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THE ROLE OF ELEMENTARY SCHOOLS IN DENGUE FEVER CONTROL: A SCOPING REVIEW

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ABSTRACT
This study aims to evaluate the role of elementary schools in controlling Dengue Fever (DF) through education of students as agents of change in the community. This research uses a quantitative approach with survey and experimental designs. Data were collected through questionnaires distributed to students, teachers, and school principals from several elementary schools involved in the DF empowerment program. Data analysis was performed using descriptive statistics and difference tests to evaluate the students' knowledge levels before and after participating in the educational program. The findings show that educational programs involving students in DF prevention activities, such as mosquito larvae monitoring and community outreach, can improve students' knowledge and attitudes toward DF prevention.Activities such as using educational media based on comics and awareness calendars were found to be effective. Elementary schools play a crucial role in DF control by empowering students through health education. Proper educational programs can enhance students' and the community's awareness in DF prevention, supporting broader efforts in disease control.

Keywords: dengue fever control; disease prevention; elementary school; health education; student education

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INTRODUCTION

Dengue Hemorrhagic Fever (DHF) is a disease caused by dengue virus infection and transmitted through mosquito bites, primarily from the Aedes aegypti species. To date, DHF cases remain prevalent and continue to pose a global health challenge. In recent years, the incidence rate of DHF has significantly increased worldwide. It is estimated that approximately 2.5 billion people are at risk of contracting this disease (Anggraini et al., 2022). Dengue Hemorrhagic Fever (DHF) has been reported in more than 100 countries globally, with Indonesia having the highest number of cases in Southeast Asia. The risk of a DHF outbreak in Indonesia is substantial due to the widespread presence of the virus and its vector, the Aedes aegypti mosquito, in both rural and urban areas, as well as in public spaces and residential homes. Moreover, Indonesia's tropical climate supports the proliferation of this disease vector (Ayudiasari, n.d.-a).

Health education initiatives can be conducted in schools, residential areas, and other public spaces. Health literacy plays a vital role in enhancing the prevention and control of infectious diseases. Knowledge and health behaviors are the main components of health literacy. Through health education, students can gain insights into infectious diseases while also developing behaviors that support disease prevention and control. Health promotion, rooted in health education and based on health knowledge, can effectively slow the spread of diseases.

The implementation of health education programs in schools not only provides students with the necessary knowledge and appropriate behaviors toward diseases but also contributes to the overall development of schools. A study in China demonstrated that health education significantly improved students' knowledge and behaviors in preventing dengue fever

compared to a control group. Therefore, strengthening health education is crucial for enhancing students' health literacy (Hapsari et al., n.d.). The aim of this study is to explore the role of elementary schools in controlling Dengue Hemorrhagic Fever (DHF) through a scoping review

METHOD

The method employed in this study follows a systematic review based on the PRISMA (Preferred Reporting Items for Systematic Reviews and Meta-Analyses) protocol (Meiliyana et al., 2020). The study aims to identify relevant articles regarding the role of elementary schools in controlling Dengue Hemorrhagic Fever (DHF). Research articles were obtained through searches on three electronic databases: PubMed, ScienceDirect, and Google Scholar. Eligibility assessment was conducted using predetermined inclusion and exclusion criteria. The inclusion criteria consisted of quantitative and mixed-methods research utilizing primary data, published between 2014–2024, written in English or Indonesian, openly accessible (open access), peer-reviewed, full-text articles, and addressing the role of elementary schools in DHF control. This includes initiatives such as educating students, implementing school community empowerment programs, or other efforts related to DHF prevention and control within school environments.

The research process involved a systematic selection of articles based on predefined inclusion and exclusion criteria. A total of 25 articles were included in this study. Articles that did not directly relate to DHF control, relied on secondary data, were unavailable in English or Indonesian, were published outside the specified timeframe (2014–2024), or had not undergone peer review were excluded. Furthermore, articles that focused solely on technical or medical aspects without discussing the role of schools in DHF control, as well as those lacking relevant information on DHF control efforts at the elementary school level, were also excluded.

