International Journal of Medical Science and Pharmaceutical Research

ISSN(e): 3050-5720
ISSN(p): 3050-5712

Vol. 02(11): 148-155, November 2025

Home Page: https://ijmspr.org/

Effectiveness of Digital Media Education on Tooth Brushing Practice (TBP) in Reducing Oral Hygiene Index Simplified (OHIS) Scores among Students at SMP Negeri 4 Gorontalo City

Mulyati Yasin Inaku[1], Irwan[2], Isman Yusuf [3]

[1,2,3] Pascasarjana Kesehatan Masyarakat, Universitas Negeri Gorontalo, Indonesia.

KEYWORDS:

Digital education; Tooth brushing practice; Oral hygiene index simplified; Adolescent; Oral health.

Corresponding Author:
Mulyati Yasin Inaku

DOI: 10.55677/IJMSPR/2025-3050-I1105

Published:
November 18, 2025

ABSTRACT

Oral and dental health is an essential component of general health that remains a common issue among adolescents. The 2018 Indonesian Basic Health Research (Riskesdas) reported that 73.4% of adolescents suffer from dental caries, yet only 2.8% brush their teeth at the correct times. In Gorontalo City, most students show poor Oral Hygiene Index Simplified (OHIS) scores despite regular oral health education. This study aimed to analyze the effectiveness of digital media-based education on Tooth Brushing Practice (TBP) in reducing OHIS scores among students at SMP Negeri 4 Gorontalo City. This quasi-experimental study employed a pre-test and post-test one group design with an intervention consisting of a 3–6-minute educational video demonstrating the WHO-standard tooth brushing technique, delivered for seven consecutive days. The results showed a significant decrease in OHIS scores after the TBP digital education compared to before the intervention. Digital education was proven to improve students' understanding and practical skills in proper tooth brushing techniques. The novelty of this study lies in the use of interactive digital media through TBP-based video content, directly measuring behavioral changes through OHIS reduction rather than relying solely on knowledge improvement. In conclusion, digital media-based education effectively enhances tooth brushing behavior and reduces OHIS scores among adolescents, making it an innovative and practical approach for school-based oral health promotion programs.

1. INTRODUCTION

Oral and dental health is an essential component of general health that is often overlooked. Moreover, the mouth serves as the primary gateway to the digestive system and plays a vital role in mastication, phonetics, and aesthetics. Therefore, efforts to maintain oral hygiene should begin early and become a lifelong habit. Oral hygiene behavior is greatly influenced by the level of knowledge and the way information is conveyed, especially among adolescents (1).

Oral health problems remain a challenge. The World Health Organization (WHO) reports that the global prevalence of deciduous tooth caries is 47%, and permanent tooth caries is 29%, with 816 million caries cases occurring in developing countries (2).

The 2018 Basic Health Research (Riskesdas) report indicates that the prevalence of caries in Indonesia reaches 88.8%, with caries prevalence among adolescents at 73.4%. This aligns with the same source data, where 94.7% of respondents stated they brush their teeth daily, yet only 2.8% brush their teeth at the correct times, namely in the morning after breakfast and at night before bed. Additionally, the 2018 Basic Health Research noted that 96.5% of children aged 10-14 in Indonesia brush their teeth daily, but only 2.1% brush their teeth at the correct times.

The 2018 Basic Health Research revealed that the proportion of oral health problems in Gorontalo Province is 63.7%, with the proportion of daily tooth brushing at 95.5%, yet only 4.6% brush their teeth at the correct times, namely in the morning after

eating and at night before bed. This aligns with the 2023 Indonesian Health Survey (SKI) results showing that 9.5% of household members experience gum inflammation indicated by bleeding gums

Data obtained from the Gorontalo City Health Office indicates that student health screenings from elementary to high school in 2023 showed an average oral health problem score of 50.1%, aligning with initial data from the West City Health Center in 2024, which showed that 67% of students from elementary to high school levels experience caries and other oral health issues, despite the Health Center routinely conducting education on maintaining oral hygiene.

