and SD Ujung Tanah with the category "very good".
3. The effect of dental health education with the *application of healthy teeth* and / or *healthy dental gymnastics* with teacher assistance statistically had a significant effect on SD Hang Tuah, while SDN Ujung Tanah and SDN Cambaya did not have a significant effect but there was a difference in mean values on improving oral hygiene.
4. The effect of dental health education with the *application of healthy teeth* and / or *healthy dental gymnastics* with teacher assistance on DMFT values before and after intervention statistically has a significant effect, especially in the aspect of Filling there is an increase in the *mean* value which is an indicator of increased awareness to treat caries.

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