



Implementation of Booklet Media on Tooth Brushing Knowledge as an Effort to Prevent Dental Caries in Students of Luqman Integrated Senior High School Private Islamic Elementary School, Padang City

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Track Record Article	Abstract
Revised: 18 July 2026 Accepted: 20 September 2026 Published: 30 September 2026 How to cite : Rahmad, Y., & Aurel, S. N. (2026). Implementation of Booklet Media on Tooth Brushing Knowledge as an Effort to Prevent Dental Caries in Students of Luqman Integrated Senior High School Private Islamic Elementary School, Padang City. <i>Contagion : Scientific Periodical of Public Health and Coastal Health</i>, 8(3), 429–441.	<i>Dental caries is one of the oral health problems that is still often found in elementary school-aged children. Lack of knowledge about how to brush teeth properly is one of the factors that increase the risk of caries. Book media is one of the printed educational media that can be used to improve students' knowledge about dental and oral health. To analyze the implementation of book media on knowledge of brushing teeth as an effort to prevent dental caries in students of Luqman Integrated Islamic Elementary School, Padang City. This study used a one-group pre-experimental pretest-posttest design on 60 students in grades IV and V. The intervention was in the form of dental health education using book media accompanied by explanations and tooth brushing practices. Data were analyzed using the Wilcoxon test because the data were not normally distributed. Before the intervention, most students had a sufficient level of knowledge (58.3%), while after the intervention all students (100%) had good knowledge. There was an increase in the proportion of students with good knowledge from 23.3% to 100% or an increase of 76.7 percentage points, with a statistically significant difference ($p = 0.000$). In addition to increasing knowledge, the booklet intervention also empowered students as agents of health change, enabling them to adopt proper toothbrushing habits while disseminating dental health information to peers and family members. The booklet implementation significantly improved knowledge about toothbrushing as a caries prevention measure among students at Luqman Integrated Islamic Elementary School in Padang City. As a simple, inexpensive, easy-to-use, and easily replicated print medium, the booklet contributes to the development of a sustainable school-based dental health education strategy. This intervention model has the potential to be adopted by Community Health Centers (Puskesmas) through School Health Unit (UKS) activities as an evidence-based caries prevention intervention.</i> Keywords: <i>Implementation, Media booklet, Knowledge, Prevention, Caries Dentistry, School Health Education, Student Empowerment, Printed Educational Media.</i>

INTRODUCTION

Dental caries is one of the most common public health problems experienced by school-age children worldwide. The World Health Organization (WHO) reports that oral diseases affect approximately 3.5 billion people worldwide, with permanent tooth caries being the most common disease globally. In children, dental caries remains a major problem impacting health, quality of life, learning ability, nutritional status, and school attendance. This condition indicates that caries is not only an individual dental hygiene problem, but also a public health issue that requires continuous promotive and preventive efforts. Based on the 2023 Indonesian

Health Survey (SKI), as many as 56.9% of Indonesians aged ≥ 3 years experienced dental and oral problems in the past 12 months, which included complaints such as cavities, missing or extracted teeth, loose teeth, swollen or ulcerated gums, and mouth ulcers. These problems are also commonly found in school-age children, with the prevalence of dental and oral problems reaching 62.6% in the 5–9 age group. Furthermore, dental caries is one of the main dental health problems in Indonesia. Dental examination results from the 2023 SKI showed that the prevalence of caries in the population aged 3 years and older reached 82.8%. In children aged 5–9 years, the prevalence reached 84.8%, while in children aged 10–14 years, it was 63.8%. This high prevalence indicates that caries remains a dental health problem that requires attention, particularly through promotional and preventive efforts starting at school age. (Health Development Policy Agency [BKPK], 2023).

Furthermore, only 2.8% of the population brushes their teeth at the appropriate times, namely after breakfast and before bed. This situation indicates a low level of dental health maintenance among Indonesians, particularly among school-age children, who are a vulnerable group to dental caries (WHO, 2022; Health Development Policy Agency [BKPK], 2023).