Digital audiovisual media enables interactive and easily understandable health information delivery. Research shows that using video media in health education is more effective than conventional methods such as lectures Xizhu Xiao et al., (2024). This is relevant in the context of adolescent education, where learning patterns are more influenced by visualization and digital interaction rather than written text (3).

Various studies have evaluated the effectiveness of digital education in increasing knowledge, but most have not directly assessed its impact on proper tooth brushing behavior or OHIS scores. For example, the study by Danti Narulita and Danu Aprilianto (2022) found that dental education can increase knowledge and attitudes, but did not measure proper tooth brushing practices or their impact on OHIS (4). Initial observations in the working area of the West City Health Center showed that despite routine counseling by the UKS team consisting of Health Center and teacher parties, dental examinations of SMP students still showed high prevalence of caries, plaque, and gum inflammation.

Interviews with 20 adolescent students at the West City Health Center dental clinic showed that all adolescents had access to cell phones, 18 adolescents preferred watching videos over reading books. Only 3 adolescents could practice proper tooth brushing techniques. OHIS examination results showed 13 adolescents (65%) had poor OHIS, while 5 adolescents (25%) had moderate OHIS, and only 2 adolescents (10%) had good OHIS.

This condition indicates that conventional education approaches have not fully formed good and correct tooth brushing habits. An innovative education medium that is attractive, interactive, and relevant to today's adolescent characteristics is needed. One potential approach is the use of digital media in the form of educational videos about Tooth Brushing Practice (TBP) to improve understanding and correct tooth brushing skills.

Based on this rationale, the author is interested in researching the Effectiveness of Digital Media Education on Tooth Brushing Practice (TBP) in Reducing Oral Hygiene Index Simplified (OHIS) Among Students at SMP Negeri 4 Gorontalo City.

2. RESEARCH METODS

This research was conducted at SMP Negeri 4 Gorontalo City. The research period was one month, from the end of August to mid-September 2025. This is quantitative research using a quasi-experimental method. The design used was a pre-test and post-test control group design. Both the control and intervention groups underwent OHIS measurement initially. Then, the intervention group was given digital education on TBP, while the control group received no treatment. Subsequently, OHIS values were measured again. The sample was a portion or representative of the population to be studied, namely students of SMP 4 Gorontalo City class VII. The sample size to be studied was 60 students from SMP Negeri 4 Gorontalo City class VII who met the inclusion criteria and were randomly divided into a control group of 30 students and an intervention group of 30 students.

3. RESULTS AND DISCUSSION

Result

Table 1. Respondent Characteristics

Variable	Given Digital TBP Education (n=30)		Not Given Digital TBP Education (n=30)	
	n	%	n	%
Gender				
Male	14	46,7	18	60,0
Famale	16	53,3	12	40,0
Age				
12 Years	21	70,0	23	76,7
13 Years	8	26,7	7	23,3
14 Years	1	3,3	0	0
Class				
7-1	2	6,7	5	16,7
7-2	3	10,0	8	26,7
7-3	5	16,7	4	13,3
7-4	6	20,0	2	6,7
7-5	5	16,7	6	20,0

7-6	3	10,0	2	6,7
7-7	6	20,0	3	10,0
Jumlah	**30**	**100**	**30**	**100**

Source : Primary Data, 2025

Based on Table 1, the respondent characteristics in both groups show a relatively balanced distribution. In the group given digital TBP education, there were 46.7% males and 53.3% females, while in the group not given digital TBP education, there were 60.0% males and 40.0% females. The majority of respondents were 12 years old, namely 70.0% in the intervention group and 76.7% in the control group, while ages 13 and 14 years were only a small portion. Class distribution was evenly spread across classes 7-1 to 7-7 in both groups. Overall, the respondent characteristics between the intervention and control groups appear homogeneous, allowing for objective comparison in subsequent analyses.

