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The Effect of Puzzle as Health Education Media on Knowledge and Attitude of DHF Prevention Among Trash Warrior Community

Ni Wayan Aris Mudariani[1], Ni Komang Ari Sawitri*[1], Indah Mei Rahajeng[1], Putu Ayu Sani Utami[1]
[1]*Nursing Study Program, Universitas Udayana, Denpasar, Indonesia*
*Corresponding Author: arisawitri@unud.ac.id

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ABSTRACT
Dengue Haemorrhagic Fever (DHF) is a significant public health threat that can be controlled by engaging all community groups in preventive measures. Interventions targeting early age are pivotal in improving knowledge and attitudes toward DHF prevention. This study proposes a health promotion strategy using a Puzzle as an educational media targeting the Trash Warrior Community members aged 9-12 years to enhance knowledge and attitudes towards DHF prevention. This was a pre-experimental study with a one-group pretest-posttest conducted from February to March 2023. All Trash Warrior Community members aged 9 – 12 (n=20) were included as respondents. They were given a questionnaire consisting of 13 questions of knowledge and ten statements of attitudes towards DHF prevention before and after the health education. The intervention in this study was health education using puzzles in 5 small groups, each consisting of 4 children. Each group was given 30 minutes to arrange the puzzle. This study shows an improvement of mean value on knowledge for 2.1 points and attitude for 0,75 points. Based on the result of bivariate analysis using the Wilcoxon test, it was found that there was a significant effect of education using puzzle media on knowledge ($p=0.000$, $p<0.05$) and attitudes ($p=0.045$, $p<0.05$) in preventing DHF among Trash Warrior Community members aged 9-12 years. Health education using puzzles effectively increases children's knowledge and attitude toward DHF prevention.

Keyword: Attitude, Dengue Haemorrhagic Fever, Knowledge, Puzzle

1. Introduction

Dengue hemorrhagic fever (DHF) is a disease found in tropical areas. According to data from the Ministry of Health Republic of Indonesia, the number of DHF patients has fluctuated over time, culminating in its highest recorded incidence in 2016, with a staggering total of 204.171 reported cases. Meanwhile, in Bali Province, there were 4347 reported cases in 2017, and its incidence rate reached 105.7/100,000 population with the Case Fatality Rate (CFR) of 0.4% (Yudhastuti & Lusno, 2020). In the eastern part of Bali, specifically in Gianyar, DHF cases increased from 511 cases in 2018 to 1,717 cases in 2020, which means the cases more than doubled in two years (Kemenkes RI, 2020). The trend seems to be still increasing in the following year, as an example in Singapadu Tengah Village, a village in Gianyar, used to be zero DHF cases in 2021, but in 2022 there were 4 cases found.

Based on the study by (Hartati et al., 2021) in Siti Khodijah Hospital, Indonesia, 697 of 1,015 children with DHF were aged 5 to 13 years. Most children with DHF in this hospital experienced DHF without shock syndrome (83.7%), and the others experienced dengue shock syndrome or DSS (16.3%). The DSS is an advanced complication of DHF and may lead to death (Akram, 2019). Controlling Dengue virus transmission to prevent DHF is the pivotal strategy to tackle this public health issue. Therefore, active participation of all community groups in preventing DHF is required to drive sustainable behavioral change and improve public health outcomes.

The Indonesian government has tried eradicating DHF through the "One House One Jumantik" program. Jumantik, or in Indonesian "Juru Pemantau Jentik," is the larvae monitoring officer in charge of monitoring and cleaning the mosquito larvae at their home by implementing Pemberantasan Sarang Nyamuk (PSN) 3M Plus then recording the results on an assessment card (Salim, Ambarita, Margarethy, and Nurmaliani, 2020). The PSN 3M Plus consists of activities such as larvae elimination by draining water reservoirs regularly, covering water containers, and recycling non-degradable waste. While the 'Plus' means additional activities such as keeping fish in the pond, applying mosquito repellent, installing screens on the windows, cleaning up the neighborhood regularly, avoiding hanging dirty clothes, applying larvacides in hard-to-reach water reservoirs, repairing blocked drains, and planting plants that can be mosquito repellent (Muhani, Mulastsih, Mayasari, and Ambarwati, 2021). Community involvement is a must to achieve the effectiveness of this program.

A community is a group of people living and interacting with each other in a particular area. In Singapadu Tengah Village, a small group in its community called Trash Warrior is interested in environmental cleanliness. The majority of members of this group are children and are guided by adults from Banjar Abasan, Central Singapadu Village. Trash Warrior community activities include picking up trash around the village every Sunday and outreach to residents regarding waste utilization. In addition, the trash that they collect can be exchanged for a small amount of money that will be the village's income. Through the Trash Warrior group, it is hoped that people will become more concerned about the environment and can minimize health problems.