RESULT

Based on the literature review conducted, a total of 25 relevant articles were identified, with the selection process outlined in Figure 1. The process followed the PRISMA (Preferred Reporting Items for Systematic Reviews and Meta-Analyses) guidelines, encompassing four main stages. In the Identification stage, articles were searched using specific keywords across scholarly databases such as Google Scholar and PubMed to collect as many relevant discussions as possible. The Screening stage involved an initial review of titles and abstracts to remove duplicates, irrelevant content, and articles unrelated to early detection or students facing bullying, retaining only those focusing on mental health detection interventions and their impacts. During the Eligibility stage, a detailed assessment of the articles passing the screening was conducted through full-text reviews based on established inclusion and exclusion criteria. Studies with differing contexts or those not evaluating early detection effects were excluded at this stage. Finally, in the Inclusion stage, articles meeting all criteria were selected for the final analysis, enabling a qualitative examination of patterns, research gaps, and the most effective methods for early detection to prevent emotional mental disorders caused by bullying. This meticulous selection process ensured that only relevant and high-quality articles were analyzed, providing a comprehensive understanding of the topic.

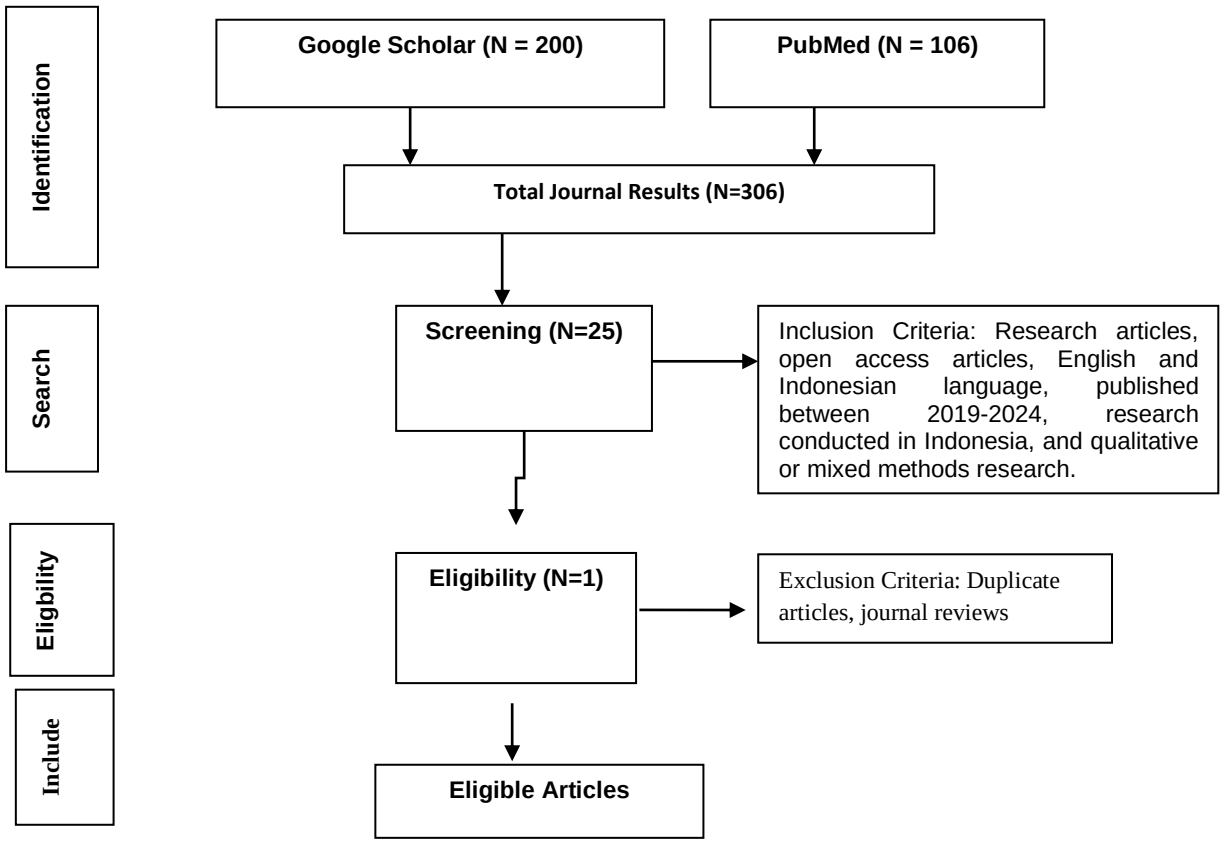

Figure 1. Stages of Article Search and Selection Leading to Reviewed Articles

Table 1.
The Role Of Elementary Schools In Dengue Fever Control: A Scoping Review

