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Knowledge of Dental Caries Through the Use of the Snakes and Ladders Game Among Fourth-Grade Students (A Study At UPT SDN Pulorejo, Jombang)

Monicha Ednin Mayfa Azhara[1], Silvia Prasetyowati[2], Agus Marjianto[3]
[1,2,3]Poltekkes Kemenkes Surabaya
Email: monichaednin01@gmail.com[1], prasetyowatisilvia@gmail.com[2], marjiantoagus@poltekkes-surabaya.ac.id[3]

Abstract

"Dental and oral health are an important part of overall health, especially among elementary school-aged children, who are at a relatively high risk of developing dental caries. Preliminary observations of fourth-grade students at SDN Pulorejo in Jombang indicate that the incidence of dental caries remains relatively high. Therefore, this study aims to describe the level of knowledge among fourth-grade students at SDN Pulorejo Jombang regarding dental caries before and after receiving health education using the Snakes and Ladders game as a teaching aid. This study employed a descriptive design with a sample size of 31 students. Data were collected through pretest and posttest questionnaires and analyzed descriptively using frequency distributions and mean values. The results showed that before the educational session, the students' average level of knowledge was 48.38%, which fell into the "insufficent" category. After participating in the educational session using the "Snakes and Ladders" game, the average knowledge score increased to 77.09%, falling into the "good" category. Oral health education using the "Snakes and Ladders" game was effective in improving students' knowledge of dental caries."

Keywords: Knowledge, Dental Caries, Snakes and Ladders Game, Elementary School Students

1. INTRODUCTION

Oral health can be defined as a state of well-being that enables a person to eat, speak, and interact socially effectively without experiencing functional impairments, aesthetic issues, or discomfort. Proper dental hygiene serves an essential function in supporting productivity in all aspects of life, both social and economic (Rachmawati et al., 2023). However, dental health issues remain a major concern, particularly among elementary school-aged children. At this age, children require intensive care and education because they are transitioning from baby teeth to permanent teeth.

One of the dental problems commonly experienced by children is dental caries (Nisyak et al., 2022). This condition occurs due to bacterial activity that damages the structure of dental tissue, starting from the outermost layer such as enamel and then spreading to the inner layers, such as dentin and cementum. Dental caries develops through a gradual process resulting from the interaction of various factors, including the host, microorganisms, diet, and time. In children, dental caries can be influenced by the child's knowledge of oral hygiene, the arrangement of teeth in the jaw, tooth morphology, and tooth structure (Wati, 2022). Dental caries is a chronic condition, and their development advances gradually across a fairly extended duration (Dewi et al., 2025).

"According to the results of the Basic Health Research (RISKESDAS), the most significant oral health problem in Indonesia is dental caries, affecting 45.3% of the population. The national DMF-T index averages 7.1 across all age groups, while the DMF-T index for the 10–14 age group averages 1.8. The prevalence of dental caries in East Java is 42.4%; among children aged 10–14, it is 41.4%; and in Jombang Regency, the prevalence among children aged 10–14 is 38.98%

(Indonesian Ministry of Health, 2018)."

This problem was also found among fourth-grade students at SDN Pulorejo in Jombang. Observation results showed that of the 31 students, 80.6% had dental caries. Most students did not fully understand dental caries and simply regarded it as ordinary cavities. The high incidence of dental caries indicates a problem with oral health maintenance among fourth-grade students at SDN Pulorejo. This situation calls for more engaging educational efforts to improve students' knowledge so that they can properly maintain their oral health.

"A lack of knowledge about dental caries causes children to be unaware of the importance of maintaining good oral hygiene. Harmful behaviors, such as neglecting to brush their teeth or frequently consuming sugary foods, make children highly susceptible to dental and oral diseases (Arnetty et al., 2025). Until now, the health education provided to students has been general in nature and has not focused on the issue of dental caries. Therefore, there is a need for innovative, engaging learning materials that are appropriate for elementary school-aged children. A suitable method for such learning is through games, one of which is Snakes and Ladders".

"The Snakes and Ladders game can serve as a learning tool for elementary school children because it is interactive, competitive, and fun (Sitanaya et al., 2021). Through the Snakes and Ladders game, material on the definition, causes, and prevention of dental caries can be presented in a more engaging way, thereby enhancing students' knowledge. Games in the learning process can impart knowledge through play-based learning and support children's intellectual, social, emotional, and physical-motor development (Suhendi et al., 2021). The Snakes and Ladders game technique can additionally elevate students learning drive and inspire their active involvement during study sessions".

Theoretically, applying the Snakes and Ladders game within this investigation can be accounted via the Stimulus–Organism–Response (S-O-R) model. The S-O-R doctrine demonstrates that cues received by an individual are processed via the organism and results through a response. In this study, the Snakes and Ladders game served as a stimulus in the form of an educational game interface, images, game rules, and messages about dental health. These stimuli are then processed by the students as organisms through their attention, motivation, thinking skills, experience, and interest in the game. This process is expected to result in a response in the form of increased knowledge regarding the definition, causes, effects, and prevention of dental caries (Abidin, 2021; Notoatmodjo, 2018b).

