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**Effect of Mystery Box Dental Media on Dental Caries Knowledge**

**Satrio Dzikrul Lail<sup>1\*</sup>, Isnanto<sup>2</sup>, Sri Hidayati<sup>3</sup>**

*<sup>1,2,3</sup> Department of Dental Health, Polytechnic of Health Ministry health, Surabaya, Indonesia*

*\*Corresponding author: [satrioxmipa5@gmail.com](mailto:satrioxmipa5@gmail.com)*

**ABSTRACT**

**Background:** Dental caries persists as a major public health issue in the field of oral health due to its high prevalence among children of elementary school age. Insufficient knowledge has been identified as a contributing factor, particularly among students in grades 4–6 at Bajang 1 Talun Elementary School, Blitar Regency, which increases their vulnerability to dental caries. **Object:** This study aims to evaluate students' cognitive grasp regarding dental caries through the use of the Mystery Box Dental educational medium. **Method:** This research utilized a descriptive design and was conducted at Bajang 1 Elementary School, Blitar Regency, with a sample of 37 participants. Data collection was performed using structured questionnaires, and the responses were analyzed by calculating mean values, which were then expressed in percentages. **Results:** The findings of this study revealed an improvement in students' knowledge, shifting from the poor category to the good category. Thus, it can be deduced that the Mystery Box Dental medium effectively enhanced the knowledge of dental caries among students in grades 4–6 at Bajang 1 Elementary School, Blitar Regency, with the overall level of knowledge falling into the good category.

**Keywords:** Dental Caries, Knowledge, Mystery Box Dent

**BACKGROUND**

Dental caries is an infectious disease that causes damage to the hard tissues of the teeth and is usually characterized by the formation of cavities. The process of caries development is triggered by the activity of acid-producing bacteria through the fermentation of carbohydrates such as sucrose, fructose, and glucose. Among elementary school children, the prevalence of caries is greatly influenced by the habit of consuming cariogenic foods. The school-age period is particularly vulnerable to caries because children at this stage tend to consume sweet and sticky snacks and often exhibit suboptimal oral hygiene behaviors (Lansari, 2021).

Dental caries refers to the damage that occurs in the tooth structure, beginning in the enamel layer and potentially

progressing to the dentin. The primary causes of caries are the bacterial activities of *Streptococcus mutans* and *Lactobacillus*. The development of caries is influenced by several factors, including the condition of the tooth surface, the presence of cariogenic bacteria, the consumption of fermentable carbohydrates, the duration of exposure, and the level of oral cleanliness. In addition, there are external factors that also play a role, such as age, gender, socioeconomic status, environmental conditions, knowledge, awareness, and behaviors related to oral and dental health. Knowledge about food and beverages that can accelerate the occurrence of caries among children is also a contributing factor (Nuraini et al., 2022).

Cariogenic foods are highly favored by children, mainly because of their sweet

taste, sticky texture, and visually appealing colors. However, excessive consumption of such foods can increase the risk of dental caries formation. Moreover, children often fail to maintain proper oral hygiene due to low motivation and limited awareness of the importance of oral and dental care (Kusuma & taiyeb, 2020).

The school-age period is a stage with a high risk of dental caries, as children in this developmental phase generally tend to consume food and drinks according to their preferences without considering the impact on their oral and dental health. The intake of sweet foods containing carbohydrates, such as sucrose, is classified as cariogenic because it has the potential to trigger dental caries. Young children generally have a strong preference for consuming sweet foods; however, their awareness of maintaining and caring for oral hygiene remains very low (Afrinis et al. 2020).

According to data from the 2018 Basic Health Research (Riskesdas), the percentage of children who brush their teeth daily is relatively high—93.2% among children aged 5–9 years and 96.5% among those aged 10–14 years. Nevertheless, the number of children who brush their teeth at the correct time is still very low, with only 1.4% in the 5–9 age group and 2.1% in the 10–14 age group. This condition has implications for the high prevalence of oral and dental health problems, with the prevalence of dental caries reaching 73.4% (Kemenkes RI, 2018).