Table 2. Frequency Distribution Analysis of Pre-Test in Intervention and Control Groups of SMP 4 Gorontalo City Students

Variable	Given Digital TBP Education (n=30)		Not Given Digital TBP Education (n=30)	
	n	**%**	**n**	**%**
OHIS				
Good	0	0	0	0
Moderate	9	30	14	46,7
Poor	21	70	16	53,3
Total	**30**	**100**	**30**	**100**
Knowladge				
Good	0	0	1	3,3
Adequate	11	36,7	14	46,7
Poor	19	63,3	15	50,0
Total	**30**	**100**	**30**	**100**
Perilaku				
Good	0	0	2	10,0
Adequate	17	56,7	16	53,3
Poor	13	43,3	11	36,7
Total	**30**	**100**	**30**	**100**

Source : Primary Data, 2025

Based on Table 2, it can be concluded that the initial condition of oral hygiene (OHIS) in both groups was still relatively poor. No respondents had good OHIS category, with the intervention group dominated by poor category (70%) compared to the control group (53.3%). Additionally, the level of knowledge about oral hygiene in the intervention group was mostly poor (63.3%), while in the control group the proportion of poor knowledge was slightly lower (50%) and there were 3.3% respondents with good knowledge. In terms of behavior, the control group showed better oral hygiene behavior compared to the intervention group, where poor behavior was more found in the intervention group (43.3%) compared to the control group (36.7%).

Table 3. Analisis Distribusi Frekuensi *Post-Test* pada kelompok intervensi dan kelompok kontrol Siswa SMP 4 Kota Gorontalo

Variable	Given Digital TBP Education (n=30)		Not Given Digital TBP Education (n=30)	
	n	**%**	**n**	**%**
OHIS				
Good	12	40,0	0	0
Moderate	17	56,7	10	33,3
Poor	1	3,3	20	66,7
Total	**30**	**100**	**30**	**100**
Knowladge				
Good	16	53,3	1	3,3
Adequate	13	43,3	14	46,7
Poor	1	3,3	15	50,0
Total	**30**	**100**	**30**	**100**

Variable	Given Digital TBP Education (n=30)		Not Given Digital TBP Education (n=30)	
	n	%	n	%
Perilaku				
Good	14	46,7	3	10,0
Adequate	16	53,3	16	53,3
Poor	0	0	11	36,7
Total	**30**	**100**	**30**	**100**

Source : Primary Data, 2025

Based on Table 3, there is a difference in results between the group given digital TBP education and the group not given digital TBP education. In the OHIS variable, most respondents in the intervention group had moderate (56.7%) and good (40.0%) categories, while in the control group most were in the poor category (66.7%) and only 33.3% moderate. This indicates that digital TBP education has a positive effect on oral hygiene. In terms of knowledge, the intervention group was dominated by respondents with good knowledge (53.3%), while the control group still had many with poor knowledge (50.0%). Regarding behavior, the intervention group showed good behavior (46.7%) and adequate (53.3%), while in the control group most had adequate behavior (53.3%) and still had poor behavior (36.7%). Overall, it can be concluded that digital TBP education improves knowledge, behavior, and oral hygiene of respondents compared to the group that did not receive education.

Table 4. OHIS Measurement Results Before and After Digital Media Education on TBP in the Intervention Group

Respondent	Measurement Results	Pre-test	Post-test
OHIS			
Intervention (given TBP education) (n=30)	Mean	3,82	1,71
	Media	3,70	1,63
	Standard Deviation	1,12	0,85
	Minimum	2,00	0,50
	Maxsimum	6,00	4,00
Control (Without Education) (n=30)	Mean	3,61	3,85
	Media	3,20	3,70
	Standard Deviation	1,09	1,06
	Minimum	1,80	2,30
	Maxsimum	6,00	6,00
Knowladge			
Intervention (given TBP education) (n=30)	Mean	1,60	3,90
	Media	1,00	4,00
	Standard Deviation	0,85	1,094
	Minimum	1	1
	Maxsimum	3	5
Control (Without Education) (n=30)	Mean	1,87	1,90
	Media	1,50	1,50
	Standard Deviation	0,973	0,995
	Minimum	1	1
	Maxsimum	4	4
Behavior			
Intervention (given TBP education) (n=30)	Mean	5,33	10,67
	Media	5,00	10,00
	Standard Deviation	2,339	1,749
	Minimum	2	7
	Maxsimum	10	14
Control (Without Education) (n=30)	Mean	7,03	7,07
	Media	8,00	8,00
	Standard Deviation	3,113	3,162
	Minimum	2	2
	Maxsimum	12	12

