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[Original Research]

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Effect of Audiovisual Health Education on Students' Health Literacy Regarding Dengue Prevention: A Quasi-Experimental Study

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Abstract

Background: Dengue fever (DF) is a tropical disease that remains a significant global public health concern. One of the contributing factors to its persistence is the lack of health literacy and public awareness. Health education programs implemented in schools can play a vital role in improving students' knowledge about dengue fever prevention, promoting better hygiene practices, and ensuring that school environments remain free of mosquito breeding sites. **Aim:** This study aimed to determine the effect of audiovisual-based health education on elementary school students' health literacy regarding dengue fever prevention. **Method:** A quasi-experimental pre–post-test design with a control group was employed. The study was conducted at *SD Negeri Plaosan 01* in November 2024, involving 25 participants in each group selected through purposive sampling. Data were collected using a dengue fever prevention health literacy questionnaire, which demonstrated validity values ranging from 0.412 to 0.774 and a reliability coefficient of 0.828. Data were analyzed using the Wilcoxon Rank Test and the Mann–Whitney U test. **Results:** Audiovisual-based health education significantly improved the health literacy of elementary school students concerning dengue fever prevention. After the intervention, all students in the intervention group (100%) demonstrated good health literacy, compared to 92% in the control group. Statistical analysis revealed a significant difference between the two groups ($p = 0.000$; $p < 0.05$), indicating the high effectiveness of audiovisual media in enhancing students' understanding. **Conclusion:** Audiovisual-based health education effectively increases students' knowledge and awareness of dengue fever prevention. Students who have gained this knowledge are expected to apply preventive behaviors, such as maintaining environmental cleanliness, implementing the *3M Plus* strategy, and promoting a healthy, mosquito-free environment.

Keywords: Dengue fever, health education, audiovisual media, health literacy, elementary school students

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Introduction

Dengue fever remains one of the most significant vector-borne diseases worldwide, with a record number of cases reported in 2023. More than 80 countries across the World Health Organization (WHO) regions were affected, resulting in over 6.5 million reported cases and 7,300 deaths (Andika et al., 2024). In Indonesia alone, approximately 114,720 cases were recorded, with 894 fatalities during the same year. The high incidence of dengue fever is strongly influenced by public knowledge, attitudes, and preventive behaviors. Limited access to

accurate health information, particularly among school-aged children, significantly contributes to increased susceptibility to dengue infection.

Clinically, dengue fever presents a broad spectrum of manifestations, ranging from mild fever to life-threatening conditions such as Dengue Hemorrhagic Fever (DHF) and Dengue Shock Syndrome (DSS). Moreover, recent studies have indicated a correlation between vitamin D deficiency (VDD) and the severity of dengue infection in children (Dissanayake et al., 2021). National surveillance data indicate an overall improvement in disease outcomes. In 2023, dengue-related deaths decreased by 143,226 cases compared with 2022, and the case fatality rate declined from 1.9% to 0.9% (Pati Regency Health Office, 2023). Similarly, the incidence rate per 100,000 population dropped from 52.1 in 2022 to 41.4 in 2023 (Pasaribu et al., 2020). In Pati Regency, the annual incidence rate was 34.1 per 100,000 population, reflecting a consistent downward trend relative to the previous year.

Despite these encouraging trends, inadequate knowledge and awareness among school-aged children continue to hinder effective dengue prevention. Suhariati and Ruliati (2024) reported that seven out of ten Indonesian schoolchildren lack proper understanding of how to manage or prevent dengue fever. This highlights the urgent need for health education interventions specifically designed for this vulnerable population group. According to Susenas national data, low health literacy remains a persistent public health challenge in Indonesia. Between 2021 and 2023, approximately 26–30% of the population reported experiencing health problems linked to limited comprehension of health-related information. This issue reflects broader socioeconomic and educational disparities that restrict access to accurate health knowledge. Alqarini et al. (2023) noted that individuals from lower socioeconomic backgrounds are more likely to engage in self-medication due to poor health literacy levels.

A growing body of research supports the effectiveness of audiovisual media, particularly animated videos, in improving health literacy and influencing behavioral change. Dewi (2022) demonstrated through a Wilcoxon test that animated video–based health education significantly improved health-related behaviors among family civil servants ($p = 0.001$). Similarly, Saputra et al. (2024), in their study "Prevention of Dengue Fever Using Animated Video on the Knowledge of Students of Gadang 4 Elementary School, Malang City," reported a statistically significant improvement in students' knowledge following audiovisual intervention ($p = 0.000$). Consistent findings were also reported by Fatimah et al. (2019), who observed a significant increase in community knowledge and attitudes toward dengue prevention following the use of audiovisual educational videos ($p = 0.000$). Likewise, Juwita and Suryati (2023) found that animated video–based health education produced significant improvements in both knowledge and attitudes related to dengue prevention ($p = 0.000$). Their results showed that the mean knowledge score increased from 6.14 (pretest) to 31.50 (posttest), indicating a substantial positive behavioral impact.