The high prevalence of dental caries in children is influenced not only by poor oral hygiene but also by various social determinants of health. Children's knowledge of proper tooth brushing is influenced by limited access to health information, low health literacy among parents and families, socioeconomic conditions, and limited implementation of sustainable dental health promotion programs in schools. School-age children still rely heavily on family and school as primary sources for developing healthy behaviors. If these two environments fail to provide adequate health education, children will develop inappropriate knowledge and habits about brushing, increasing the risk of tooth decay. Therefore, schools have a strategic role as health promotion platforms to foster clean and healthy lifestyles from an early age.

One recommended health promotion strategy is the use of educational media appropriate to children's cognitive developmental stage. Booklets are a form of health communication that combines verbal and visual information, making it easier for children to gradually understand the material. In accordance with the World Health Organization's health promotion principles, improving health literacy is a crucial step in empowering individuals to obtain, understand, evaluate, and use health information to make informed decisions. Therefore, booklets serve not only as a medium for conveying information but also as an empowerment tool that helps children develop their ability to understand the importance of maintaining dental health and practice independent tooth brushing behavior. This media is designed using simple language, engaging illustrations, and information delivery that is appropriate to the learning

characteristics of school-age children, thereby increasing the effectiveness of the dental health learning process.

Health education interventions in schools also have strategic value in building empowerment in school communities. Increasing student knowledge is expected to not only impact individual behavior changes but also strengthen the school's capacity to support the implementation of Clean and Healthy Living Behaviors (PHBS). Students who acquire dental health knowledge can become agents of change who disseminate information to peers and family members, thereby establishing a culture of collective dental health care. Support from teachers, health workers, and parents is a crucial factor in creating a school environment conducive to the sustainability of correct toothbrushing behavior as part of public health promotion and prevention efforts.

Several previous studies have shown that the use of booklets effectively improves dental health knowledge in elementary school students. Research by Reza et al. (2024) reported an increase in knowledge after providing education using booklets to elementary school students. Research by Rusmiati and Marlia (2019) also found that booklets significantly improved dental health knowledge and behavior compared to before the intervention. Furthermore, Dzurrul Fatih and Primadani (2021) reported that booklets resulted in higher knowledge gains than posters or flyers. However, most of these studies focused on changes in knowledge scores and did not evaluate empowerment aspects, such as increased student self-efficacy in practicing toothbrushing techniques, parental involvement in supporting children's healthy behaviors, or the potential for disseminating health information to peers. These limitations indicate a research gap that needs to be developed so that health promotion interventions not only result in increased knowledge but also build the capacity of individuals and school communities to maintain healthy lifestyles.

Data from the Padang City Health Office shows that the Lubuk Kilangan Community Health Center is one of the areas with the highest rate of dental caries among elementary school students. Health checks revealed 1,625 cases of caries among 5,260 students examined, while at the Luqman Integrated Islamic Private Elementary School, 256 cases of caries were found, with the highest number of cases in fourth-grade students. This condition indicates that dental caries remains a health problem that requires effective promotive interventions to improve dental health maintenance behaviors from school age.

Although students generally know basic information about brushing their teeth, there is a *significant research gap* in understanding the correct technique, duration, and dosage of toothpaste due to the lack of systematic education in schools. On the other hand, of the various

print media available, booklets have proven to be the most effective, with an increase in knowledge scores reaching 87.5% compared to posters and flyers (Dzurrul Fatih et al. 2021). Therefore, this study was conducted to provide empirical evidence regarding the application of visually appealing booklets in improving students' knowledge about brushing teeth as a caries prevention measure (Reza *et al.*, 2024).

This study was conducted in Padang City because the area has a significant incidence of dental caries in elementary school-aged children, reaching 36.71% or around 6,154 children (Utami *et al.*, 2024). Specifically, the intervention location was chosen at Luqman Integrated Islamic Elementary School because the school is located in the working area of the Lubuk Kilangan Community Health Center, which is recorded as having the highest prevalence of caries cases in Padang City with 256 active cases found among its students (Padang City Health Office, 2024).