Researcher(s), Year	Objective	Population	Method	Findings
(Abbas et al., 2021)	2021	500 healthcare workers, including doctors and interns.	A comparative study using a self-reported questionnaire to evaluate hand hygiene and respiratory etiquette practices before and after a web-based training module. Post-intervention assessment was conducted 1–2 weeks later.	The training improved hand hygiene practices, including increased use of alcohol-based sanitizers and adherence to 20-second handwashing. Female participants showed a 6.5% increase in handwashing (>5 times/day), while males showed a 4.5% increase. The web-based module proved effective in promoting preventive measures to reduce COVID-19 spread in healthcare settings.
(Hayudini et al., 2022)	2022	Principals, teachers, and school nurses in selected elementary schools in Jolo, as well as 38 reported dengue hemorrhagic fever cases among school children	The study used a descriptive research design with a validated self-devised survey questionnaire. Data were analyzed using frequency, percentage, mean, and chi-square. Focus group discussions, interviews, video recordings, and notes were also employed for qualitative insights.	The majority of national preventive measures, such as information dissemination, environmental sanitation, use of mosquito repellents, and OVI-Larvicidal Tap placement, were implemented. However, spraying insecticides and ensuring children wore prescribed uniforms were poorly executed. The study revealed 38 dengue cases from hospital

Researcher(s), Year	Objective	Population	Method	Findings
				data and found a significant difference between the implementation of preventive measures and dengue incidence, rejecting the hypotheses.
(Aslam et al., 2024)	2024	High school students (n = 36), primarily aged 15–16 years, with a small proportion aged 18 years.	A quasi-experimental (pre-test, post-test) design was used over six months. Data were collected using a convenience sampling technique and an adopted questionnaire. Statistical analysis compared pre- and post-intervention awareness scores.	The pre-intervention mean awareness score was 7.13 ± 1.41, while the post-test score increased to 13.69 ± 3.02, indicating a statistically significant improvement.
(Dede et al., 2023)	2023	76 students at SD Negeri Pokoh 1, with the majority being male	Quantitative research with a quasi-experimental design (pre-test and post-test without a control group).	Dengue fever education significantly improved students' knowledge.
(Dadang Purnama et al., 2024)	2024	48 students aged 9–12 from SDN 2 Cintaratu.	A pre-test and post-test design evaluated students' knowledge of DHF	Health promotion improved students' knowledge and addressed key PHBS (Clean and Healthy Living Behavior) indicators: handwashing, proper toilet use, eradicating mosquito larvae, and managing waste disposal.
(Santos et al., 2022)	2022	The study involved 883 participants, including 690 high school students (ages 14-41, average age 17 ± 2 years) and 193 teachers (ages 22-64, average age 38 ± 9 years) from the city of Campina Grande, Paraíba, northeastern Brazil	A pre-post intervention study design was used, with participants completing a self-reported questionnaire assessing environmental risk factors, sociodemographic variables, attitudes, and behaviors. The e-health intervention involved a competition among schools to implement preventive actions through content production for social media, with monitoring conducted using ZikaMob software over three months.	The ZikaMob intervention proved effective in promoting preventive behaviors and can be replicated in any location with internet access, involving a large number of participants.
(Kosasih et al., 2021)	2021	The study involved 323 elementary school students in grades 4-6 from four schools: Bojong Asih Elementary School, Pasawahan Elementary	A quasi-experimental research design with a pre-test and post-test approach was used. Students were given a questionnaire before receiving counseling on Dengue Hemorrhagic Fever (DHF) prevention	The DHF prevention education significantly improved students' knowledge and attitudes about DHF prevention.