Source : Primary Data, 2025

Based on Table 4, the results show that the intervention group given digital TBP education experienced a significant improvement in oral hygiene, indicated by a decrease in mean OHIS from 3.82 to 1.71 and a decrease in median from 3.70 to 1.63. The standard deviation also decreased from 1.12 to 0.85, indicating more consistent measurement results among respondents, with improved minimum and maximum value ranges. Conversely, in the control group without education, the mean OHIS slightly increased from 3.61 to 3.85, the median remained 3.70, and the result variation hardly changed, indicating no significant improvement. Thus, digital TBP education proved effective in improving oral hygiene in the intervention group compared to the control group

Table 5. Comparison Analysis of Pre-test and Post-test OHIS Before and After Digital Media Education on TBP in the Intervention Group of SMP 4 Gorontalo City Students

Category	n	*Mean Rank*	Z	*Asymp.Sig. (2-tailed)*	Keterangan
OHIS	30	15,5	-4,810[a]	0,000	*Significant*

Wilcoxon Signed Ranks Test

Table 5 shows the comparison of OHIS values before and after digital education in the form of videos about TBP for 7 days to class VII students in the intervention group. The SPSS Bivariate Analysis results using the Wilcoxon Signed Ranks Test with 30 respondents, and a Mean Rank of 15.5 and Z value of -4.810, the negative sign (-) indicates a meaningful change, in this case, a decrease in OHIS values after the intervention of providing digital education about TBP (the smaller the OHIS value → the better the oral hygiene). The Wilcoxon test obtained Asymp.Sig.(2-tailed) 0.000 or P-Value < 0.05, meaning there is a significant difference between OHIS values before and after digital video education about TBP in the intervention group.

Table 6. Comparison Analysis of OHIS After Digital Media Education on TBP Between Intervention and Control Groups

Category	Group	n	*Mean Rank*	Z	*Asymp.Sig. (2-tailed)*	Keterangan
OHIS	Intervention	30	17,25	-5,898	0,000	*Significant*
	Control	30	43,75			

Mann-Whitney Test

Table 6 compares OHIS values in the intervention group that received treatment in the form of digital education about TBP with the control group that received no intervention, from SPSS analysis using the Mann-Whitney test, the Mean Rank OHIS of the intervention group 17.25 is smaller than the Mean Rank OHIS of the control group 43.75, meaning the OHIS value in the intervention group after digital

Discussion

Oral Hygiene Index (OHIS) of Students Before Providing Digital Education on Tooth Brushing Practice

Based on the research results, it is known that before the intervention, the Oral Hygiene Index Simplified (OHIS) scores in both groups, intervention and control, were not yet in the good category. Most respondents in the intervention group had poor oral hygiene at 70%, while in the control group it was 53.3%. These results indicate that the oral hygiene condition of adolescents before the intervention was still low, which could be caused by insufficient knowledge and suboptimal oral hygiene maintenance behavior. The lower the knowledge level, the greater the likelihood of individuals having poor behavior towards oral health maintenance.

In the knowledge variable, the research results show that most respondents in the intervention group had poor knowledge (63.3%), while in the control group it was 50%. This condition indicates that adolescents generally do not yet have adequate understanding of the importance of maintaining oral hygiene and its impact on overall health. These findings align with Aung et al. (2022), who stated that low knowledge about oral health is the main determinant of poor oral hygiene status among adolescents in Southeast Asia (5). Additionally, Nirmala et al. (2020) also reported that increased knowledge has a significant relationship with improved OHIS scores after educational intervention (6).

