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Controlling Aedes Aegypti Mosquitoes as Dengue Fever Vectors Through Drain, Cover, and Reuse (3M) Poster Media for Junior High School Students of the Mutiara Aulia Education Foundation

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ABSTRACT

Dengue Hemorrhagic Fever (DHF) remains a significant public health problem in Indonesia, with 210,644 cases and 1,239 deaths reported until the 43rd week of 2024. This study investigates the effect of counseling using the Drain, Cover, and Reuse (3M) method through poster media in enhancing students' knowledge about controlling Aedes aegypti mosquitoes as DHF vectors. The study employed a one-group pretest-posttest experimental design, involving 63 students from Mutiara Aulia Middle School. Results showed an increase in knowledge from a pre-test mean score of 52.42 to a post-test mean score of 80.06. The paired sample t-test yielded a significance value of 0.000 (<0.05), indicating a statistically significant difference in students' knowledge before and after the intervention. These findings suggest that the use of 3M posters as an educational tool is effective in increasing students' knowledge about DHF prevention. Future interventions should explore additional behavioral outcomes, such as changes in attitude and practice, to ensure long-term impact.

Keywords: *Dengue Hemorrhagic Fever (DHF), School, Health Education*

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INTRODUCTION

Dengue Hemorrhagic Fever is an infectious disease caused by the dengue virus. Humans will be infected after being infected by the Aedes Aegypti mosquito carrying the DENV virus. The dengue virus consists of 4 serotypes, namely DENV-1, 2, 3 and 4. The dengue virus can cause two types of infections, namely primary infection and secondary infection. Primary infection can appear as acute fever or called dengue fever which will be neutralized within seven days by the immune response. While secondary infections tend to be more severe and will result in dengue hemorrhagic fever (DF) or dengue shock syndrome (DSS) (1).

The transmission of dengue fever (DHF) primarily depends on the vector, Aedes aegypti, which carries the dengue virus. When an Aedes mosquito bites a person experiencing viremia, the virus multiplies in the mosquito's salivary glands over a period of 8–10 days (extrinsic incubation period) before it can be transmitted to another human through subsequent bites. In the human body, the virus requires 3 to 14 days before symptoms appear, which is known as the intrinsic incubation period (2). The occurrence of dengue fever can be influenced by several factors, including nutritional status, age, presence of mosquito vectors, housing conditions, environmental factors, the habit of hanging clothes, temperature, use of mosquito repellents, type of occupation, knowledge and attitudes, as well as the implementation of the 3M program (3).

In Indonesia, dengue is a serious health problem because its prevalence is quite high and often causes extraordinary events (KLB). Cumulatively, in 2023 there were 114,720 cases reported with 894 deaths. In the 43rd week of 2024, 210,644 cases were reported with 1,239 deaths due to DHF which occurred in 259 districts/cities in 32 provinces. Dengue suspects reported through SKDR cumulatively until the 43rd week reached 624,194 suspects (4).

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The number of dengue fever (DBD) cases in North Sumatra (Sumut) increased in the first quarter of this year, compared to the previous year. Until May 2024, DBD cases reached 2,526 with 24 deaths. Binjai City is an endemic area for DBD, we can see in the last 5 years, for 2018 the number of DBD cases was 116.7 per 100,000 population while for 2019 the DBD morbidity rate was 97.6 per 100,000 per 100,000 population and for 2020 the number of DBD cases the DBD morbidity rate was 39.7 per 100,000 population (5).

The age group with the highest risk of contracting dengue fever is under 15 years old. This statement is supported by existing data that the largest number of dengue fever sufferers in Indonesia are children aged 4-15 years. Children are at high risk of contracting dengue fever because the disease vector is active in biting humans in the morning and afternoon. The Aedes aegypti mosquito likes shady places, in other words protected from the sun, and places that smell of humans. Not only in the house, but mosquito nests are also found in schools, especially if the classroom conditions are damp and dark. Therefore, school children are the main target because they are at school in the morning and afternoon (6). The implementation of dengue fever (DHF) prevention programs in endemic areas is highly recommended through health promotion and health education, particularly targeting school-aged children (7).

