

# Board Game as an Educational Game Media to Change the Attitude of Dengue Prevention in School-Aged Children

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## Abstract

Indonesia is the second highest country for dengue prevalence, and the cases have rapidly increased in the last 45 years. The study aimed to identify the attitude of the children about dengue prevention and develop an educational game to teach new information about it.

Methods: This study uses a quasi-experimental design with pre and post-test with the control group. The participants are school-age children from 10 to 12 years old, with a total of 92 participants, 46 for each group. The results show a significantly increasing score at children's attitude of dengue prevention before and after intervention except for the strategy of closing the water storage ( $p=0.008$ ). The other strategy that gets significantly increasing score are fever and fever management ( $p=0.000$ ), draining the water storage ( $p=0.001$ ), checking the water storage ( $p=0.000$ ), recycling ( $p=0.000$ ), chemistry agent ( $p=0.000$ ), biology agent ( $p=0.000$ ), self protection ( $p=0.001$ ), immune system ( $0.000$ ). There are different attitude between control and intervention groups ( $p=0.000$ ). The conclusion is the dengue board game can be an educational game media to give dengue prevention information to children, also can improving the attitude of dengue prevention.

**Keywords:** board game; dengue prevention strategy; school-aged children

## 1. Introduction

Dengue fever is a major endemic disease caused significant mortality and morbidity in the tropical and sub-tropical area, particularly in developing country (1). Indonesia is the second highest endemic country for dengue fever prevalence (129.435 cases) after Brazil (447.466 cases) (2). The incidence of dengue fever in Indonesia has rapidly increased in the last 45 years, from 0.05 cases in 1968 to 35-45 cases per 100.000 populations in 2013. In 2015, there were 129.650 cases with 1,071 deaths (incidence rate (IR) = 50.75 per 100,000 population, case fatality rate (CFR) = 0.83%) (3).

Children at the age group 6-14 years old have the highest rates of dengue fever (78,2%) compared to other age groups. Children have limited performance in the hemodynamic system to compensate the capillary damage caused by dengue infection so that the mortality rate in children is higher than the other age group (4). In children under 15 years old have a hospital case that caused by dengue with a total of 25% (5).

The Indonesian government has conducted several programs for controlling the dengue fever transmission, such as the epidemiological investigation of DHF cases by the village and community health center surveillance team in the affected region, community deal dengue fever, health promotion about dengue for the community, PSN (Mosquito Nest Eradication), and PJB (Periodic Larva Monitoring), but the efforts have not sufficiently effective in reducing the cases (3). Especially in Yogyakarta, there were increasing cases from 2009 to 2015, and Yogyakarta is the fourth highest incident in Indonesia (IR = 92.96%) (6).

Community participation (including in children) is an essential factor in controlling the transmission of dengue fever (2). With total incidence in children is high, they supposed to be have been given the skill to prevent dengue fever by themselves. Some dengue prevention programs that are conducted by the government have not been specifically aimed at the children. In school-age children, health promotion is undertaken to improve the health status of the students and preventing disease so that they can obtain good academic achievement (7).

Behavior has a relation by the knowledge and the attitude in dengue fever prevention (8). A right approach to the prevention of dengue fever can provide a long-term effect on better behavior. In the effort to increase the attitude of dengue fever prevention in a child, required an interesting learning media so they can learn with fun (9). Playing a game can be a learning method for increasing a learning motivation in child and avoiding the feeling of being bored while learning (10). The board game is one the game that developed as a learning media. It consists of board and cards which material can be tailored to the learning objectives (10).

This study was carried out to develop an educational media that is devoted to the attitude of dengue fever prevention in school-aged children using board games. The material subjects in this study added material from Indonesian's dengue fever guideline.

## **2. Objectives**

The objectives of this study are:

- 2.1 To identify the attitude of the children about dengue prevention
- 2.2 To determine the effect of a board game to the attitude of dengue prevention of the children

## **3. Methods**

### *3.1 Design*

This study used quasi-experiment design with pre and posttest with the control group. The intervention was held for one month, from April to May 2017. The posttest was conducted two weeks after the last session of intervention was done.

### *3.2 Setting and research participants*

The mixed sampling method was used to get the study participants. First, to get the study area, purposive sampling was used, that is WR and UH sub-district, both of which are endemic areas for dengue. Simple random sampling was used to selected the elementary school in the two study area, that is SR and TS elementary school, the location between two schools are far, so the participant can't meet each other.

The participants' aged of 10-12 years old, enrolled fifth and six grade and had not received educational information on control and prevention of dengue fever in school or from the media. There are 92 participants, with 46 participants for each group.

