ORIGINALES

Board game as an educational media for dengue prevention knowledge for school-aged children

El juego de mesa como medio educativo para el conocimiento sobre la prevención del dengue en niños en edad escolar

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ABSTRACT:
Indonesia is one of the endemic countries for dengue fever, and for the incidents are increasing year by year. Children are the risk population to dengue incidents than the others age groups. Part of the dengue prevention is increasing the knowledge, and also the children's knowledge. The use of the game is the enjoyable way for learning in children.
Aim: The aim of the study was to know children's basic knowledge about dengue prevention and develop an educational media for children. This study uses a quasi-experimental design with pre and post-test and using a control group.
Method: The participants are a school-aged children between the ages of 10-12 years old with total 92 participants who were divided into intervention group and control group.
Results: The results showed that there are a significantly increasing score at children basic knowledge at intervention group about dengue fever sign and symptom (p=0,001); prevention strategy based on Indonesia Health Ministry guidelines (p=0,001); chemistry agent (p=0,000); biology agent (p=0,000); self-protection (p=0,001); and immune system (p=0,001). There are difference knowledge between intervention and control groups (p=0,000).
Conclusion: The conclusion of the study is board game can be designed to be an educational media to give a health education about dengue prevention strategy to the children.

Keywords: Board game, dengue prevention strategy, educational media.

RESUMEN:
Indonesia es uno de los países endémicos del dengue y los incidentes aumentan año tras año. Los niños son la población de mayor riesgo de incidentes de dengue que los demás grupos de edad. Parte de la prevención del dengue es aumentar el conocimiento y también el conocimiento de los niños. El uso del juego es una forma divertida de aprender en los niños.
Objetivo: El objetivo del estudio fue conocer los conocimientos básicos de los niños sobre la prevención del dengue y desarrollar un medio educativo para los niños.

Método: Este estudio utiliza un diseño cuasi experimental con pre y post prueba y el uso de un grupo de control. Los participantes son niños en edad escolar de entre 10 y 12 años de edad con un total de 92 participantes que se dividieron en grupos de intervención y control.

Resultados: Los resultados mostraron que hay un puntaje significativamente creciente en el conocimiento básico de los niños en el grupo de intervención sobre el signo y el síntoma de la fiebre del dengue (valor de p = 0,001); estrategia de prevención basada en las directrices del Ministerio de Salud de Indonesia (valor de p = 0,001); agente químico (valor de p = 0,000); agente de biología (valor de p = 0,000); autoprotección (valor de p = 0,001); y sistema inmune (valor de p = 0,001). Existen diferencias de conocimiento entre los grupos de intervención y control (valor de p = 0,000).

Conclusión: La conclusión del estudio es que el juego de mesa puede diseñarse para ser un medio educativo que brinde a los niños una educación sanitaria sobre la estrategia de prevención del dengue.

Palabras clave: Juego de mesa, estrategia de prevención del dengue, medios educativos.

INTRODUCTION

More than 2.5 million people and nearly 40% of the world's population are at risk of getting dengue infection [1]. Indonesia (129,435 cases) is the second highest country for dengue fever cases after Brazil (447,466 cases) and is among the highest endemic countries [2]. In 2015 the number of dengue cases in Indonesia has increased compared to the previous year, both in the incidence rate and the affected district. 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]. Compared with other age groups, the highest incidence of dengue fever is in the age group of 6-14 years (78.2%). The hospitalization case in children treated for dengue is 25% for children under 15 years old [4].

The government has conducted several programs in controlling dengue transmissions, 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). However, the programs have not been effective enough in reducing the incidence of dengue [3]. Community participation, including children, is an important factor in controlling the transmission of dengue fever [5]. Because of the high incidence in children, it is important for them to be equipped with the ability to prevent dengue infection especially for 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 conducted to improve the health status of the students and preventing disease so that they can obtain good academic achievement [6].

Knowledge improvement program regarding dengue fever prevention should be conducted in an interesting way so that the children can learn in a fun way. The method of learning using games is a fun method, children also love learning using games because this method is interactive and challenging [7]. This method will increase the children's motivation and prevent boredom in learning [8]. One game that is being developed as a learning medium for children is board game. It uses board and card as the media which material can be tailored to the learning objectives [8,9].

This study was carried out to develop an educational media that is devoted to the prevention of dengue fever in school-aged children using board games. The study was conducted in Yogyakarta because this area was the fourth highest area with a high incidence of dengue fever in 2015 (IR = 92.96%) [10].

METHODS

Design

This study used a quasi-experimental design with pre and post-test with the control group. There are two groups are intervention group and control group. The intervention was held for one month from April until May 2017. The evaluation through posttest was held two weeks after intervention ends.

Setting and Research Participants

This study was conducted in two urban community school districts in Yogyakarta, Indonesia, both of which are endemic areas for dengue. Thus, the two selected schools were: SS in Kotabaru and ST in Wirobrajan. The location is far, so the participants cannot meet each other.