Based on dental examinations conducted on 10 students of SDN Bajang 1 Talun, Blitar Regency, it was found that 100% of them suffered from dental caries, with a DMF-T score of 2 and a def-t score of 2.9. The high number of caries cases among 4th to 6th grade students at SDN Bajang 1 Talun, Blitar Regency, is attributed to the lack of knowledge about dental caries. Interviews conducted with 10 students from grades 4 to 6 revealed that 8 students (80%) had poor knowledge regarding dental caries, while 2 students

(20%) had sufficient knowledge. This indicates that most 4th to 6th grade students at SDN Bajang 1 Talun, Blitar, still lack understanding and knowledge about dental caries.

Knowledge refers to understanding, thinking, and the ability to answer questions accurately. Both documents and human thoughts contain knowledge, which is reflected in attitudes and behaviors. One of the causes of oral and dental health problems is behavioral factors that stem from a lack of knowledge about dental caries. This lack of knowledge is often due to inadequate health promotion efforts. For elementary school children, oral health promotion media should be adapted to their age characteristics (Pariati & Jumriani, 2021).

Promotive efforts through educational activities generally utilize media such as posters, dental phantoms, or flip charts. In practice, health education is often delivered through lectures and direct explanations. However, this approach has limitations because it tends to be monotonous and less engaging for children. As a result, students often become passive, acting only as listeners and observers (Oktaviani et al., 2022). Such conditions may lead to boredom and reduced concentration, affecting their ability to listen, pay attention, and understand the material presented.

This situation illustrates that students' interest in lecture-based education using conventional media remains low. Therefore, the researcher took the initiative to use an alternative medium called the Smart Dental Box. This medium is designed to resemble a game and is equipped with audio features that deliver information about dental and oral health. The researcher's interest in using the Smart Dental Box arose from its potential to increase students' enthusiasm and comprehension (Abral et al., 2020).

Mystery Box Dental is a set of educational tools designed to teach students about dental caries knowledge. When used

as an educational aid, the Mystery Box Dental has both advantages and disadvantages. Its advantages include being easy to use, helping students better understand the content related to dental caries, and being more effective for educational activities. However, its main disadvantage is that it is easily damaged since it is made of cardboard. This study aims to determine the level of knowledge about dental caries among elementary school students before and after health education using the Mystery Box Dental media.

## RESEARCH METHODE

### Description of Materials or Research Subjects

The subjects of this study were 37 students from grades 4 to 6 at SDN Bajang 1 Talun, Blitar Regency, Indonesia. The participants were selected because of their relevance to the study's objective, which was to measure knowledge about dental caries among elementary school students. All participants were included based on their enrollment in the school and their willingness to participate, with no exclusion criteria applied.

### Research Design

This research employed a descriptive design aimed at describing the level of students' knowledge about dental caries before and after health education using the *Mystery Box Dental* media. The design allowed the researcher to observe changes in knowledge without manipulating any variables, thereby focusing on the natural responses of the participants after exposure to the educational intervention.

### Research Location and Period

The research was conducted at SDN Bajang 1 Talun, Blitar Regency. The data collection process took place over a period of eight months, starting from August 2024 until March 2025.

## Research Procedure

The research procedure was divided into three main stages:

1. Preparation Stage
  - a. The researcher obtained research permission from the principal of SDN Bajang 1 Talun.
  - b. Coordination was made with the class teachers to determine appropriate research schedules.
  - c. The researcher developed the Mystery Box Dental media to be used during the health education activity.
2. Implementation Stage
  - a. Permission was obtained from the grade IV class teacher.
  - b. Students from grades 4–6 were asked to complete a pretest questionnaire to assess their initial knowledge of dental caries.
  - c. The completed pretest questionnaires were collected.
  - d. A health education session on dental caries was conducted using the Mystery Box Dental media.
  - e. After the session, students were given a posttest questionnaire to evaluate changes in their knowledge levels.
3. Data Processing Stage
  - a. The completed posttest questionnaires were collected.
  - b. Each correct answer was assigned a score of 5, while incorrect answers received a score of 0.
  - c. The total number of correct and incorrect answers was calculated and summarized for analysis.