Further evidence is provided by Winda et al. (2024), who investigated the impact of educational video counseling on mosquito breeding site eradication among elementary school students. Their study revealed a marked improvement in knowledge, with a mean post-intervention score of 90.83 and a significant difference of 22.44 ($p = 0.000$). Collectively, these findings highlight the efficacy of audiovisual-based learning in promoting preventive health behaviors, especially among children.

A preliminary assessment conducted at SD N 1 Plaosan, located in Cluwak District, Pati Regency, in 2024 revealed a total student population of 117. Discussions with the school principal on August 5, 2024, indicated that the local health center periodically conducted health education sessions. Several students had previously contracted dengue fever in 2023, although no new cases were reported during the current study period. Preventive efforts at the school included waste management, provision of categorized trash bins, elimination of mosquito breeding sites, weekly cleaning activities, and installation of mesh covers on ventilation openings. During dengue outbreaks, students were advised to use mosquito repellent regularly.

Despite these preventive measures, limited understanding of dengue prevention among students suggests the need for more interactive and engaging educational approaches. Accordingly, this study aims to analyze the effect of audiovisual media–based health education on improving health literacy concerning dengue fever prevention among elementary school students.

This research builds upon a well-established body of evidence demonstrating that audiovisual learning methods, particularly animated video interventions, significantly enhance comprehension, knowledge retention, and behavioral adaptation compared to conventional teaching methods. By focusing on elementary school students, who represent a high-risk and information-sensitive demographic, this study contributes meaningfully to the advancement of school-based health promotion programs in Indonesia and supports broader national efforts toward dengue prevention.

Methods

This study employed a quantitative research approach using a quasi-experimental design. The research utilized a pretest–posttest control group design involving one type of treatment. The independent variable in this study was audiovisual-based health education, while the dependent variable was students' health literacy related to dengue fever prevention. The research was conducted at two elementary schools in Pati Regency. The intervention group was implemented at Plaosan 01 Public Elementary School in Cluwak District, whereas the control group was conducted at Ngablak 01 Public Elementary School in November 2024. Each group consisted of 25 respondents, resulting in a total sample of 50 students. The sample was selected using a purposive sampling technique, which allows researchers to determine participants based on specific considerations related to the known characteristics of the target population.

The sample selection criteria were divided into inclusion and exclusion categories. The inclusion criteria were: (1) students registered at Plaosan 01 or Ngablak 01 Public Elementary Schools; (2) students enrolled in grades V and VI; (3) students who possessed a valid student identification number; and (4) students who agreed to participate voluntarily and signed an informed consent form before data collection. The exclusion criteria included students who were absent, on leave, or ill during the data collection period.

The research instrument used was a Health Literacy on Dengue Fever Prevention Questionnaire, which was developed by the researcher. The instrument consisted of 10 questions with four response options: very difficult, quite difficult, quite easy, and very easy, generating a total possible score range of 10 to 40. The assessment results were categorized into two levels of health literacy: good and poor. The validity and reliability of the questionnaire were tested on 30 students from Kayen 05 Public Elementary School. The validity coefficients ranged from 0.412 to 0.774, while the reliability coefficient was 0.828, indicating that the instrument was valid and reliable.

Health literacy assessments were conducted before and after the implementation of animated video-based health education about dengue fever prevention. The educational video lasted three minutes and was officially registered under Intellectual Property Rights with registration number 000805851. The collected data were analyzed using the Wilcoxon Rank Test and Mann–Whitney Test to determine the significance of changes in health literacy levels between the intervention and control groups. This study received ethical approval from the Health Research Ethics Committee of Muhammadiyah University of Kudus on October 13, 2024, with certificate number 56/Z-7/KEP/UMKU/X/2024.