The participants were between the ages 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. This age group is appropriate to used board game as an educational tool for their cognitive level [12]. Simple random sampling was used for sampling method. There are 92 participants, with each group total 46 participants.

Procedure

Data collection began with pretest for both groups. After that, for the control group received standard Indonesian government dengue fever information through health education which conducted in front the class. This includes brochures and flyers on the importance of dengue fever control and prevention in the community and home. No other information was presented.

For the intervention group, intervention began with health education in front the class, same method and information like control group. And also they received information through brochures and flyers. After that, they played the board game. The game divide into 4 parts, in part one and two they played a board game in easy and moderate level, in part three and four played the moderate to difficult level. There are 3 days for interval for each part.

The game consists of a board, one six-sided dice, 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 difficult level questions and 20 dengue glossary cards, and a "Rules and Instructions" pamphlet. The game was played by small groups (4-8 participants) of students in schools. The game played about 40-minute per sessions.

There are 5 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 collecting the research data.

Data Analysis

The instruments in this study were used to evaluate the children's knowledge about dengue fever and the prevention. The questions were divided into seven categories

are: 1) vector characteristics; 2) Dengue fever sign and symptom; 3) Prevention strategy (4M Plus Strategy: based on Indonesia Health Ministry Guidelines); 4) Prevention strategy: chemistry agent; 5) Prevention strategy: biology agent; 6) Prevention strategy: self-protection; 7) Immune system. They had the validity score from 0,385 to 0, 777 and the reliability is 0,864.

To evaluate the statistical significance of differences of the impact of treatments (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 two groups. The significance level was 5%.

RESULTS

Average age and standard deviation (± SD) of the intervention group and control group was 10.71 ± 0.62 and 10.67 ± 0,70 years, respectively. There were 24 (52.17%) females in the intervention group and 29 (63.05%) females in the control group. The child age related to the way they catch the new information to be a knowledge, on a child with age 9-12 years old is good, and in this age suitable with the board game as an educational media [12].

All 92 subjects responded to the questionnaire before playing the board game and after f days. Average age and standard deviation (±SD) of the intervention group and control group was 10,71 ± 0,62 and 10,67 ± 0,70.

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

Question	Intervention Group			Control Group		
	Before	After	p*	Before	After	p*
Vector characteristics	135 (75%)	165 (91.6%)	.008	147 (81.6%)	150 (83.3%)	.031
Dengue fever sign and symptom	96 (53.3%)	145 (80.6%)	.001	110 (61.6%)	134 (74.7%)	.025
Prevention strategy (4M Plus Strategy : based on Indonesia Health Ministry Guidelines)	159 (88.3%)	172 (95.6%)	.001	170 (94.4%)	172 (95.5%)	.250
Prevention strategy: chemistry agent	78 (65%)	95 (79.2%)	.000	86 (71.6%)	88 (73.3%)	.250
Prevention strategy: biology agent	63 (52.5%)	93 (77.5%)	.000	65 (54.1%)	59 (49.16%)	1.00
Prevention strategy: self protection	104 (86.6%)	114 (95%)	.001	104 (86.6%)	103 (85.8%)	1.00
Immune system	58 (96.6%)	59 (98.33%)	.001	56 (93.3%)	54 (90%)	1.00

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

After that, we analyze the effect of the board game to the knowledge with a t-test. According to the table, 2 show that there is differences in knowledge between intervention group and control group after the intervention.

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

Variable	Groups	Mean	Differences mean	95% CI	p*
Knowledge	Intervention Group	14.89	3.78	-4,29 – (- 1,18)	0.000
	Control Group	12.30	0.54		

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

DISCUSSION

Vector Characteristics

In this study, participants were introduced to common dengue vector that is Ae. Aegypty[14]. The result shown the highest participants knowledge about vector characteristic is Ae. Aegypty did not put the eggs in the dirty water. In contrast, participants do not know about the time when mosquito actively bite. These findings same like the previous study that the child does not know when mosquito will bite [12]. By knowing when the mosquito will bite, the child can be more vigilant, so they can improve they self-protection such as using the mosquito repellent or using the cloth to protect the body [5].

There are 16 cards with information about vector characteristics. After the intervention, the knowledge about vector characteristics is increased, but not significant (p=0.008). Besides that, the improvement of knowledge is important, in control group there is an improvement but not as high as in the intervention group.

Sign and symptom of dengue fever

The result showed that the lowest score about the sign and symptom knowledge is about the first symptom of dengue fever. The previous study finding that child does not know about the first symptom of dengue fever and the severity of the disease [12; 13]. In the community, commonly they assume that 'fever' in the first day of sick does not sign of dengue fever, they will be more vigilant in the third day, they will take the medicine in the third day of fever [14].

There are 10 cards with information about sign and symptom of dengue fever. After the intervention, there is a significant improvement of children's knowledge about sign and symptom of dengue fever (p=0.001).