Based on the results of an interview with the coordinator of Jumantik in Central Singapadu Village on January 2023, it is known that this village has done the Jumantik program since 2019. Unfortunately, the cadre of Jumantik is only one person for estimated 177 householders; therefore, the program's effectiveness could be better. The Trash Warrior Community is a group that has the potential to become agents of change that support the "One House One Jumantik," considering that its members are children whose activities are relatively lower compared to adults. This is also in line with Trash Warrior's main goal: keeping the environment clean. However, this community needs to be given education about DHF prevention first.

Health education requires suitable media to achieve improvement in knowledge and attitudes. Especially if the targets are children, the educational media must be interesting to motivate children to learn. *Puzzles* are games that contain exciting pictures and have the potential as educational media for children. Puzzles may improve cognitive function, train concentration, and train fine motor skills in children (Bota, 2020). Printed puzzles allow children to touch and feel the puzzle pieces and assemble them in groups. The use of puzzles involves children actively in putting puzzles together. This is different from the conventional method, such as giving a class session which often causes children to receive information passively and quickly get bored because they only listen to the explanations of the speakers (Sihombing, Rosma, and Realita, 2020).

Based on the background, this study aims to investigate the effect of using puzzles as educational media on knowledge and attitudes toward DHF prevention among Trash Warrior members aged 9-12 years.

2. Method

This research is pre-experimental with one-group pretest-posttest design. The population in this study are members of Trash Warrior aged 9-12 years, totaling 20 children. The entire group of Trash Warrior Community members, consisting of 20 individuals aged 9-12, served as respondents for this study. The respondents' criteria were Trash Warrior Community members who were active for at least three months and had no difficulty reading and writing. The intervention in this study was education using puzzles arranged by children in 5 small groups, and there were four children in each group. The puzzle was arranged in 30 minutes. The puzzle contains information on DHF prevention.

This research was implemented in Banjar Abasan, Singapadu Tengah Village, Gianyar District, Province of Bali. The research was conducted in February-March 2023, and one day during that period was chosen to collect the data. Respondents were given a questionnaire adopted by other researchers consisting of 13 questions about knowledge and ten attitude statements toward DHF prevention. The knowledge questionnaire validity and reliability test showed all the knowledge question was valid with the r count > r table 0.3310 and reliable with the Cronbach's alpha coefficient >0.600 and count coefficient 0,933. The attitude questionnaire validity and reliability test also showed that all the attitude statements were valid with the r count > r table 0.3310 and reliable with Cronbach's alpha coefficient >0.600 and count coefficient 0,841. Children were given a questionnaire twice before and after the puzzle health education. Once data was collected, it was tested for distribution and was not normally distributed. Therefore for the bivariate analysis Wilcoxon statistical test was conducted.

This research was approved by the Ethics Commission of the Faculty of Medicine Udayana University with number 349/UN14.2.2.VII.14/LT/2023. The ethical principles in this study were respect for persons, including autonomy, beneficence, non-maleficence, and justice.

3. Result

Table 1. Characteristics of Trash Warrior Community Members in March 2023 (n=20)

No	Variable	Mean	Min-Max
1	**Age**	10.5	9-12
2	**Gender**	**Frequency (n)**	**Percentage (%)**
	Female	6	30
	Male	14	70
	Total	20	100

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Table 1 shows respondents between 9-12 years old, with a mean value of 10.5 years old. There were more male than female respondents, reaching 70%. Based on an interview with the stakeholder of the Trash Warrior Community, the members have never been educated about health; the education was only about environmental cleanliness.

Table 2. Overview of Knowledge of DHF Prevention in Trash Warrior Community Aged 9-12 Years Before and After Education with Puzzle in March 2023 (n=20)

Knowledge		
	Before	**After**
Mean±SD	7.10±1.744	9.20±2.016
Median	7	9
Min-Max	5-11	5-13
Knowledge Changes	**Frequency**	**(%)**
Increase	18	90
Still	1	5
Decrease	1	5

Table 2 shows the change in the mean value of DHF prevention knowledge before and after education with puzzle media. The value changed from 7.10 with a standard deviation of 1.744 to 9.20 with a standard deviation 2.016. The median value also increased by 2 points after education with puzzle media. The questionnaire of knowledge of DHF prevention in this study contained 13 questions, so the maximum score is 10 points. The range of knowledge scores on DHF prevention before education was between 5-11 points, and after education, it was 5-13 points. The maximum number of points obtained based on the DHF prevention knowledge question questionnaire was 13. There are 90% of respondents getting an increase in score.