Results

Among the 40 respondents, the mean age of students in the intervention group was 11.52 years (SD = 0.51), whereas the control group had a mean age of 10.64 years (SD = 0.50). The majority of respondents in the intervention group were male (52.0%), compared with 64.0% in the control group. Furthermore, most students in the intervention group had never experienced symptoms (52.0%), while this proportion was 60.0% in the control group (Table 1)

Table 2. Age, Gender and Health History of Elementary School Students Students (n=50)

Characteristics	Intervention		Control	
	f	%	f	%
Age (year) *(Mean ± SD)*	11.52 ± 0.51		10.60 ± 0.50	
Gender				
Male	13	52	16	64
Female	12	48	9	36
Health History				
Never experienced symptoms	13	52	15	60
Ever experienced symptoms	3	12	3	12
Don't know	6	24	1	4
Other	3	12	6	24
Total	25	100	25	100

Table 3 presents that 17 students (68.0%) in the intervention group demonstrated good health literacy prior to receiving health education. Following the intervention, all students in this group (25 students; 100%) showed an improvement in health literacy levels. In comparison, before receiving health education, 13

students (52.0%) in the control group exhibited good health literacy. After the intervention, this number increased to 23 students (92.0%), indicating a positive change in health literacy outcomes.

Statistical analysis using the Wilcoxon Rank Test revealed a significant difference in health literacy scores before and after the intervention in the intervention group ($p = 0.000$; $p < 0.05$). Similarly, the control group also showed a significant improvement in health literacy between the pre-test and post-test assessments ($p = 0.000$; $p < 0.05$).

Table 3. Health Literacy of Students in the Intervention and Control Group Befor and after intervention (n=25)

Literacy Health	Before (n=25)		After (n=25)		p-value
	f	%	f	%	
Intervention Group					
Good	17	68	25	100	0,000
Not good	8	32	0	0	
Total	**25**	**100**	**25**	**100**	
Control Group					
Good	13	52	23	92	0,000
Not good	12	48	2	8	
Total	**25**	**100**	**25**	**100**	

Table 4 presents the results of the Mann–Whitney test for the intervention and control groups. The analysis revealed a statistically significant difference in the health literacy of elementary school students, with a p-value of 0.000 ($p < 0.05$). Therefore, it can be concluded that audiovisual media–based health education had a significant effect on improving elementary school students' health literacy related to dengue fever prevention.

Table 4. The Influence of Health Education on Students' Health Literacy

Group	p-value
Intervention Group **Control Group**	0,000

Discussion

Research indicates that dengue fever most frequently affects individuals aged 5–14 years, with children under 12 years being 19,056 times more likely to contract dengue fever compared to those aged 12 years and older. This heightened vulnerability is attributed to the relatively lower immune capacity of younger children and their greater likelihood of engaging in outdoor activities, which increases their exposure to mosquito bites. The Aedes aegypti mosquito, known for its tendency to bite multiple individuals, further amplifies this risk (Saputra et al., 2024). These findings are consistent with the study by Tokan and Artama (2022), which reported that most students were aged 10–11 years (32.4%), followed by 31 students (29.5%) aged 12–13 years. Their study emphasized that children under 12 years are at higher risk of dengue infection because they spend substantial time outdoors at school, both in the morning and afternoon.

In the present study, nearly all respondents were male, which aligns with findings by Suhariati and Ruliati (2024) at Candimulyo Public Elementary School, where more than half of the students (52%) were male. Boys are generally less attentive to environmental cleanliness and less likely to heed advice or warnings from others. This observation is supported by developmental theories suggesting that boys tend to show less concern for personal hygiene and environmental order, whereas girls are typically more conscientious, organized, and responsive. Similarly, Dewi (2022) found that most respondents were male (58.33%) compared to 41.67% female students.

High outdoor activity levels and infrequent use of mosquito repellent among boys contribute to their increased susceptibility to dengue infection. Previous studies have similarly reported that dengue fever occurs more frequently among males due to their outdoor habits and lower awareness of personal protection measures. The results also revealed that most students in both the intervention and control groups had never experienced dengue-like symptoms, based on the questionnaire data. Observations indicated that respondents' residential areas were densely populated, with stagnant water during the rainy season serving as potential breeding sites for Aedes aegypti. It is possible that some respondents experienced mild symptoms but did not recognize them as early signs of dengue, often mistaking them for common fever or influenza (Prameswarie et al., 2022). Consistent with Berliano et al. (2019), approximately 77% of respondents had never experienced dengue symptoms, which was

attributed to limited knowledge and insufficient preventive behaviors, such as inconsistent application of the 3M strategy—draining, closing, and recycling water containers. Limited health education and restricted access to information may further reduce students' ability to recognize and prevent dengue infection.