Based on the description, this study aims to evaluate the effectiveness of small book media in increasing knowledge about tooth brushing as an effort to prevent dental caries in elementary school students, while also testing its potential as a health promotion media that can empower students to be able to practice, maintain, and disseminate correct tooth brushing habits to peers and family members. The results of the study are expected to be the basis for the development of school-based dental health promotion programs that are not only oriented towards increasing knowledge, but also on empowering the school community in supporting the creation of clean and healthy living behaviors in a sustainable manner.

METHOD

This quantitative study, with a pre-experimental design, used a single-group pretest-posttest approach to evaluate the effect of booklet education on elementary school students' knowledge of tooth brushing as a caries prevention measure. This study was conducted at Luqman Integrated Islamic Elementary School in Padang City in 2025.

The study population consisted of 60 fourth and fifth grade students at Luqman Integrated Islamic Elementary School in Padang City. The sampling technique used was purposive sampling, with all students who met the inclusion criteria included as respondents, resulting in a final sample size of 60 students. Purposive sampling was chosen because only students who met certain characteristics could participate in the entire series of interventions, so the sample was considered representative of the target population of the study.

Inclusion criteria included fourth and fifth grade students who were present during the study, obtained written permission from their parents/guardians, were willing to participate in

the study (assent), were able to read and understand the contents of the booklet, and had not participated in structured oral health education in the past six months. Exclusion criteria were students who did not participate in all stages of the study or returned incomplete questionnaires.

The intervention used a booklet developed based on the Indonesian Ministry of Health's oral health guidelines, recommendations from the American Dental Association (ADA), and scientific literature on proper toothbrushing techniques. The booklet covers the definition of dental caries, its causes, the importance of maintaining oral hygiene, brushing time and frequency, and steps for proper toothbrushing technique, along with colorful illustrations for easy understanding.

Before being used in the study, the booklet underwent a content validation process by three experts: a public health dentist, a health promotion expert, and a health education lecturer. The assessment covered aspects of material suitability, scientific accuracy, language, illustrations, design, and readability using a four-point Likert scale. The assessment results showed a Content Validity Index (CVI) value of ≥ 0.80 , thus the media was declared valid and suitable for use as an educational medium. In addition, a readability test was conducted on several elementary school students with characteristics similar to the research respondents to ensure that the language and illustrations were easy to understand according to the child's developmental level.

The health education was delivered directly by researchers who had received training in delivering dental health education materials. The activity began with a 15-minute pre-test, followed by a 30-minute presentation using a booklet. The presentation consisted of an interactive lecture, two-way discussion, questions and answers, and a demonstration of toothbrushing techniques using the Fones method, which is recommended for elementary school-aged children. After all sessions were completed, students were given the opportunity to review the booklet and ask questions before being given a final test using the same instrument.

The primary variable in this study was knowledge about toothbrushing, measured using a structured questionnaire that had undergone validity and reliability testing. Furthermore, the study also measured secondary variables: attitudes toward toothbrushing habits, intentions to encourage family members to maintain dental health, and frequency of toothbrushing over the past seven days as indicators of empowerment in health behaviors.

Before being used in research data collection, the knowledge questionnaire instrument was first tested for validity and reliability on 40 respondents with homogeneous characteristics. Validity testing was carried out by analyzing correlations. The score for each question item

was calculated using *the Corrected Item-Total Correlation (KOR) method* in SPSS version 23 software. The results of the analysis showed that of the 20 questions tested, all items were declared **valid** because they had correlation values (r count) ranging from 0.357 to 0.546, which overall were above the r table value of 0.312. Next, a reliability test was conducted to measure the consistency of the questionnaire instrument using *the Cronbach's Alpha approach*. The test results showed a *Cronbach's Alpha coefficient value* of 0.768. This value exceeds the minimum standard of 0.70, thus *stating that* this questionnaire is reliable and suitable for use as a measuring tool in research.

Data were analyzed univariately to describe the distribution of respondent characteristics and scores for each research variable. Normality was tested using the Shapiro–Wilk test. Because the data were not normally distributed, differences in scores before and after the intervention were analyzed using the Wilcoxon Signed Rank Test with a significance level of $p < 0.05$. Subgroup analyses were also conducted based on gender and initial knowledge level (low and high) to identify groups of students who benefited most from the guidebook intervention.