### *3.3 The Board Game Intervention*

The board game consists of a set of 34 game cards with easy to moderate level questions and 19 dengue glossary cards, the second set of 25 game cards with moderate to severe level questions and 20 dengue glossary cards, and a "Rules and Instructions" pamphlet (11).

The material of the board game are: 1) fever and fever management; 2) dengue prevention strategy based on Indonesian's Dengue Prevention Guidelines such as closing, draining, and checking the water storage, and recycling; 3) dengue prevention strategy with a chemical agent; 4) dengue prevention strategy with a biological agent; 5) immune system.

The game played in a small group with 4-8 participants. The game consists of 4 game sessions, each session played for 40 minutes, and 1-week interval for one to another session: the first and second session for easy to moderate level materials, and the third and fourth session for moderate to the problematic level material.

### *3.4 Data Collection*

Before the intervention, there was a data collection for pretest for each group to measuring attitude. After that, for the control group received health education about dengue prevention standard from Indonesian government guideline in front of the class, also leaflet and brochure given to the group. No other information was presented. And even for the intervention group before the board game intervention started, they received health education about dengue prevention, same as the information that given to the control group.

The posttest was done for each group at two weeks after the intervention ended. There are five research assistants to help to collect the data and to be a facilitator while intervention was run. The research assistants had several qualifications are a nurse, had experience in child education and obtaining the research data.

## **4. Data analysis**

The instruments in this study used to evaluate the dengue fever prevention attitude according to study instrument from Breinner (2015) and the tools were modified according to dengue fever prevention guideline from Indonesia's Department of Health (2016). There were true or false questions, and the question components of the instrument are 1) fever and fever management; 2) dengue fever prevention strategy; 3) immune system. The test of the instrument was performed by 30 participants and obtained validity test score from 0,403 to 0,705, and the reliability test score is 0,866.

To identify the description of the attitude used descriptive analysis with the percentage of the right answers for each component of the question for each group. To evaluate the statistical significance of differences in the effect of the intervention (intervention group and control group), before and after the interventions McNemar's chi-square test for dependent samples was used. Paired t-test used to analyze the differences in the impact of treatments between the two groups. The significance level was 5%.

## 6. Results

There were 22 (47.82%) males in the intervention group and 17 (36.95%) males in the control group. Mean age and standard deviation ( $\pm$  SD) of the intervention group and control group were  $10.71 \pm 0.62$  and  $10.67 \pm 0.70$  years, respectively. The board game as an educational media is suitable to the child age between 9-12 years old; it is related to the way they received the new information.

### 6.1 The attitude of dengue prevention

Table 1. Pre and Post Study of Children Attitude about Dengue Prevention

Question	Intervention Group			Control Group		
	Before	After	p*	Before	After	p*
Fever and fever management	63 (45.65%)	120 (86.96%)	.000	69 (50%)	81 (58.69%)	.250
Prevention strategy (4M Plus Strategy: based on Indonesia Health Ministry Guidelines)						
a. Closing the water storage	24 (52.17%)	43 (93.47%)	.008	26 (56.52%)	28 (60.87%)	.250
b. Draining the water storage	25 (54.34%)	44 (95.65%)	.001	27 (58.69%)	26 (56.52%)	1.00
c. Checking the water storage	60 (65.21%)	90 (97.83%)	.000	64 (69.57%)	60 (65.21%)	1.00
d. Recycling	22 (47.83%)	40 (86.96%)	.001	21 (45.65%)	22 (47.83%)	0.31
Prevention strategy: chemistry agent	60 (43.48%)	114 (82.61%)	.000	81 (58.69%)	78 (56.52%)	.250
Prevention strategy: biology agent	46 (50%)	78 (84.78%)	.000	46 (50%)	40 (43.47%)	1.00
Prevention strategy: self protection	44 (47.82%)	80 (86.96%)	.001	48 (52.17%)	46 (50%)	1.00
Immune system	32 (69.57%)	46 (100%)	.001	35 (76.08%)	31 (67.39%)	1.00

\*McNemar's chi-square test for dependent samples ( $p < 0.05$ )

Table 1, showed that there was an increasing correct answer across all question, but for the attitude of closing the water storage did not have a statistically significant increasing ( $p>0.05$ ).

## 6.2 The effect of the board game to the attitude of dengue prevention

Table 2. The effect of Board Game on the Increasing Dengue Prevention Knowledge

Variable	Groups	Mean	Differences mean	95% CI	p*
Attitude	Intervention Group	57.34	6.63	-9,07 - (-4,66)	0.000
	Control Group	52.58	-0.24		

\*paired t-test for differences groups ( $p<0.05$ )

## 7. Discussion

The dengue fever prevention strategies in the community began from a commitment from each community members to always maintain a clean environment, so there are no breeding sites. The responsibility is seen from the attitude of a person to dengue fever prevention (12).