Employing the Snakes and Ladders board as a dental health instruction medium gets backed via multiple prior researches. Sitanaya et al. (2021) exhibited that a Snakes and Ladders game simulation held a substantial impact on enhancing dental and oral health awareness among primary school kids, featuring a p-value of 0.00. Research by Rachman et al. (2025) also displayed a rise in students awareness regarding tooth decay following education utilizing the Snakes and Ladders game, where 92.8% of students fell into the "good knowledge" category.

Grounded on prior talk, an urge stays to deploy interactive learning tools shaped toward elementary schoolers profiles concerning dental caries inside SDN Pulorejo located at Jombang. This research novelty sits inside traditional snakes-and-ladders board application custom-made educating fourth graders SDN Pulorejo Jombang about dental caries, by comparing students' knowledge levels before and after using this medium. Furthermore, this study does not merely treat the snakes and ladders game as a medium for conveying information. Instead, the game is also used as an educational stimulus, as explained by the Stimulus-Organism-Response (S-O-R) theory.

2. METHOD

This study was conducted at SDN Pulorejo in Jombang, with 30 fourth-grade students as the research subjects. The research design used in this study was a descriptive study. A descriptive study is a type of research that employs statistical analysis to summarize, present, and explain the characteristics of data based on the obtained sample (Swarjana, 2016). This research design was used to describe the fourth-grade students' knowledge of dental caries at SDN Pulorejo, Jombang, before and after the use of the "Snakes and Ladders" game as a teaching aid."

Information gathering executed via handing out pre-test alongside post-test forms. These steps regarding data collection procedures followed thus: distributing initial questionnaires toward participants measuring their awareness degrees concerning tooth caries prior intervention; performing intervention by delivering instruction about dental cavities utilizing the "Snakes and Ladders" board; and lastly, administering final surveys assessing respondents knowledge levels regarding dental decay following implementation.

The collected data was then processed and analyzed through several stages, namely tabulation, editing, and coding. During the coding stage, responses to the questionnaire were assigned a score of 1 for correct answers and 0 for incorrect answers. Afterward, the results of the knowledge assessment were calculated using the following formula (Nursalam, 2016):

$$\text{Assesment Criteria} = \frac{Total\ Score}{Maximum\ Possible\ Score} x\ 100$$

The results of these assessment criteria were then categorized according to the following scale: Good = 76–100%; Fair = 56–75%; Insufficient = <56%

3. RESULT AND DISCUSSION

Table 1. "Distribution of Dental Caries Knowledge Levels Among Fourth-Grade Students at SDN Pulorejo Before and After Receiving Education Using the Snakes and Ladders Game in 2026"

Variable	Mean	Percentage(%)	Category
"Knowledge of Dental Caries Among Fourth-Grade Students at SDN Pulorejo Before Receiving Education Using the Snakes and Ladders Game in 2026"	15	48,38	Insufficient
"Knowledge of Dental Caries Among Fourth-Grade Students at SDN Pulorejo After Health Education Using the Snakes and Ladders Game in 2026"	25	77,09	Good

Based on Table 1, the students' average knowledge score regarding dental caries before the educational session using the Snakes and Ladders game was 15, representing 48.38% and falling into the "inadequate" category. After the educational session, the average score increased to 25, representing 77.09%, and fell into the "good" category. Thus, there was a 28.71% rise inside average knowledge grades subsequent educational sessions utilizing the Snakes and Ladders game.

"Pupils understanding concerning tooth decay ahead of getting instruction through the Snakes and Ladders game indicated that their knowledge level fell into the "insufficient" category. This was evident from the still-low percentage of correct answers on several indicators, particularly regarding knowledge of dental caries and the factors underlying its occurrence. The low level of students' knowledge about dental caries was attributed to a lack of educational

materials that were engaging and easy for students to understand. This situation indicates that the use of learning media is important to help enhance students' thinking, attention, and interest (Ali et al., 2024). The low level of students' knowledge prior to the educational intervention is also consistent with the study conducted by Sawitri et al. (2024). In that study, which examined the effectiveness of teaching dental caries knowledge using a "Snakes and Ladders" game among elementary school students, students' knowledge scores on the pre-test were predominantly in the "inadequate" category."

This reduced understanding level gets additionally impacted via age traits defining elementary school pupils, currently staying within concrete operational stages regarding cognitive growth. Following Piaget cognitive development doctrine, kids aged 7 until 11 years learn more effectively through concrete experiences and visual media that can stimulate attention and enhance understanding (Argasiam, 2024). Therefore, before being provided with educational materials tailored to children's developmental characteristics, students' understanding of dental caries tends to remain low (Santrock et al., 2014).