In terms of behavior, this study shows that the control group had more respondents with good behavior compared to the intervention group, while poor behavior was more prevalent in the intervention group (43.3%) compared to the control group (36.7%). This can be explained through the Theory of Planned Behavior (Ajzen, 1991), which asserts that a person's behavior is influenced by intention and attitude towards the behavior, as well as self-control. Thus, the low behavior in maintaining oral hygiene is likely caused by insufficient motivation and poorly formed habits.

Oral Hygiene Index (OHIS) of Students After Providing Digital Education on Tooth Brushing Practice

The research results show that after the intervention in the form of digital education using videos on tooth brushing practice (TBP), there was a significant improvement in the oral hygiene of respondents in the intervention group. The number of respondents with good OHIS category increased to 40%, while in the control group, none of the respondents reached the good category. Additionally, the proportion of moderate OHIS in the intervention group reached 56.7%, and only 3.3% of respondents were still in the poor category. Conversely, in the control group, most respondents (66.7%) remained in the poor category. These results indicate

that digital education through video media can improve adolescents' ability to perform correct tooth brushing practices and impact the improvement of oral hygiene.

These research findings align with Sari et al. (2022), who reported that the use of educational video media is effective in improving the oral hygiene of elementary school students in Yogyakarta, as indicated by a decrease in OHIS scores after intervention (7). Another study by Al-Shehri et al. (2020) also showed that video-based interventions can improve correct tooth brushing skills in adolescents compared to conventional counselling (8). This is supported by Mayer's (2009) Cognitive Theory of Multimedia Learning, which explains that the combination of visual and audio elements in videos facilitates more effective learning processes compared to text media or lectures alone. Thus, video-based education becomes one of the educational methods capable of increasing conceptual understanding as well as practical skills simultaneously.

In addition to the improvement in oral hygiene, the research results also show that the respondents' knowledge level in the intervention group increased significantly after receiving digital education. As many as 53.3% of respondents had good knowledge, while only 3.3% still had poor knowledge. Conversely, in the control group, most respondents (50%) still had poor knowledge. These research results indicate the effectiveness of video educational media in increasing respondents' understanding of the importance of maintaining oral hygiene. Nirmala et al. (2020) strengthen these results, stating that increased knowledge after visual health education correlates positively with improved oral hygiene (6).

In the behavior variable, this study also shows positive changes in the intervention group, with 46.7% of respondents having good behavior in maintaining oral hygiene, and no respondents with poor behavior. Meanwhile, in the control group, 36.7% of respondents still had poor behavior. These results indicate that digital education can significantly influence behavior through increased motivation and awareness. According to Bandura's Social Cognitive Theory (1986), behavior is influenced by observation and social learning processes, where individuals learn through observing behavioral models displayed. In the context of this study, educational videos provide a model of correct tooth brushing behavior, allowing respondents to imitate it effectively.

Effectiveness of Education Using Digital Media on Tooth Brushing Practice in Reducing Oral Hygiene Index

The research results show a significant improvement in the oral hygiene status of respondents after providing education using digital media on Tooth Brushing Practice (TBP). Before the intervention, no respondents were in the good OHIS category, but after TBP education, this number increased to 12 people (40%). Conversely, respondents with poor OHIS decreased from 21 people (70%) to only 1 person (3.3%). This change indicates that digital education through TBP videos is effective in improving students' ability to maintain oral hygiene.

The effectiveness of educational videos in this study can also be explained through Mayer's (2009) Cognitive Theory of Multimedia Learning, which states that learning will be more effective if information is presented through two cognitive channels, namely visual and auditory. The combination of images, narration, and demonstrations in TBP videos helps students understand the correct steps of tooth brushing, increases information retention, and facilitates application in daily practice. Thus, digital video-based education not only increases cognitive knowledge but also forms real motor skills and oral hygiene behavior.