Table 3. Overview of Attitudes of DHF Prevention in Trash Warrior Community Aged 9-12 Years Before and After Education with Puzzle in March 2023 (n=20)

	Attitude	
	Before	**After**
Mean±SD	6.30±1.689	7.05±0.999
Median	6,5	7.0
Min-Max	2-9	5-9
Attitude Changes	**Frequency**	**(%)**
Increase	10	50
Still	8	40
Decrease	2	10

Table 3 shows the change in the average value of DHF prevention attitudes before and after education with puzzle media. The value changed from 6.30 with a standard deviation of 1.689 to 7.05 with a standard deviation of 0.999. The median value also increased by 0.5 points after education with puzzle media. The questionnaire of attitudes of DHF prevention in this study contained 10 statements so that the maximum score are 10 points. The range of respondents' attitude scores before education was between 2-9 points and after education it became 5-9 points. Half of the respondents got an increase in score.

Table 4. Analysis Result of Wilcoxon Analysis of DHF Prevention Knowledge and Attitude in Trash Warrior Community Aged 9-12 on March 5, 2023 (n=20)

Variable	**Mean±SD**	**∆Mean**	**p-value**
Pretest of knowledge of DHF prevention	7.10±1.744	2.10	0.000
Posttest of knowledge of DHF prevention	9.20±2.016		
Pretest of attitudes of DHF prevention	6.30±1.689	0.75	0.045
Posttest of attitudes of DHF prevention	7.05±0.999		

Table 4 displays the result of the Wilcoxon statistical test, which shows a significant effect of education using puzzle media on DHF prevention knowledge ($p<0.05$). 2.10 points increased the mean value of knowledge of DHF prevention after education using the puzzle. In addition, education with puzzle media has a significant effect on DHF prevention attitudes ($p <0.05$). The mean value of attitudes toward DHF prevention also increased by 0.75 points after education using a puzzle.

4. Discussion

Bivariate analysis using Wilcoxon in this study shows a significant effect of providing education with puzzles on knowledge of DHF prevention among members of the Trash Warrior Community aged 9-12 with $p = 0.000$ ($p <0.05$). These results align with research by Putri & Suparti (2020), which shows the effect of using puzzles on knowledge ($p=0.035$) regarding volcanic eruptions mitigation among 43 students of SD Negeri Karangsalam. Similar results were also stated in research by Yolanda (2022) regarding the effect of education with puzzles on increasing scores of children's knowledge about hand washing ($p <0.000$). These results prove that health education using puzzles is effective in increasing the knowledge of respondents regarding health information.

This research results show that the mean of DHF prevention knowledge increases by 2.10 points after using puzzles for health education. In this study, an increase in the respondent's knowledge score may occur because of the source of information obtained through education using puzzles. Sources of information are influential because the more a person receives information, the more knowledge they will have (Sulistyowati et al., 2017). The information obtained must come from a trusted source so that the information is appropriate

to apply (Martilova, 2020). In this study, the puzzles used contain information about DHF and its prevention based on information published by the Ministry of Health Republic of Indonesia so that respondents are expected to gain knowledge from reliable sources while having fun at the same time. A study on health education using puzzle media conducted by Oktafiani & Sunarti (2020) supported this result. The study result showed that the experimental group who was given health education using puzzles obtained better posttest scores in nutrition-balanced knowledge (Oktafiani & Sunarti, 2020).

The change in the respondent's knowledge in a positive way may be caused by the media that promotes respondents' interest in learning. Hikmawati, Yasnani, and Sya'ban (2016) state that using appropriate learning media can also affect a person's motivation to learn particular things. This research used puzzles that interested respondents because the health education was conducted pleasantly. This method increased respondents' motivation to receive information about the prevention of DHF. Based on the results of this study and supported by other studies, health education interventions using puzzle media can be an effective method in health promotion to increase knowledge, especially for school-age children.

Wilcoxon analysis in this study also shows a significant effect of providing education with puzzles on DHF prevention attitudes among members of the Trash Warrior Community aged 9-12 with $p = 0.045$ ($p < 0.05$). These results align with research by Safitri et al. (2021), which shows the effect of education using puzzles on attitudes about nutrition in elementary school children ($p=0.003$). The study's results by Hikmah (2019) also show an increase in the mean score of respondents' attitudes after being given education with puzzles, from an average of 25.32 to 27.00. An increase in the attitude of the respondent has likely occurred because the respondents experienced an increase in knowledge about DHF prevention, which improves their understanding and belief.