Schools are one of the primary targets for dengue fever studies because school-aged children are typically in classrooms and active within the school environment during the same hours when Aedes mosquitoes—blood-sucking vectors—are most active, specifically in the morning between 08:00 and 12:00, and in the afternoon from 15:00 to 17:00 (8).

Several studies have highlighted the importance of environmental sanitation, public awareness, and preventive measures in reducing the incidence of dengue fever (9). Increasing understanding is considered to be able to influence the attitudes of school children to prevent dengue fever around them, this is in line with research conducted by

Musparlin Halid, 2022 (10). increasing knowledge, attitudes, and behavior related to dengue fever prevention through education and community empowerment initiatives can have a significant impact on dengue fever prevention and control.

Perguruan Islami Aulia, one of the schools in Medan Denai has a case of dengue fever. Students at the school are potentially infected, this is in line with the observations we have made before the counseling found that there were students who had been infected with dengue fever. Dengue Hemorrhagic Fever is an infectious disease caused by the dengue virus, transmitted through the bite of Aedes aegypti mosquitoes. In Indonesia, DHF is a major health issue, affecting children aged 4-15 years due to mosquito activity in the morning and afternoon when students are in school. Mutiara Aulia Middle School has recorded DHF cases, highlighting the need for targeted interventions. This study aims to evaluate the effectiveness of 3M (Drain, Close and Reuse) posters in increasing students' knowledge of DHF prevention.

METHODS

This study used a one-group pretest-posttest design at SMP Yayasan Pendidikan Mutiara Aulia in December 2024, involving 63 students. The intervention consisted of counseling using lectures, Q&A sessions, and 3M posters, which covered:

- Drain: Emptying water containers to eliminate mosquito breeding grounds.
- Cover: Sealing water storage containers to prevent mosquito access.
- Reuse: Recycling or eliminating potential breeding sites.

A questionnaire with 10 multiple-choice questions assessed knowledge before and after the intervention. Data were analyzed using a paired sample t-test.

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RESULTS

Table 1. Respondent Characteristics

Respondent Characteristics	n	%
Gender		
Man	27	42.85
Woman	36	57.15
Age		
<17 years	24	38.10
>16 years	39	61.90
Class		
VII	21	33.33
VIII	24	38.10
IX	18	28.57
Total	63	100.00

Source: Primary Data, 2024

Based on table 1, the characteristics of the respondents were that the highest number of respondents were female (57.15%), the highest age was >16 years (61.90%), and the largest number of respondents came from class VIII (38.10%).

Table 2. Analysis Pretest and Posttest

	Correct (%)	Wrong (%)	Total
Pre Test	55.03	44.97	100.00
Post Test	82.66	17.34	100.00

Source: Primary Data, 2024

Based on table 2, it is known that the average sample answered questions correctly during the pre-test, namely 55.03%, and during the post-test 82.66%, which means that there was an increase in knowledge of 27.63%.

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Table 3. Results of *Paired Sample Test* of Knowledge Level

		Paired Differences					t	df	Sig. (2-tailed)
		Mean	Std. Deviation	Std. Error Mean	95% Confidence Interval of the Difference				
					Lower	Upper			
Pair 1	PRE TEST - POST TEST	-27.63	20.69	2.55	-32.72	-22.55	-10.85	65	0,000

Source : Primary Data 2024

Based on the results of *the t-test* in the form of *the Paired Sample Test* above, it shows that the significance value is 0.000 (<0.05), and the T-value is -10.85. This shows that the knowledge before being given counseling is smaller than the knowledge of students after being given counseling. So it can be concluded that there is a significant difference between counseling regarding Controlling Aedes Aegepty as a Vector of Dengue Fever before and after being given.