## Instruments and Equipment

The primary research instrument used in this study was a structured questionnaire designed to assess students' knowledge of dental caries. The questionnaire consisted of multiple-choice questions related to the causes, prevention, and effects of dental caries. The educational medium used in the intervention was the Mystery Box Dental, a cardboard-based

interactive tool that allows students to learn through play and auditory cues.

### Data Collection Methods

Data collection was conducted using pretest and posttest questionnaires administered before and after the educational intervention. This method aimed to measure changes in students' knowledge following exposure to the Mystery Box Dental media. The data collection process ensured consistency by administering the same set of questions in both tests.

### Data Analysis

Data were analyzed using descriptive statistics. The percentage method was used to determine the proportion of correct responses both before and after the intervention.

### Research Ethics

This study has received an ethical exemption from the Health Research Ethics Committee of the Surabaya Ministry of Health Polytechnic (Poltekkes Kemenkes Surabaya) under reference number No.EA/3661/KEPK-Poltekkes\_Sby/V/2025. The ethical assessment was conducted in accordance with the seven WHO 2011 standards, which include social values, scientific values, the balance of risks and benefits, confidentiality, and informed consent in accordance with the 2016 CIOMS Guidelines. This ethical approval is valid from 25 July 2025 to 25 July 2026.

## RESULT AND DISCUSSION

This research was conducted at SDN Bajang 01, which is located in the center of Blitar City, near residential areas with easily accessible transportation routes, as it is situated close to the surrounding community. The total number of students enrolled at SDN Bajang 1 Talun, Blitar Regency, from grades 1 to 6 is 49 students. The school employs one principal, one teacher for Islamic Religious Education, one teacher for Christian Religious Education, one teacher for Physical and Spiritual Education, six homeroom teachers, and one extracurricular scout instructor.

**Table 1.**

Frequency Distribution of Gender Among Pupil sat Bajang 01 Primary School

Gender	Frequency	Percentage (%)
Male	16	43.2
Female	21	56.8
<b>Total</b>	<b>37</b>	<b>100</b>

**Table 2.**

Frequency Distribution of the Ages of Pupils at Bajang 01 Primary School

Age (Years)	Frequency	Percentage (%)
8 Years	15	40.1
9 Years	13	35.1
10 Years	9	24.3
<b>Total</b>	<b>37</b>	<b>100</b>

### Students' Knowledge of Dental Caries Prior to the Lecture

**Table 3.**

Distribution of Respondent Data Prior to Education Using the Mystery Box Dental Media

No	Question	Respondents' Answers			
		Correct		Incorrect	
		Σ	%	Σ	%
1	Which picture shows a decayed tooth?	37	100	0	0
2	What do you know about tooth decay?	8	22	29	78
3	What is the infectious disease that can damage the hard tissue of the tooth called?	16	43	21	57
4	What can cause tooth decay?	19	51	18	49

No	Question	Respondents' Answers			
		Correct		Incorrect	
		Σ	%	Σ	%
5	The cause of tooth decay is the sticking of food residues containing bacteria, called what?	14	38	23	62
6	Food that sticks to teeth will form plaque containing bacteria that can cause tooth decay, called what?	13	35	24	65
7	What types of food can cause tooth decay?	22	59	15	41
8	What are the early signs of tooth decay formation?	17	46	20	54
9	What are the characteristics and color of decayed teeth?	18	49	19	51
10	What kind of sensation will arise when the tooth starts to decay?	16	43	21	57
11	What are the effects of tooth decay?	14	38	23	62
12	What are the adverse impacts that may occur due to tooth decay?	12	32	25	68
13	If a decayed tooth is not treated, what can it cause?	16	43	21	57
14	How can we prevent tooth decay?	12	32	25	68
15	How many times a day should we brush our teeth?	13	35	24	65
16	What should we do to keep our teeth healthy after consuming sweet and sticky foods?	20	54	17	46
17	What types of food can prevent tooth decay?	31	84	6	16
18	What kind of treatment should be done so that decayed teeth do not get worse?	20	54	17	46
19	Is the treatment for tooth decay only by filling it?	8	22	29	78
20	What are the benefits of filling treatment for decayed teeth?	12	32	25	68
<b>AVERAGE</b>		<b>20</b>	<b>46%</b>	<b>17</b>	<b>54%</b>
<b>CATEGORY</b>		<b>POOR</b>			

Table 3 shows that the majority of upper-grade students at SD Bajang 01 Talun, Blitar Regency have a low level of knowledge. Most respondents were not yet aware of the causes of dental caries, the signs and symptoms, the effects, and the preventive measures of caries. However, it was found that most respondents understood the definition of dental caries.