Researcher(s), Year	Objective	Population	Method	Findings
		School, Cangkuang Elementary School, and Leuwi Bandung Elementary School in Dayeuhkolot, a flood-prone area.	and then re-assessed with a questionnaire after the intervention. The Integrated UKS method was applied for the intervention. Descriptive univariate analysis and bivariate t-test were used for data analysis.	
(Mutia Nasir & Adhiyanto, 2019)	2019	The study involved 632 elementary school students from 21 schools in Jakarta, Indonesia. The participants were 5th and 6th grade students, with 211 students in each of the intervention groups (poster and flipchart) and 210 students in the control group.	A quasi-experimental study design was employed. Seven schools received a poster intervention, seven received a flipchart intervention, and seven were assigned as the control group. The study assessed students' attitudes and preventive behaviors regarding Dengue Hemorrhagic Fever (DHF) prevention before and after the interventions.	The study concluded that health education interventions, such as posters and flipcharts, were effective in promoting preventive behaviors against DHF among elementary school students.
(Hayat et al., 2021)	2021	The study involved elementary school students at SDN Jawilan, Serang City, focusing on educating them about Dengue Hemorrhagic Fever (DHF) and its prevention.	Filling out a questionnaire to assess students' initial knowledge	The community service program successfully enhanced student awareness and knowledge of DHF prevention, highlighting the importance of the PSN 3M Plus method in combating the disease.
(Nasution et al., 2024)	2024	The study involved fifth and sixth grade students from two elementary schools in Bogor, Indonesia: SDN Cibedug 01 (rural) and SDN Kaum Pandak 02 (urban). A total of 179 students participated, divided into two treatment groups and one control group at each location.	The study employed a true experimental design with a 2 x 1 factorial model and pre-test post-test control group design.	The Indonesian version of the OPAT SIHAT innovation proved to be effective in enhancing students' knowledge and attitudes about dengue vector control in both rural and urban settings. The study suggests that this version should be expanded to more schools in both areas. The involvement of Sismantik (student flick monitors) plays a key role in the success of this program.
(Sawitri & Maulina, n.d.)	2022	SDN 3 Muara Dua school.	The approach used in this project includes education, socialization, and the formation of mosquito larvae hunter teams (Buru Sergap	The community service project effectively increased the students' awareness and knowledge about the importance of mosquito larvae eradication. The formation of

Researcher(s), Year	Objective	Population	Method	Findings
			Jentik). The aim was to equip students with the knowledge about the risks of mosquito larvae and to create a group that would regularly monitor and eliminate mosquito larvae in their school environment.	mosquito larvae hunter teams at SDN 3 Muara Dua will help contribute to the prevention of DHF in the school environment. Continued education and motivation are crucial for sustaining the program and enhancing its impact.
(Issri Rubandiyah et al., 2018)	2018	The sample consisted of 52 students from grades 4 and 5 at SDN 1 Mluweh.	This study was conducted in November 2017 using a One Group Pre-test-Post-test design.	The intervention had a positive effect on increasing the knowledge of the students about DHF prevention. The training of Jumantik cadres also contributed to enhancing the overall awareness and participation in the mosquito larvae eradication program at the school.
(Hernández-Suárez & Mendoza-Cano, 2016)	2016	The study was conducted in Colima state, Mexico, with a population of 568,000. It focused on elementary schools (grades 1–9).	In 2007, a massive campaign was implemented to train janitors to identify and eliminate mosquito breeding places, with the goal of keeping elementary schools free of mosquitoes.	The campaign resulted in a 45% reduction in dengue incidence in the region compared to the previous year, while the rest of Mexico saw an 81% increase in cases. The costs associated with the campaign were low, and the results were promising, although further controlled studies are needed to confirm the findings.
(Hendri et al., 2020)	2020	The study involved 300 students: 98 male and 202 female, with an average age of 10.7 years for elementary school students, 14 years for junior high school students, and 16.5 years for senior high school students.	The study aimed to describe students' knowledge about Dengue Hemorrhagic Fever (DHF) and their attitudes and practices toward controlling the disease. Interviews were conducted to assess the students' knowledge and actions regarding DHF and its vector control.	The study found that knowledge about DHF was still low among students at various education levels. At the elementary level, 49.5% of students had favorable knowledge about DHF, while only 3.4% had knowledge about DHF vector control. Junior high and senior high students had even lower percentages of favorable knowledge. Additionally, only a small percentage of students took vector control measures. The study concluded that comprehensive and continuous socialization of the 3M Plus program is needed in schools to improve students' knowledge and participation in controlling DHF.
(Kopong Tokan et al., n.d.)	2022	The study focused on students of Inpres Elementary School Watujara, aged 5-14 years, who are at high	The research used a non-experimental quantitative approach with a descriptive study design. It aimed to assess the students' knowledge	The majority of students had a low level of knowledge about DHF, particularly in prevention, management, symptoms, and causes. There is a significant gap in the