### 7.1 Fever and fever management attitude

Fever and fever management attitude in this study focused on the early sign of dengue fever and followed with clinical manifestation of dengue fever. The clinical event also focused on the symptom that obtained in children, such as gastroenteritis (vomiting and diarrhea) (14).

Before intervention began, the attitude of the child to fever and fever management are relatively good (45.65% for the intervention group and 50% for control group), this results from it like the previous study said that the community attitude for recognizing a dengue fever symptom is good<sup>7</sup>. After the intervention, the attitude of fever and fever management is increased, and significant ( $p=0.000$ ). This indicated that board game as an educational media could improve the child attitude to fever and fever management (15).

### 7.2 Dengue prevention strategy

Indonesia had a dengue prevention guideline named 4M plus (closing, draining, checking the water storage and recycling). In this study also include the dengue prevention strategy from WHO guideline, such as controlling with chemistry agent, biology agent and increasing our self-protection (16).

In the previous study showed that a good attitude was significant in the behavior of dengue prevention such as skill knowing the dengue breeding site and to preventing the mosquito bites (17). There are limited study shown about the specific attitude of dengue prevention in children, but in this study demonstrate the description of each dengue prevention strategy, both are a strategy in Indonesian and WHO Guideline.

Before the intervention, the highest result of dengue prevention attitude for checking the water storage (65.21% for the intervention group and 69.57% for control group). The lowest result is dengue prevention in chemical (43.48% in control group) and

does the recycling (45.65% in control group). Same like the previous study showed that recycling behavior in children had a lower score than the other's behavior (12). With the recycling, the secondhand can be used again and decreasing probability for the vector to breed.

In attitude on the control group, although they did not receive the intervention, they still had an increasing score especially about closing the water storage and recycling (56,52% to 60,87%). The swelling score at the control group, explains that children could learn by themselves with looking for the answer from the previous questions that they had done (18).

In this study, there are 12 cards with information about Indonesian guideline of dengue prevention strategy (4M plus approach), seven cards about dengue prevention strategy with a chemical agent, and six cards with details of biological control. The study results showed that there is an increasing score at each dengue prevention strategy, and there is a significant increasing except the attitude of closing the water storage ( $p>0.05$ ). This finding is the limitation of this study, for the future research should try to increase the content of the game.

### *7.3 Immune system*

The immune system in this study includes the attitude of the child to increase the ability to fight the disease. Both in intervention and control group had a good attitude with the ability to improve the immune system (69.57% for the intervention group and 76.08% for control group). This attitude is the highest score owned by the children than the other prevention strategy.

There are four cards with information about the immune system to prevent dengue fever. In the intervention group, there is a significant increasing score before and after intervention ( $p=0.001$ ). Immune system related to endurance, with good stamina, can reduce the probability of the disease<sup>18</sup>. The previous study told that the child had a good attitude about nutritional food, but in fruit and vegetable consumption is still low (12).

### *7.4 The relationship between dengue board game interventions to the attitude*

In this study, before intervention shown that both groups had a good attitude about dengue fever prevention. Same like the previous study, told that the children had a good attitude and perception about dengue prevention, especially for chemical and biological agent prevention (12).

There is an increasing score of the dengue fever prevention after intervention in the intervention group with a p-value ( $p=0,000$ ). Same with the previous study demonstrated that there is an increasing attitude of dengue prevention strategy in children after played a board game (20). Lenon and David (2008) also said there is a growing attitude of dengue control after played board game in adults.

With the increasing of the attitude can be the first step to change a dengue prevention behavior amongst children (18). This step also is the first step to family and community for increasing personal behavior in controlling dengue fever. The best way to reduce the risk of dengue fever comes from individual behavior and also the community to prevent dengue fever both in the family and in the community (20).

## **8. Conclusion**

The dengue board game can be an educational media to give dengue prevention information to children, also can improving the attitude of dengue prevention. Children can learn a new activity of dengue prevention from the cards. The dengue board game can teach further information to the children with fun way; it can be played in the classroom or the community.

According to the result, the limitation of this study is on the part of the content about closing the water storage; there was no significant increasing score. For the future research should try to increase the content of the game especially in closing the water storage part and also the suggestions for the next study are composing a game material that fit other age range.

## **9. Research ethics**

This study has been passed from the research ethics committee from Faculty of Nursing of Universitas Indonesia with number 103/UN2.F12.D/HKP.02.04/2017.

## **10. Declaration of conflict of interest**

The researcher declare that there are no conflict interests of this study



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