**Table 4.**

Distribution of Respondents' Answers Before Education Using the Mystery Box Dental Media

Knowledge Category	Total	Percentage (%)
Good	0	0
Fair	3	8
Poor	34	92
<b>Total</b>	<b>37</b>	<b>100</b>

Table 4 shows that the average knowledge of upper-grade students at SD Bajang 01 Talun, Blitar Regency falls into the low category. Most students did not know about the causes of dental caries, the signs and symptoms, the effects, and the proper care for teeth affected by caries. However, almost all respondents were aware of the definition of dental caries and its preventive measures.

**Table 5.**

Distribution of Respondent Data After Education Using the Mystery Box Dental Media

Knowledge Category	Total	Percentage (%)
Good	32	86
Fair	5	14

Knowledge Category	Total	Percentage (%)
Poor	0	0
<b>Total</b>	<b>37</b>	<b>100</b>

Table 5 indicates that the majority of upper-grade students at SD Bajang 01 Talun, Blitar Regency possess a good level of knowledge about dental caries, while only a small portion of students demonstrate limited understanding. This finding

suggests that the use of educational media, such as the Mystery Box Dental, has contributed positively to improving students' awareness and comprehension regarding the causes, symptoms, and prevention of dental caries. Overall, the results reflect a noticeable improvement in students' knowledge following the implementation of the health education program.

**Table 6.**

Distribution of Respondents' Answers After Education Using the Mystery Box Dental Media

No	Question	Respondents' Answers			
		Correct		Incorrect	
		Σ	%	Σ	%
1	Which picture shows a decayed tooth?	37	100	0	0
2	What do you know about tooth decay?	31	84	6	16
3	What infectious disease can damage the hard tissue of the tooth?	36	97	1	3
4	What can cause tooth decay?	36	97	1	3
5	Tooth decay is caused by food residues containing bacteria that stick to the teeth. What is it called?	33	89	4	11
6	Food that sticks to teeth becomes plaque containing bacteria that can cause the tooth to become...?	31	84	6	16
7	What kind of food can cause tooth decay?	34	92	3	8
8	What are the early signs of tooth decay formation?	30	81	7	19
9	What are the characteristics and color of a decayed tooth?	33	89	4	11
10	What sensation will you feel when the tooth starts to decay?	33	89	4	11
11	What are the consequences of having decayed teeth?	30	81	7	19
12	What are the negative impacts that may occur due to tooth decay?	26	70	11	30
13	If a decayed tooth is not treated, what can it cause?	33	89	4	11
14	How can we prevent tooth decay?	30	81	7	19
15	How many times a day should we brush our teeth?	29	78	8	22
16	What should we do to keep our teeth healthy after consuming sweet and sticky foods?	32	86	5	14
17	What kind of food can help prevent tooth decay?	35	95	2	5
18	What treatment should be done to prevent a decayed tooth from getting worse?	28	76	9	24
19	Is treatment for tooth decay only through filling?	20	54	17	46
20	What is the benefit of filling treatment for decayed teeth?	22	59	15	41
<b>AVERAGE</b>		<b>31</b>	<b>84%</b>	<b>6</b>	<b>16%</b>
<b>CATEGORY</b>		<b>GOOD</b>			

Table 6 shows that the average knowledge of upper-grade students at SD Bajang 01 Talun, Blitar Regency falls into the good category. Most respondents demonstrated a solid understanding of the definition of dental caries, its causes, signs and symptoms, effects, and preventive measures. However, there were still some students who lacked knowledge about the

proper ways to care for teeth affected by caries. This indicates that while the educational intervention was effective in enhancing students' general understanding of dental caries, further emphasis is needed on practical aspects of dental care and treatment to ensure comprehensive oral health awareness.