Another contributing factor is the lack of oral health maintenance habits in daily life. Children who are not accustomed to receiving guidance on how to brush their teeth properly or who do not receive education about the effects of dental caries tend to have insufficient knowledge. This lack of knowledge can lead to low awareness of the importance of regular toothbrushing, thereby increasing the risk of dental caries (Malawat & Rosmalia, 2025).

"The low level of students' knowledge prior to the intervention can be explained by the Stimulus-Organism-Response (S-O-R) theory. According to Notoatmodjo, (2018), based on the Stimulus–Organism–Response (S-O-R) theory proposed by Skinner, students' low level of knowledge about dental caries before receiving education through the Snakes and Ladders game may be caused by suboptimal stimuli received by students regarding oral health information. Limitations in delivering engaging and interactive information caused the organism—that is, the students—to pay insufficient attention and fail to process the information to the fullest extent. Consequently, the resulting response was a level of knowledge that remained in the "inadequate" category. This indicates that without effective educational stimuli, the process of knowledge formation does not proceed optimally."

Following the intervention using the Snakes and Ladders game, the students' knowledge scores fell into the "good" category. During the educational session, no obstacles were encountered, and the students were able to participate without the teacher's assistance. This improvement was due to the students' ability to understand the material presented, which covered the definition of dental caries, factors influencing dental caries, and knowledge of how to prevent dental caries. The Snakes and Ladders game can increase children's interest through movement, colorful visuals, educational images, and brief text relevant to the educational material (Arja et al., 2025; Aura et al., 2024; Darmawan et al., 2025).

The effectiveness of the "Snakes and Ladders" educational game in this study stems from the inclusion of motor activities or movements that provide students with opportunities to observe and reflect on the activities they have been taught, thereby preventing them from becoming easily bored (Notoadmodjo, 2018). The effectiveness surrounding the "Snakes and Ladders" board in elevating awareness gets accounted through theories concerning children cognitive development. Primary school students sit inside concrete operational stages, whichis a transitional period from preoperational to concrete operational thinking (Sutisna & Laiya, 2020). At this stage, children find it easier to understand concepts presented through real objects, pictures, or hands-on activities.

Through the use of the Snakes and Ladders game, students not only passively receive information but also gain a learning experience that involves observation, discussion, and interaction with peers—this aligns with the elementary school learning principle of "learning by doing" (Darmawan et al., 2025). At this age, children are already capable of abstract thinking, using hypothetical reasoning, and connecting the information they receive to conditions in their surrounding environment. Knowledge gains among fourth-grade students can also be influenced by the use of learning media that facilitate the process of information acquisition.

The outcomes of this research get backed through multiple prior investigations revealing that employing the "Snakes and Ladders" board as an instructional medium proves efficient in boosting primary school pupils awareness regarding oral health. Moreover, decay prevention teaching utilizing the Snakes and Ladders game has likewise displayed enhancing student knowledge subsequent educational sessions. These findings point out that the Snakes and Ladders game stands as an efficient instructional tool for elevating awareness concerning dental cavities among elementary school aged children (Sawitri et al., 2024).

"According to the S-O-R theory proposed by Skinner (as cited in Notoatmodjo, 2018), changes in behavior or knowledge occur through three stages: the stimulus (S), which involves providing education using the Snakes and Ladders game as a medium; the organism (O), namely the students as recipients of information who process, understand, and interpret the health messages conveyed during the game; and the response (R), which is an increase in knowledge about dental caries after receiving the stimulus. A snakes-and-ladders game that is presented in an engaging and interactive manner and accompanied by educational messages can increase students' attention, interest, and active involvement in the learning process. These conditions make it easier for students to receive and retain information regarding the causes, prevention, and effects of dental caries, resulting in a greater increase in knowledge compared to before the intervention was administered."

Thus, the increase in knowledge observed in this study can be seen not only in the difference in scores before and after the educational session but can also be understood through the process by which students received the educational stimuli. The interactive nature of the game and its emphasis on hands-on activities allow students not only to passively receive information but also to learn through observation, interaction, and the experience of playing. This matches with traits belonging to primary school pupils, who spot it simpler grasping ideas through tangible objects, pictures, alongside hands-on activities.

4. CONCLUSION

Grounded on research findings, pupils understanding regarding dental caries prior gaining instruction via the Snakes and Ladders game sat inside poor category, standing at 48.38%. Following receiving education, their awareness elevated toward good category, hitting 77.09%. Thus, the Snakes and Ladders game proves efficient in boosting student knowledge levels and might function as an engaging alongside interactive instructional tool for elevating learners understanding concerning dental decay..

Parents and school teachers are advised to play an active role and utilize interactive and creative educational media when presenting health-related material, particularly regarding oral health. For future researchers, it is hoped that they can develop further studies by including a control group to enhance the validity of the research findings and by incorporating qualitativemethods to obtain more comprehensive information regarding respondents' perceptions and experiences that cannot be fully captured through questionnaires.

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