Health literacy components in this study were evaluated to assess students' ability to obtain, understand, and apply health information effectively. These included understanding medical advice from healthcare professionals, interpreting health warnings, assessing the credibility of health information from media sources, and making informed decisions regarding disease prevention and self-protection (Farmani & Laksmini, 2023). The findings demonstrated a significant improvement in health literacy among students in the intervention group after receiving audiovisual-based health education, as reflected by higher posttest scores compared to pretest results. This aligns with Hapsari et al. (2024), who found that exposure to animated video interventions led to notable improvements in children's knowledge about dengue prevention. In their study, 24 of 30 children (80%) scored between 80 and 100 after the intervention, with mean pretest and posttest scores of 67.33 and 89.67, respectively. A paired t-test revealed a significant difference ($p = 0.001$), indicating that audiovisual learning effectively enhances understanding of dengue prevention. Similarly, Anisa (2024) reported that animated video–based health education significantly improved students' knowledge and attitudes toward dengue prevention, with a p-value of 0.000 ($p \leq 0.05$). These results confirm that audiovisual media serve as an effective educational tool for promoting dengue prevention behaviors. By presenting information in a visually engaging and easily comprehensible format, audiovisual media increase motivation and facilitate behavioral change among children.

The findings of the present study further support existing evidence that audiovisual health education significantly enhances students' health literacy related to dengue prevention. This improvement can be explained through the principles of cognitive dual-channel processing, where information is simultaneously received through visual and auditory pathways. Such dual engagement improves comprehension, memory retention, and understanding of complex health concepts (Galmarini et al., 2024). Audiovisual materials therefore enable learners to integrate information more effectively than verbal instruction alone.

Further research supports the use of audiovisual media to promote health-related behaviors. Studies have demonstrated that videos and other multimedia interventions enhance knowledge and engagement across various health domains, including oral health, pregnancy care, and infectious disease prevention (Ismi et al., 2025; Rahayuningsih et al., 2024). These findings are consistent with the present study's results, showing that audiovisual-based education not only increases factual knowledge but also improves learners' ability to interpret, apply, and act upon health information—key aspects of functional and interactive health literacy.

In summary, the evidence strongly supports audiovisual health education as an effective strategy for improving health literacy among students. By integrating both visual and auditory elements, this approach enhances attention, comprehension, retention, and motivation—critical factors for successful learning and behavioral change in health promotion. Nevertheless, this study has certain limitations. It was conducted with a relatively small number of respondents and limited to specific geographic areas, which may restrict the generalizability of the findings. Moreover, the study primarily focused on improvements in knowledge and attitudes, without directly measuring long-term behavioral changes such as the consistent application of 3M Plus practices. Additionally, the short intervention period limited the ability to assess the sustained effects of audiovisual health education on dengue prevention behavior. Future research should involve larger, more diverse samples, extended intervention durations, and longitudinal follow-ups to evaluate long-term behavioral outcomes.

Conclusion

The results of this study demonstrate a statistically significant effect of the intervention on the health literacy of elementary school students ($p = 0.000$; $p < 0.05$). These findings indicate that audiovisual-based health education effectively enhances students' understanding and awareness of dengue fever prevention. Students who acquire this knowledge are expected to strengthen their self-awareness and actively participate in preventive behaviors, including maintaining environmental cleanliness, implementing the 3M Plus strategy (draining, closing, and recycling water containers, along with additional preventive measures), and fostering a healthy, mosquito-free environment. The findings of this study are anticipated to serve as a valuable reference and learning resource for students, teachers, and health educators, promoting the practical application of dengue prevention strategies in both school and community settings. Future research is recommended to include larger and more diverse samples across different geographic regions to enhance the generalizability of results. Broader participation will allow for a more comprehensive understanding of how audiovisual-based health education

influences students' health literacy, confidence, awareness, behavior, and attitudes toward dengue fever prevention.

Declaration of Conflicting Interest

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Author's Contribution

All authors contributed significantly to the completion of this research. The first author was responsible for developing the research concept and design, as well as conducting the health education intervention using audiovisual media. The second author contributed to data collection, statistical analysis, and interpretation of the results. The third author provided critical review, helped refine the manuscript, and ensured the academic quality and alignment with current literature. All authors have read and approved the final version of the manuscript.

Data Availability Statement

The data that support the findings of this study are available from the corresponding author upon reasonable request. All data have been anonymized to protect participant confidentiality.

Declaration of Use of AI in Academic Writing

The authors declare that generative artificial intelligence (AI), including large language models such as ChatGPT by OpenAI, was used to assist in the improvement of language clarity, grammar, and structure during the preparation of this manuscript. All content has been reviewed and verified for accuracy, and the intellectual contributions remain those of the authors. The use of AI did not influence the research design, data collection, analysis, or interpretation of results.

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