**Table 7.**

Distribution of Respondent Data Before and After the Educational Session Using the Dental Mystery Box

Knowledge Category	Before		After	
	Number	Percentage	Number	Percentage
Good	0	0	32	86
Fair	3	8	5	14
Poor	34	92	0	0
<b>Total</b>	<b>37</b>	<b>100</b>	<b>37</b>	<b>100</b>

Table 7 shows that before the health education session was conducted, the majority of students were in the low knowledge category. However, after the intervention, there was a significant improvement, with most students shifting to the good knowledge category. This finding indicates that the use of the Mystery Box Dental media was effective in enhancing students' understanding of dental caries. The interactive and engaging nature of the learning media helped increase students' interest and participation, ultimately leading to better comprehension and retention of the information delivered during the health education session.

### Discussion

The purpose of this study was to describe the level of knowledge about dental caries among students in grades 4–6 at SD Bajang 1 Talun, Blitar Regency. The evaluation results showed that the students' initial understanding, as measured using the Mystery Box Dental media, was still categorized as low. However, after the health education session using the Mystery Box Dental media, there was a noticeable

improvement in their level of knowledge. The following section provides a more detailed explanation of these findings.

### Knowledge of Dental Caries Among Children in Grades 4-6 at Bajang 1 Talun Elementary School, Blitar Regency, Prior to Education Using the Mystery Box Dental Media

Based on the research findings, it was revealed that the respondents still had a limited understanding of dental caries. This lack of knowledge covered various aspects, including the causes of caries, the signs and symptoms, the effects, the preventive measures, and the treatment procedures for dental caries. The students' low level of knowledge was likely due to the lack or absence of oral health education.

To improve their understanding, educational interventions using engaging media such as the Mystery Box Dental are necessary. Based on data analysis of students in grades 4–6 at SD Bajang 1 Talun, Blitar Regency, it was found that before receiving counseling using the Mystery Box Dental media, their level of knowledge about dental caries was still in the low category. According to Anggreini et

al., knowledge refers to the extent to which an individual understands a particular concept. The main components of knowledge include the individual as the subject who knows, the object as the target of knowledge, and awareness of what is being understood (Angreini et al., 2023). This study is consistent with the findings of Novitry and Lilia, which showed that the knowledge of students at SDN 3 Muaradua regarding dental caries was also in the low category before educational intervention using media (Novitry & Lilia, 2022).

The majority of students in grades 4–6 at SD Bajang 1 Talun, Blitar Regency, did not fully understand the causes of dental caries. According to Hidayati et al., sweet, soft, and sticky foods such as chocolate can potentially trigger tooth decay. However, some respondents were still unaware that food debris left in the oral cavity and not cleaned immediately could also contribute to the development of caries. Therefore, in addition to understanding the causes of caries, respondents need to possess comprehensive knowledge about maintaining optimal oral and dental health (Hidayati et al., 2022).

Most students in grades 4–6 at SD Bajang 1 Talun, Blitar Regency, did not yet understand the characteristics of dental caries, and the majority of respondents were also unable to recognize the signs and symptoms associated with the condition. According to Hartami et al., one of the early indications of dental caries is the appearance of white spots on the tooth surface, which signify enamel demineralization and may gradually turn brown over time. Other common symptoms include pain, discomfort due to enamel exposure, and the possible formation of abscesses if the condition progresses untreated (Hartami et al., 2022).

Most students in grades 4–6 at SD Bajang 1 Talun, Blitar Regency, also lacked understanding of the consequences of dental caries. The effects of dental caries arise from the destruction of the hard tissues of the teeth due to bacterial activity in the

oral cavity. Students' limited awareness of the consequences particularly regarding appearance is likely caused by their lack of knowledge about the relationship between oral health and physical appearance. According to Hidayati et al., dental caries not only interferes with the chewing process but also affects appearance and speech function. Damaged teeth can lead to bad breath, and if left untreated, the decay may worsen, causing nerve death and ultimately rendering the tooth nonfunctional (Hidayati et al., 2021).