These results are consistent with previous studies. Al-Shehri et al. (2020) reported that education using videos is more effective than conventional lectures in improving tooth brushing skills and reducing plaque accumulation in school children (8). Studies by Putri et al. (2021) and Nirmala et al. (2020) also showed that video-based educational media significantly reduce OHIS scores and increase students' knowledge about oral hygiene (9) (6). Meanwhile, Sari et al. (2022) and Setiawan et al. (2022) proved that the use of educational video media for one week can reduce OHIS scores more significantly than conventional methods, because videos are more engaging and motivate students to practice the exemplified behavior (7) (10).

Similar results were also reported by Aldridge et al. (2021) and Anita et al. (2023), who found that multimedia-based educational interventions can double adolescents' oral hygiene behavior compared to groups receiving only verbal counselling (11) (12). Likewise, Aung et al. (2022) affirmed that knowledge level is an important determinant in the oral hygiene status of adolescents in Southeast Asia (5). Indrasari et al. (2021) and Putri and Sari (2023) also reported that digital education can significantly increase knowledge and tooth brushing behavior, thus directly impacting the reduction of OHIS values (13) (9) (7).

According to Notoatmodjo (2014), changes in health behavior are the result of health education processes that increase individuals' knowledge, awareness, and skills to behave healthily consistently. These findings align with Bandura's Social Cognitive Theory (1986), which states that learning occurs through observation and imitation of behavioral models. In the context of this study, TBP videos serve as behavioral models demonstrating correct tooth brushing techniques, enabling participants to imitate and practice the behavior better. From a behavioral theory perspective, these results reinforce the Health Belief Model concept (Rosenstock, 1974; Glanz et al., 2015), which explains that increasing perceptions of benefits and knowledge about health risks can encourage individuals to adopt healthy behaviors. TBP videos not only provide information but also increase perceptions of the benefits of brushing teeth correctly through visualizations of the impact of oral hygiene on health.

4. CONCLUSION

Before providing education using digital media on Tooth Brushing Practice (TBP), most students had poor oral hygiene with OHIS values in the moderate to poor categories. After implementing digital TBP education for seven days, there was a significant improvement in oral hygiene status, indicated by a decrease in OHIS values and an increase in the number of respondents with good

OHIS categories and a sharp decrease in the poor category. Education using digital media on TBP proved effective in reducing OHIS values in SMP Negeri 4 Gorontalo City students, where statistical analysis results show a significant difference between OHIS values before and after intervention, as well as between the intervention and control groups.

ACKNOWLEDGMENTS

Thank you to the School Party of SMP Negeri 4 Gorontalo City for providing permission and support in conducting this research. Thanks are also extended to the Gorontalo City Health Office and Kota Barat Health Center for their assistance and cooperation during the data collection process. The highest appreciation is given to the students who became research respondents for their participation and cooperation during the intervention. The author also thanks Universitas Negeri Gorontalo, especially the Postgraduate Public Health Program, for the academic support and scientific guidance provided until this research could be completed well.