The result of this study shows an increase in the mean value of DHF prevention attitudes by 0.75 points after education with puzzles. The results of this study are in line with research by Safitri, Sulistyowati, dan Ambarwati (2021) which shows that after being given nutrition education with puzzles, there is a change in attitudes about fruits and vegetables in a positive way because along with the increased knowledge accordingly build attitudes among children. This result is also supported by the study by Hikmah (2019), which shows an increase in the average score of respondents' attitudes after being educated using puzzles. The increase in attitude scores in this study could be influenced by the experience given by researchers when providing educational interventions using puzzles about DHF prevention.

Using educational media that is easy to understand and interesting can also affect the attitude of the respondents (Hikmawati et al., 2016). However, in this study, two respondents experienced a decrease in the attitude score for DHF prevention, and eight respondents did not experience an increase in attitude score (table 3). This may be caused by the process that goes through in changing attitudes according to Carl Hovland's theory (1950), containing the reception of selective information, the existence of selective memory, and the formation of selective perceptions. The existence of this process is likely the cause of changes in attitudes that are only slightly visible if measured immediately after the intervention. In addition, changes in attitude scores can also be influenced by cognitive abilities and lack of knowledge so that they affect respondents' perceptions (Hikmawati et al., 2016).

Respondents in this study were aged 9-12 years. According to Piaget's theory, they were in the concrete operational development stage. The characteristics of children in this stage are that children already can sort, for example, by shape, size, and other characteristics (Nainggolan & Daeli, 2021). Children aged 9-12 years also have characteristics that they like doing something directly, like to move, like to play, and like to be in groups (Safitri, 2020). This age is an effective time to educate children about cognitive and motor development (Nurfalah et al., 2014). Education that uses appropriate media and methods is expected to help children to have good knowledge and attitudes.

This study used puzzles to improve cognitive function because players will try to solve problems by arranging image pieces based on shape, color, and logic (Nurwita, 2019). Puzzles are also useful in improving soft motoric skills when someone moves puzzle pieces without destroying previously made arrangements (Nurwita, 2019). This media allows children to learn while playing in groups, thus providing a memorable experience, and children can remember the information conveyed. Implementing education with the method of playing puzzles makes children feel less in a learning mode because playing puzzles with their peers creates

a fun and enjoyable ambiance. According to Hikmah (2019), a pleasant learning atmosphere can activate the work of brain cells and stimulate thinking skills so that there is an increase in children's concentration and ability to solve problems.

Providing education through puzzles can be done individually or in groups. Composing in groups may train children's social skills when holding discussions to arrange pieces of pictures with their group (Bota, 2020). However, the educational method of compiling puzzles in groups has challenges; the children must cooperate with their group. According to Hikmawati, Yasnani, and Sya'ban (2016), some respondents experienced changes in knowledge that decreased after counseling with puzzles because respondents did not work together thoroughly with their groups and tended to be apathetic. Therefore, the role of the facilitator in guiding the group is needed so that all respondents can participate in the preparation of the puzzles.

This study used puzzles in the form of printed media so that children could touch them directly. In addition, children worked together in groups while arranging puzzle pieces into one complete unit so that children's socialization skills also increased. As technology develops, puzzles are also available in electronic form. The electronic form of puzzles also provides cognitive benefits for children, but its use requires an electronic device (Faradisha & Ambara, 2022). Electronic puzzles that require devices have limitations as the children can not put puzzles simultaneously at one time (Yuanita, Sabekti, and Silitonga, 2022). Therefore, printed puzzles have the advantage that apart from training children's abilities, this media also allows children to socialize with their groups while compiling puzzles.

Compiling puzzles involves the active role of children. This is different from conventional counseling methods, which often cause children to become passive and easily bored because they only listen to the explanations of the presenters (Sihombing, Rosma, and Realita, 2020). The same thing was also conveyed by the research by Rachma (2021), which uses puzzles to influence the understanding of the intervention group to be better compared to the control group, which was only given education using the lecture method. According to Sihombing et al. (2020), the puzzles have a more significant impact than the lecture method because puzzles are more exciting and have attractive pictures. Hence, the children's motivation to learn becomes greater. Therefore, puzzles can be an alternative educational medium for the community, especially for children.

This study has limitations in that the research sample still needs to be expanded because it is specific to the Trash Warrior Community aged 9-12 years. This research was carried out using puzzles and accompanied by discussions about the material in the puzzles so that the changes in knowledge are not only due to the use of puzzles. However, it can also change due to discussion sessions.

5. Conclusion

In conclusion, health education using puzzle media effectively increases knowledge and attitudes toward DHF prevention. Health education using puzzles is suitable for children.

The Trash Warrior Community stakeholders recommended giving the members more health education to promote their disease prevention knowledge and attitudes. Future researchers expect to examine a broader sample and examine more factors that influence individual knowledge and attitudes.

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