This study has obtained ethical approval from the Health Research Ethics Committee of the Faculty of Dentistry, Baiturrahmah University No. A.78/KEPKFKGUNBRAH/XI/2025 which was conducted before data collection was conducted. In addition, all parents or guardians of students signed an informed consent form, while students provided voluntary assent before participating in the study. The confidentiality of respondents' identities was maintained and all data was used only for research purposes.

RESULTS

This study involved 60 fourth- and fifth-grade students at Luqman Integrated Islamic Private Elementary School in Padang City who met the participation requirements. Results included student characteristics and knowledge levels regarding tooth brushing as a caries prevention measure.

Description of Respondent Characteristics

The findings show the distribution of respondents based on age groups and gender characteristics of students at Luqman Integrated Islamic Private Elementary School, Padang City.

Table 1. Frequency Distribution of Respondents' Ages

Age	<i>f</i>	%	<i>Means</i>	<i>Median</i>	<i>Elementary school</i>
8 Years	1	1.7	8:00 AM	8:00 AM	0.00
9 Years	12	20	9:00 AM	9:00 AM	0.00
10 years	33	55	10:00 AM	10:00 AM	0.00
11 years old	14	23.3	11.00	11.00	0.00
Total	60	100.0			

Table 1 shows that of the 60 students who answered, the 10-year-old age group was the largest age group, namely 33 people or 55%.

Table 2. Frequency Distribution of Respondents' Gender

Gender	<i>f</i>	%
Man	36	60
Woman	24	40
Total	60	100.0

Table 2 shows that of the 60 students who answered, males were the largest group, namely 36 people or 60%.

Univariate Analysis

The results of the study showed that the pattern of participants' level of understanding before and after being given *the booklet* could be detailed systematically:

Table 3. Frequency Distribution of Respondents' Knowledge about Toothbrushing Before *the Booklet Media Intervention*

Knowledge Pretest	<i>F</i>	%
Good	14	23.3
Enough	35	58.3
Not enough	11	18.3
Total	60	100.0

Table 3 shows that before *the booklet media intervention*, most of the 60 students had sufficient knowledge, namely 35 people or 58.3%.

Table 4. Frequency Distribution of Respondents' Knowledge about Tooth Brushing after *Booklet Media Intervention*

Knowledge Pretest	<i>F</i>	%
Good	60	60
Enough	0	0
Not enough	0	0
Total	60	100.0

Table 4 shows that all 60 students who answered the question (100%) had good knowledge.

Normality Test

Before conducting testing to answer the hypothesis, a normality test was carried out on each variable which can be seen in table 5:

Table 5. Normality Test

	Group	Signature.	Significant Limits	Information
Knowledge	<i>Pre-test</i>	0.024	0.05	Abnormal
	<i>Post-test</i>	0.000	0.05	Abnormal

Table 5 shows that the results of the Kolmogorov-Smirnov normalization test for *pretest* and *posttest information* are abnormal. Therefore, the Wilcoxon test was used to answer the hypothesis.

Bivariate Analysis

The results of the study showed that there was a difference in knowledge about brushing teeth as an effort to prevent dental caries in students at Luqman Integrated Islamic Elementary School, Padang City after *media intervention in the form of a small book*.

Table 6. Wilcoxon test

	<i>Pre-test</i>	<i>Post-test</i>
Z	-6,772 ^b	
<i>Asymptomatic. Significance (2 tails)</i>	0,000	

Table 6 shows that the Wilcoxon statistical test found a significance value of $0.000 < 0.05$. This indicates a change in the level of knowledge of students at Luqman Integrated Islamic Elementary School, Padang City, about the importance of brushing their teeth as an effort to prevent dental caries before and after *the booklet media intervention*.