Researcher(s), Year	Objective	Population	Method	Findings
		risk of dengue transmission due to spending significant time in school activities.	about Dengue Hemorrhagic Fever (DHF) from August 1 to October 1, 2020.	students' understanding, and the study emphasizes the need for more effective education on dengue prevention and management.
(PENgETAHUAN et al., n.d.)	2020	This study involved 60 fifth-grade elementary school students from SDN 1 and 2 Panarung, Palangka Raya City. The participants were divided into two groups: an experimental group (30 students) and a control group (30 students).	The study used a quasi-experimental two-group pre-posttest design. The researchers used questionnaires, checklist sheets, and booklets as instruments. The sample size was calculated using a hypothesis test with a 90% power of test. The data were analyzed using t-tests to determine knowledge and attitude differences, the Mann-Whitney test for behavior differences, and a chi-square test to assess the presence of larvae.	The booklet used for counseling significantly improved the knowledge, attitude, and behavior of students regarding the Jumantik-PSN program. It also contributed to a reduction in the presence of mosquito larvae. The study concluded that booklets can be an effective educational tool to enhance community participation in dengue prevention. 4o mini
(Pujiyanti et al., 2014)	2014	107 elementary school teachers and janitorial staff in Tembalang District.	Cross-sectional study using proportional random sampling and structured interviews with a questionnaire; data analyzed descriptively (univariate analysis).	School community awareness of DHF transmission was low due to lack of knowledge about secondary infection, mosquito life cycle, and vector seriousness. Respondents did not perceive themselves at risk, as DHF was seen as primarily affecting children. Mosquito breeding prevention (PSN) was not positively received by the school community. Vector control and mosquito bite prevention efforts needed improvement. Recommendations included health promotion on DHF infection, PSN measures, and vector mosquito behavior for teachers and school staff.
(Hapsari et al., n.d.)	2024	Students of Utsman Bin Affan Islamic Elementary School, Ungaran.	Public health education program using interactive learning methods (videos, games, hands-on activities); knowledge assessed through pre-test and post-test; paired T-test for statistical analysis.	Pre-test average score: 67.34; post-test average score: 89.67; significant improvement ($p=0.001$). 80% of students retained knowledge. The interactive approach effectively increased students' understanding of dengue fever prevention through '3M Plus' activities.
(Pujiyanti et al., 2012)	2012	Physical education teachers in primary schools in Tembalang subdistrict	Quasi-experimental research with community intervention studies; nonequivalent control group design;	Teachers trained with the active learning method showed significantly higher knowledge, practices, and self-efficacy in DHF

Researcher(s), Year	Objective	Population	Method	Findings
		(intervention group) and Pedurungan Tengah Village, Pedurungan subdistrict (comparison group).	comparison of active learning methods vs. leaflet and poster media.	prevention ($p < 0.05$) than those using posters and leaflets. The active learning method was more effective in improving teachers' self-efficacy as health promoters in schools and was recommended for DHF health education in primary schools.
(Hidayati et al., 2022)	2022	32 students from grades 5 and 6 at SDN Deket Wetan, Lamongan.	Community service activity involving health education through presentations, discussions, and demonstrations; topics included larvae monitoring, DHF education, mosquito nest eradication, and clean living habits; evaluation through interviews and observations.	Participants' knowledge increased after the activity, and all students mastered larval monitoring skills. 100% of participants correctly performed larva monitoring and handwashing per WHO recommendations. The combination of presentations, discussions, and demonstrations by multiple resource persons improved student understanding, leading to successful outcomes.
(Rahmawati et al., 2023)	2023	65 fifth-grade students and accompanying teachers at SDN Naikoten I, Kota Kupang.	Community service activity using health education and training on DHF prevention; included lectures and hands-on mosquito nest eradication practices.	Students showed high enthusiasm and active participation throughout the activity. They successfully understood the material and demonstrated proper mosquito nest eradication techniques.
(Suhariati & Ruliati, 2024)	2024	40 fifth-grade students at Candimulyo State Elementary School 1.	Quasi-experimental (Pre and Post-test design) with Wilcoxon sign rank test for data analysis.	Before counseling, 56.1% of students had poor dengue prevention knowledge. After counseling, 56.1% had good knowledge. Wilcoxon test showed a significant effect ($p = 0.00 < 0.05$), indicating that health education effectively improved dengue prevention awareness.
(Susanna et al., 2019)	2019	Elementary school students in Kutaraja, Banda Aceh.	The activity included advocacy, socialization, module development, training for student mosquito larvae monitors (Sismantik), Focus Group Discussions (FGD) with schools, and regular mosquito larvae checks.	There was a significant improvement in knowledge before and after training ($p = 0.004$). The highest Free Larvae Rate (ABJ) was achieved after the fourth mosquito larvae monitoring session.
(Anggraini et al., 2022)	2022	18 students of SDN Malabar, Tegallega, Bogor.	The activity involved providing education and counseling to students about DBD prevention, the identification of mosquito larvae, and where these larvae can develop.	The expected outcome was improved knowledge among students about DBD prevention, with students also becoming capable of recognizing and eliminating mosquito larvae in their surroundings.