Dengue Prevention Strategy

Indonesia's government has a dengue prevention strategy called 4M Plus [16]. There are four strategies (4M) to prevent dengue based on that, first is draining a kind of water storage periodically, then closing the water storage, burying or recycling the secondhand, and monitoring the breeding site. The "Plus" activities are using the larvacide, using the repellent, using the mosquito net while sleeping, keeping the

predatory fish larva, planting the plant that can carry out the mosquito, regulating the light and ventilation in the house, avoiding the habits of hanging up clothes.

The study results found that the child knows about the closing storage activities to reduce the vector's breeding site, this study finding same like the previous study about the child prevention knowledge [12]. The child should have the knowledge about the variety of water storage that can be the vector's breeding site, so they can taking action to do the prevention strategies [13].

Draining the water storage every three days is the most doing behavior in the community to prevent the mosquito breeding [14]. Same like in this study, found that child has a good knowledge about the way to prevent the mosquito breeding with draining the water storage periodically.

Recycling the secondhand is the newest strategy form the government, this strategy does not consist of the previous government strategy [15]. In this study found that child's knowledge about recycling is good. In contrast, the previous study found that the knowledge about recycling is bad [12]. With the recycling, the secondhand can be used again and decreasing probability for the vector to breed.

In this study, there are 12 cards with content about dengue prevention strategy that is based on Indonesia's government program (4M Plus). After the intervention, found that the knowledge is significantly improved (p=0.001).

Dengue Prevention Strategy: Chemistry agent

In this study, there are 7 cards with information about chemistry agent to prevent the dengue fever. The result showed that there is a significant improvement of children's knowledge about chemistry agent (p=0.000). In the control group also had the knowledge improvement, just for two participants and the result does not a significant improvement (p=0.25).

Based on WHO guidelines for chemistry agent to prevent the dengue fever, there are some strategies that are larvacide, fogging, and the other repellent [5]. In Indonesia, the most common larvacide that was used is "Abate". The child does not familiar with that term, they said that the term is very difficult to remember.

Dengue Prevention Strategy: Biology Agent

There are 6 cards with information about biology agent to prevent the dengue fever. The result showed that there is a significant improvement of children know about biology agent (p=0.000). In contrast, in the control group the knowledge is decreasing (p=1.00).

The most often biology agent strategy to prevent the dengue fever is using by the community is the Siamese fighting fish (Betta Splendens) [14]. In this study found that child still cannot understand about several fishes that may eat mosquito larvae, they assume that every fish can eat the larvae. The other biology agent is the plant that can carry out the mosquito. In this study, the child can mention the plant. Children should be provided with knowledge about biology agent to prevent the dengue prevent, the added value is the child will protect the environment [12].

Dengue Prevention Strategy: Self Protection

In this study, there are 4 cards with information about self-protection. Basically, before the intervention, children have a good knowledge about self-protection. The cards help the child to know more about self-protection to prevent the dengue fever, so in intervention group have a significant improvement (p=0.001) than the control group (p=1.00). The knowledge about self-protection is important, it is also related to mosquito biting time, so they can protect themselves while mosquito biting actively [13].

Immune System

There are 4 cards with information about the immune system to prevent the dengue fever. Before the intervention, the child already had a good knowledge of the immune system, and after the intervention, they can recall the knowledge and have a significant improvement knowledge (p=0.001).

Immune system related to endurance, with a good endurance, can reducing the probability the disease [5]. Same as the previous study is child already know about nutritious can improve the endurance, but in fruit and vegetable consumption is still low [12].

The relationship between board game intervention to knowledge

In this study, both groups had a good score for dengue prevention knowledge, same as previous study child already have a good knowledge in dengue prevention, good at the chemical agent, biology agent, but low at environment management [12]. The other study, shown that community had a good knowledge about the prevention strategy, including controlling the breeding site and preventing the mosquito bite [16].

After the intervention, there are increasing knowledge in both groups, but after doing the further analysis there are a statistically differences for before and after intervention in intervention group and control group. After doing the paired t-test to know different groups, the results showed that the increasing knowledge in the intervention group is significant (p=0,000). It means that the board game can be used as a media for learning the dengue prevention for children. In the previous study, shown that board game can be used for health education [17].

There are increasing knowledge of the child, indicates that the new knowledge got by the child [18]. The board game as an educational media helps the child understand the difficult terms that are rarely heard by the children. During the learning process, the child can reveal they expression freely because of the enjoyable learning process. The child also can express the difficulty of the new terms that they learned from the cards. At the end of the learning session, the children said that with this media they can enjoy the learning process.

CONCLUSIONS

The board game can be an educational media to teach the children about dengue prevention strategy, with this media the children can increase. Children can learn the new terms both are they never heard before and the difficult one.

This media can be used to teach about dengue prevention strategy for the child. The dengue board game is relatively simple to use by a child, be it in classrooms or in community center settings. This game can also add a material about the prevention strategy in the other country based on each government guidelines. Suggestions for the next research is involving parents in the game with the aim of improving the ability of the family in the prevention of dengue fever.

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