DISCUSSION

The statistically significant increase in students' knowledge from sufficient (58.3%) to good (100%) after the booklet media intervention proves the effectiveness of this visual print media in conveying dental and oral health messages. This booklet is theoretically aligned with Paivio's (1971) dual coding theory, which states that the human memory system processes information through two separate but complementary channels, namely the verbal channel (text/words) and the non-verbal or visual channel (images/illustrations) (Suanthara et.al, 2022). "Let's Brush Your Teeth: Healthy Teeth, *Happy Smiles*" is designed by integrating concise text and colorful images proportionally. This integration successfully minimizes the child's cognitive load, making it easier for the brain to encode and store information into long-term memory (Reza et al., 2024).

In addition, this media facilitates active learning, where students are not only passive listeners like conventional lecture methods, but are directly involved physically and mentally in reading, Observation. Visualization of toothbrushing techniques, as well as discussing them with peers (Reza et al., 2024). In the context of *oral health literacy* in children, this dual

stimulation is crucial (Reza et al., 2024). Elementary school-aged children are at the concrete operational stage of development, where they require concrete visual representations to understand abstract concepts such as bacterial plaque formation, the role of substrates, and the role of bacteria in the oral cavity, sucrose, and tooth enamel demineralization (Listrianah et al., 2019). Improving literacy through this booklet is a fundamental preventative measure to enable children to recognize the risk of caries and understand the importance of maintaining oral hygiene independently (Eldarita et al., 2023).

The findings of this empirical study confirm that the post-intervention knowledge spike is a fundamental initial phase in *the health empowerment process* (Maulana, 2018). *Based on the health behavior domain, knowledge* is a key determinant underlying the formation of attitudes and concrete actions (Darsini et al., 2019). Students who have a comprehensive understanding of dental health will have higher levels of self-efficacy *and* a sense of *perceived control* over their own health behaviors (Apriyani et al., 2024). When students understand precisely why they should brush their teeth twice a day (in the morning after breakfast and at night before bed) (Sulistyaningrum, 2019) and the correct brushing technique (Sriani et al., 2023), they are more likely to adopt the habit due to internal awareness, not external coercion. Furthermore, this mature knowledge capacity equips students to act as peer educators *in* the school environment (Reza et al., 2024). They can be small agents of change who remind their classmates to rinse their mouths after eating sweet foods (Utami et al., 2024), reprimand their peers for bad habits, or demonstrate a safe pea-sized (0.3 gram) dose of fluoride toothpaste (Dwimega, 2023).

Although the intervention results showed positive outcomes evenly distributed among the 60 respondents at Luqman Integrated Islamic Private Elementary School in Padang City, the evaluation should not be simplified. Evaluation should not generalize results without analyzing the contextual differences in the macro-environment (Rosada et al., 2024). The institutional characteristics of private elementary schools in urban areas *are generally* supported by a higher parental socioeconomic status profile, a well-established family education level, and broad access to digital information (Darsini et al., 2019).

Therefore, successful implementation in the field is heavily influenced by supporting factors (*encouraging factors*). Concrete support from schools, such as teachers' commitment to regular post-counseling supervision, the availability of adequate clean water sanitation facilities, and the availability of shared toothbrushes and toothpaste at school, are key catalysts that bridge students' theoretical knowledge into consistent daily practice (Ripana et al., 2024).

Without these environmental support factors, the knowledge gained from the textbook risks being wasted and not translated into permanent habits (Apriyan et al., 2024).

The researchers also recognized that the use of a single-group design without a control group (*a single-group pretest-posttest design*) in this study has inherent limitations in drawing absolute causal conclusions. The absence of a comparison group (*a control group*) poses several threats to internal validity, such as *history effects and maturation effects* (Sianturi, 2025). *History effects* refer to the possibility of external factors outside the research intervention occurring concurrently and influencing students' knowledge—for example, students coincidentally watching a dental education program on television or receiving counseling from parents at home during the observation period. Meanwhile, *maturation effects* refer to biological changes or increases in the child's natural cognitive developmental maturity over time that indirectly improve their ability to answer the posttest questionnaire (Guampe et al., 2025). To minimize these threats and increase the validity of causal conclusions, future research should employ true experimental designs such as *Randomized Controlled Trials* (RCTs) or at least quasi-experimental designs involving a control group for comparison (*a non-equivalent control group design*) (Wara et al., 2025).