REFERENCES

1. Ribeiro YJS, Ferreira LG, Nelson-Filho P, Arnez MFM, Paula-Silva FWG.Trials. 2022 Aug 9;23(1):639. doi: 10.1186/s13063-022-06602-4.PMID: 35945570**.**
2. Reliability of self-reported toot1. Agung IGAA, Hartini IGAA, Rahina Y, Sujana KAD. Penyuluhan Tentang Gizi, Kesehatan Gigi dan Mulut pada Lansia di Banjar Kebonkuri Tengah, Desa Kesiman, Denpasar. Open Community Serv J. 2025;04(01):65–72.
3. Fasya S. Tinjauan Literatur : Hubungan Stunting terhadap Keparahan Karies Gigi Sulung dan Kebersihan Rongga Mulut pada Anak Usia Sekolah Dasar. 2024;5(6).
4. Xiao X, Wong RM, Yang W. Effectiveness of video-based health promotion: A systematic review and meta-analysis. Patient Educ Couns J. 2024;119(2).
5. Narulita D, Aprilianto D. Meta-Analysis Study : Is Dental Health Education Effective to Improve Knowledge , Attitude , and Behavior in Adolescents ? J Heal Promot Behav. 2022;7(3):197–207.
6. Aung TT, Zaitsu T, Ueno M, Kawaguchi Y. Determinants of oral hygiene status among adolescents in Southeast Asia. BMC Oral Health. 2022;76(1).
7. Nirmala S, Sudhakar S, Reddy CVK. Effectiveness of oral health education on improving oral hygiene status among school children – A quasi-experimental study. J Educ Health Promot. 2020;9(1):203.
8. Sari RM, Herawati N, Pratiwi R. Efektivitas video edukasi dalam meningkatkan pengetahuan dan praktik menyikat gigi pada anak usia sekolah. J Kesehat Masy. 2020;8(1):45–53.
9. Al-Shehri AM, Alqarni AM, Alqahtani AS, Togoo RA. Effectiveness of video-assisted oral health education among school children: A randomized controlled trial. J Int Soc Prev Community Dent. 2020;10(3):324–9.
10. Putri NLS, Wibowo A, Lestari P. Pengaruh edukasi menyikat gigi menggunakan media video terhadap kebersihan gigi dan mulut anak sekolah dasar. J Kesehat Gigi. 2021;8(2):77–83.
11. Setiawan AD, Fitriani D, Hartati R. The effectiveness of video-based dental health education in improving oral hygiene among junior high school students. J Public health Res. 2022;11(3):3567.
12. Aldridge E, Johnson NW, Nguyen T. The impact of multimedia oral health education on adolescent oral hygiene behavior: A randomized controlled trial. Int J Dent Hyg. 2021;19(4):450–8.
13. Anita R, Wahyuni R, Santoso A. Effect of animated video-based oral health education on oral hygiene status among elementary school students. BMC Oral Health. 2023;23(1):612.
14. Indrasari R, Nurhidayah I, Wulandari D. The effect of digital health education on oral hygiene among junior high school students. J Kesehat Gigi. 2021;8(2):85–92.
15. Influence of digital media in the oral health education of mother-child pairs: study protocol of a parallel double-blind randomized clinical trial.hbrushing frequency as an indicator for the assessment of oral hygiene in epidemiological research on caries in adolescents: a cross-sectional study.
16. Irwan I, Boekoesoe L, Katili D, Pratiwi Hantulu D, Una M. HIV/AIDS Risky Behavior Model for LGBT Youth in the Gorontalo Province. Open Public Health J, 2023; 16: e18749445262206. http://dx.doi.org/10.2174/0118749445262206230927054154
17. Gil GS, Morikava FS, Santin GC, Pintarelli TP, Fraiz FC, Ferreira FM.BMC Med Res Methodol. 2015 Mar 8;15:14. doi: 10.1186/s12874-015-0002-5.PMID: 25887179
18. Study protocol of a randomized controlled trial to test the effect of a smartphone application on oral-health behavior and oral hygiene in adolescents with fixed orthodontic appliances.
19. Scheerman JFM, van Meijel B, van Empelen P, Kramer GJC, Verrips GHW, Pakpour AH, Van den Braak MCT, van Loveren C.BMC Oral Health. 2018 Feb 7;18(1):19. doi: 10.1186/s12903-018-0475-9.PMID: 29415697.
20. The association between minor recurrent aphthous stomatitis (RAS), children's poor oral condition, and underlying negative psychosocial habits and attitudes towards oral hygiene.

21. Tecco S, Sciara S, Pantaleo G, Nota A, Visone A, Germani S, Polizzi E, Gherlone EF.BMC Pediatr. 2018 Apr 13;18(1):136. doi: 10.1186/s12887-018-1094-y.PMID: 29653566**.**
22. Effectiveness of a school-based educational intervention on oral health knowledge, attitudes, practices, and self-efficacy among female secondary school students: a randomized controlled trial.
23. Taheri AM, Zarei F, Hidarnia A, Tavousi M.BMC Oral Health. 2025 Apr 24;25(1):625. doi: 10.1186/s12903-025-06028-9.PMID: 40275272.