Furthermore, most students in grades 4–6 at SD Bajang 1 Talun, Blitar Regency, did not have sufficient knowledge regarding preventive efforts against dental caries. Caries prevention involves a series of actions aimed at avoiding tooth damage caused by plaque formation and acid production from bacterial activity in the mouth. Therefore, according to Fifiana et al., preventive measures include brushing teeth regularly (after breakfast in the morning and before bed at night), consuming fibrous foods, having routine dental check-ups, and applying fissure sealants to protect tooth surfaces from caries risk (Fifiana et al., 2023).

Most students in grades 4–6 at SD Bajang 1 Talun, Blitar Regency, lacked understanding of dental caries treatment. According to Abadi et al., dental caries treatment can be carried out through filling or extraction procedures. Tooth extraction is typically the last resort when the damage is severe and filling is no longer possible. For elementary school-aged children, the most common treatments include fissure sealing or strengthening the enamel surface to prevent further damage. Thus, the results of this study are consistent with existing theories, showing that insufficient knowledge can contribute to the occurrence of dental caries (Abadi et al., 2023).

### **Knowledge of Dental Caries Among Children in Grades 4-6 at Bajang 1 Talun Elementary School, Blitar**

### **Regency, After Education Using the Mystery Box Dental Media**

After the counseling session using the Mystery Box Dental media, the results showed a significant increase in knowledge among students in grades 4–6 at SD Bajang 1 Talun, Blitar Regency. Before the counseling, most students were categorized as having low levels of knowledge, whereas after the intervention, the respondents' knowledge was classified as good. This improvement was attributed to the use of the Mystery Box Dental media, which effectively facilitated the delivery of information about oral and dental health to elementary school students, making it easier for them to understand.

The improvement in students' knowledge was strongly influenced by learning methods that aligned with individual characteristics. The learning process becomes more effective when supported by media that match students' learning styles and cognitive development levels, as this enhances comprehension. One of the educational tools that supports effective learning is Mystery Box Dental, an educational medium in the form of a box containing hidden and surprising materials related to oral and dental health. This design stimulates students' curiosity about dental caries (Akyun et al., 2025).

According to Kusumaningrum et al., the Mystery Box Dental media is effective in improving oral health knowledge among elementary school students (Kusumaningrum et al., 2025). Similarly, Khoiry states that Mystery Box Dental has a more significant influence on the learning process compared to conventional methods (Khoiry, 2023). The Mystery Box Dental serves as a tangible learning medium that conveys oral health information in a concealed and engaging manner within the box, making the learning experience more interactive and memorable (Chandrasekaran et al., 2025).

The increase in knowledge also aligns with the Stimulus-Organism-Response (SOR) theory, which explains

that the delivery of stimuli. In this case, counseling through the Mystery Box Dental media can trigger visual and kinesthetic responses that engage elementary school students (Erensoy et al., 2024). In this context, the organism refers to the learners themselves, who possess individual characteristics and are at specific stages of cognitive development, making them more receptive to interactive learning media. The response, therefore, is the observable improvement in students' understanding of dental caries, resulting from a learning process tailored to their needs and abilities.

The findings of this study indicate that the use of Mystery Box Dental media can serve as an effective educational tool for oral health promotion, enhancing respondents' knowledge levels. Before the counseling session, the respondents' knowledge level was categorized as low; however, after the counseling activity, there was a noticeable increase, placing them in the good category. This demonstrates that the educational intervention successfully addressed the main issue identified in the study the low level of oral health knowledge among elementary school students, which was primarily due to the lack of health education activities and the limited availability of engaging educational media. Therefore, the results of this study align with the hypothesis that the Mystery Box Dental media can effectively improve students' knowledge about dental caries.

### **CONCLUSIONS**

Based on the results of the study entitled Knowledge About Dental Caries Using the Mystery Box Dental Media Among Grade 4–6 Students at SD Bajang 1 Talun, Blitar Regency, it can be concluded that the level of knowledge about dental caries among students before the use of the Mystery Box Dental media was categorized as low. However, after the implementation of the Mystery Box Dental media, the students' level of knowledge improved significantly and was categorized as good.

## CONFLICTS OF INTEREST

The authors declare that there is no conflict of interest in this manuscript.

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