Researcher(s), Year	Objective	Population	Method	Findings
(Muli Endang Pekenasa Tarigan & Zulaiha, n.d.)	2021	Indonesian population	Literature review of various scientific sources to analyze facts related to DBD determinants, epidemiology, and control programs.	The review found significant relationships between DBD occurrence and factors such as age, gender, education, presence of mosquito larvae, temperature, humidity, and water storage. There was no link between occupation and hanging clothes. The number of DBD cases in Indonesia has been increasing, with major outbreaks in 2015 (129,650 cases), 2016 (202,314 cases), and 2017 (68,407 cases). The most effective control program is the Mosquito Nest Eradication (PSN) through the 3M approach (draining, closing, and reusing). The government plays a key role in educating and raising public awareness on risk factors and intervention programs.

The role of elementary schools in controlling Dengue Hemorrhagic Fever (DHF) has been demonstrated through various educational interventions aimed at improving students' knowledge, attitudes, and behaviors. Health education programs, including training on preventive measures such as mosquito larvae eradication, have proven effective in raising awareness among students. Multiple studies show that interventions, such as workshops, lectures, and multimedia tools like posters and booklets, significantly improve students' understanding of DHF prevention and control. Gender and age were identified as influencing factors, with older students and females generally exhibiting better knowledge and attitudes. Overall, these educational programs have shown a positive impact on promoting health-conscious behaviors and community participation in DHF control, especially in school settings.

DISCUSSION

The role of elementary schools in dengue fever control is significant, as illustrated by various studies focusing on health education and preventive interventions. A number of studies have highlighted the impact of dengue education on students' knowledge and attitudes toward preventing Dengue Hemorrhagic Fever (DHF). For example, the research by Dede et al. (2023) and Dadang Purnama et al. (2024) showed that dengue education significantly improved students' knowledge and behavior regarding DHF prevention. These studies utilized pre-test and post-test designs, with the interventions enhancing awareness about mosquito control, proper hygiene, and other preventive measures. Similarly, studies like those conducted by Hayudini et al. (2022) and Sawitri & Maulina (n.d.) emphasized the importance of implementing mosquito larvae monitoring teams in schools to engage students actively in preventive practices, which has proven effective in raising awareness about the risks of dengue and promoting hygiene practices. In addition, other research, such as that by Mutia Nasir & Adhiyanto (2019), demonstrated that health education programs, whether through posters or interactive learning methods, significantly influenced students' attitudes toward dengue prevention.

This was further corroborated by Hidayati et al. (2022) and Rahmawati et al. (2023), who found that health education through demonstrations and hands-on activities enhanced students' understanding and practical skills in controlling mosquito larvae. However, some studies also indicated that despite the positive outcomes, the full implementation of all preventive measures such as the use of insecticides and the wearing of prescribed uniforms remained inconsistent (Hayudini et al., 2022). This suggests that while educational efforts are valuable, more consistent and comprehensive strategies are needed for effective dengue control in school settings. Collectively, these findings underline the crucial role that elementary schools can play in dengue prevention by improving student awareness, involving them in active monitoring, and fostering long-term habits that can contribute to reducing the spread of the disease.

CONCLUSION

In conclusion, school-based health education programs play a crucial role in enhancing students' awareness and understanding of Dengue Fever (DBD) prevention. Through activities like mosquito breeding site eradication training and the use of educational media, these programs significantly improve students' knowledge, attitudes, and behaviors towards DBD prevention. While challenges such as ensuring sustainability and proper implementation of preventive measures remain, the overall effectiveness of primary school education in controlling DBD is evident. Strengthening these programs can lead to a reduction in DBD incidence, particularly among children, and is vital for the long-term success of public health efforts. Therefore, continuous support and improvement of health education initiatives in schools are essential in achieving sustainable DBD control and prevention.

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