Another limitation of this study is the lack of objective data regarding *students' actual toothbrushing practices* and the pattern of this behavior's distribution in the home environment. Measurements relying solely on written questionnaires (cognitive aspects) do not guarantee that all students (100%) consistently apply the circular toothbrushing technique (Fones) (Sriani et al., 2023) with a minimum duration of 120 seconds at home (Tandigau et al., 2023). This classic gap between knowledge and actual practice (*knowledge-practice gap*) should be recognized as a limitation and is recommended as a key topic for further research (Aurel, 2026). Further research is recommended using direct observation methods (both covert and overt) or independent notebook instruments validated with parental signatures (Cara et al., 2023). In addition, it is crucial to conduct longitudinal studies to measure the long-term impact of these interventions on reducing dental caries incidence clinically (e.g., tracking changes in students' DMF-T/def-t indices over the next 6 to 12 months), given that eliminating caries risk is the true clinical outcome to be achieved (Indanah et al., 2024).

In terms of practical and policy implementation, this booklet has great potential for integration into the School Health Program (UKS) as a standard medium for dental health education. The booklet's *low-cost characteristics* and ease of mass distribution make it highly feasible for sustainable implementation in various elementary schools (Natassa et.al, 2022). This integration step opens up opportunities for a solid strategic partnership between three main

pillars: schools, community health centers (Puskesmas), and the local Health Office. Schools facilitate time and facilities for daily habituation; Puskesmas plays a role in providing clinical supervision, cadre training, and routine monitoring through dental health checks (Rosada et al., 2024); while the Health Office acts as a regulator, establishing standardization of educational materials, allocating printing budgets, and formulating macro policies for program replication at the city level (Utami et al., 2024).

As a final recommendation, for this educational program to have a sustainable impact, the use of the booklet should not be implemented in isolation but should be combined with other community-based empowerment strategies to create a supportive ecosystem (Beama et al., 2020). Recommended operational steps include the formation of youth dental health cadres (little dentists) in schools. Selected student cadres are specifically trained to lead group toothbrushing activities after lunch and serve as *role models* for their peers in maintaining good hygiene (Reza et al., 2024).

On the other hand, active parental involvement should be strengthened through the use of regular school meeting forums (such as school committees or class associations) (Rofi'ah, 2025). In these forums, health workers can share special booklets for parents and align understanding regarding the importance of supervising nighttime tooth brushing before bed and limiting children's consumption of cariogenic foods at home (Haryani et al., 2020). Strong synergy between instructional interventions in schools and consistent behavioral conditioning in the domestic environment (home) will create a supportive environment that perpetuates the adoption of healthy dental health behaviors in children permanently (Indanah et al., 2024).

CONCLUSION

The implementation of the guidebook media has been proven effective and significantly improves elementary school students' knowledge about brushing their teeth as an effort to prevent dental caries, as indicated by an increase in the average score from the sufficient category to good overall and a strengthening of the statistical significance value of $p = 0.000$. The success of this intervention is not only limited to the delivery of theoretical information in a one-way manner, but also succeeded in instilling critical awareness and deep internal motivation in students. These cognitive and affective changes become the main foundation for the process of empowering children individually to be able to take independent control over clean and healthy living behaviors in caring for their oral organs.

As a practical policy implication, the Ministry of Education and the Ministry of Health are advised to adopt the booklet media. This low-cost program serves as a formal supplement to

the School Health Unit (UKS) program, accompanied by training of classroom teachers as educational facilitators and the provision of group toothbrushing practice facilities in schools. To address existing methodological limitations, further research is recommended to use a quasi-experimental design involving a comparison control group, conduct long-term clinical tracking of dental caries status, and measure empowerment indicators. Real-world outcomes such as adoption of self-care behaviors at home and student effectiveness as peer educators. Ultimately, it can be affirmed that school-based health promotion using simple media is a highly effective, efficient, and sustainable prevention strategy for reducing caries prevalence in children while making a significant contribution to achieving national oral health targets.

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