DISCUSSION

The results of this study indicate that the implementation of counseling on controlling dengue mosquito vectors has a positive impact on increasing students' knowledge at SMP YP. Mutiara Aulia Sei Mencirim. This increase can be seen from the comparison between the average results of the pre-test and post-test. This shows that counseling has a positive impact, although the increase in knowledge is relatively small, However, this improvement was moderate, likely due to the limited session length and passive learning method. Future research should employ interactive strategies such as demonstrations and group activities to enhance retention and adoption of behaviors.

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Control of vector disease is an important effort in increasing students' understanding and awareness of the prevention of diseases transmitted by mosquitoes. The government plays a role in developing strategic policies, control guidelines, technology, and training programs that can be integrated into education. Through community mobilization, including school students, this effort contributes to increasing their knowledge of risk factors, prevention methods, and the importance of active roles in vector control. With a safe, rational, and effective integrated vector control approach, students can gain better understanding and apply preventive measures in daily life (11).

Effective mosquito control includes covering containers containing water, using predators as natural enemies, eliminating breeding sites, using bed nets impregnated with pyrethrin, and cleaning up the environment where water can drain (12). Vector control methods can be carried out periodically based on ecology, efficiency, and economy including the use of larvicidation and fogging. Sustainable, environmentally friendly biological control techniques that target major diseases caused by mosquito species can use processed plant extracts, Wolbachia spp, bacterial insecticides spp, and copepod predators (13). Therefore, school students who are part of the community can play a strategic role in vector control in Binjai City.

In the context of education and counseling, counseling for school students in Binjai can include various methods of controlling mosquitoes that are relevant and can be applied in daily life. The main focus of counseling is to provide an understanding of the preventive measures that they can take, such as the elimination of mosquito breeding places, utilizing the net of inspecticide beds, and maintaining environmental cleanliness. If needed, students can also be introduced to further biological control methods, so that they can understand the role of technology in mosquito control in a sustainable manner. Thus, counseling not only increases student awareness, but also encourages their active involvement in vector control efforts in their community.

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Junior High School students are considered necessary to be given education about mosquitoes spreading diseases to humans in order to help the community avoid contact between humans and mosquitoes at home, school and the environment. Schools are one of the places to provide knowledge to students about the potential dangers of mosquitoes at home, school and the environment. Efforts to create healthy schools free of vectors need to be increased, because of the increasing number of infectious diseases caused by vectors such as scabies, dermatitis, diarrhea, typhoid, and dengue fever in students (14). Students' knowledge about DHF and DHF vector control is still low (15).

Research is in line with research conducted by Arif Rahman and friends[11] that there is a significant difference before and after providing education on efforts to control disease-carrying vectors with a significance value of 0.000. Physical control through integrated control activities is the main choice for controlling dengue vectors. Activities to control the habitat of larvae done by draining, close, and bury the container water unused. In addition, this is also in line with the counseling activity conducted by Devi et al. (2022), in which 79% of students showed an increase in knowledge (16).

Previous research conducted by Budi and Rika (15) Showed similar results, where socialization activities about Dengue Hemorrhagic Fever (DHF) succeeded in increasing students' knowledge. In this activity, the average student knowledge increased after socialization, which shows the effectiveness of the lecture and discussion methods in conveying information about DHF prevention. The results of this study indicate that students who participated in the socialization had a better understanding of how to prevent DHF, similar to the increase found in the study at SMP YP. Mutiara Aulia.

CONCLUSIONS AND RECOMMENDATIONS

This study found that the 3M (Drain, Close and Reuse) poster -based counseling effectively increased student knowledge about DHF prevention in Mutiara Aulia Middle School. Schools should implement interactive learning strategies and multi-session interventions to strengthen mosquito control practices. It is expected that MIS Mutiara Aulia students will apply their knowledge in preventing aedes aegepty mosquitoes as vectors of dengue fever with the 3M (Drain, Close and Reuse) method.

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