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The Effectiveness of an Automated Audio System for Health Education Tool on Dengue Fever Prevention Knowledge Using the "3M+" Strategy

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ABSTRACT

Background: The Indonesian Ministry of Health has been providing community counselling on dengue fever prevention. Knowledge is crucial for habit change, making dengue fever counselling vital. To enhance direct knowledge delivery to residents, an updated counselling method using an automated audio system is needed. Additionally, assessing the effectiveness of this automated audio system in promoting dengue fever prevention with the 3M+ strategy is essential. **Methods:** This study employed a pre-and post-test experimental design. **Results:** The significance value of 0.012, which is less than 0.05, indicates that there was a positive difference in dengue prevention knowledge before and after treatment with an automated audio system tool. **Conclusion:** Before and after treatment, there was a significant difference in knowledge about dengue fever prevention. Finally, this tool can be used to increase the level of knowledge of each respondent as well as to prevent other diseases. Implementing automated audio for dengue education among community nurses offers cost-effective, scalable dissemination of customized content. It enhances comprehension and retention and empowers healthcare providers, yielding favorable public health outcomes.

Keywords: Automated Audio System; Dengue Fever; Knowledge

INTRODUCTION

After Malaysia and Singapore, Indonesia has the highest number of dengue cases in Southeast Asia. In 2021, dengue fever cases in Indonesia were fairly high, at 137,000 per year, with an average monthly rate of 11,416. In June 2021, there were 68,753 dengue cases, an increase from the previous month's average of 11,458. The monthly average in 2019 was 11,416,416; in 2020, it was 11,458 (Fauzi *et al*., 2022).

The symptoms of dengue can vary widely, from mild cases with no noticeable symptoms to severe complications like hemorrhagic fever and shock. Typically, dengue presents with a sudden high fever, muscle and joint aches, myalgia, skin rash, bleeding episodes, and circulatory shock (Khan *et al*., 2024). The Indonesian Ministry of Health continues to make efforts to reduce dengue cases by preventing dengue fever by eradicating mosquito nests (PSN). Efforts to reduce dengue fever are communicated to residents either in writing or through counseling. The environment is managed using a three-step procedure known as 3M+, which stands for "Menguras, Menutup, and Meng bur", which means draining, closing, and burying (Faridah *et al*., 2022). Removing or burying any old objects that can hold water, draining the bathtub once a week, and securing the water reservoir are all recommended. The biological defense strategy involves keeping betta fish in a pond that can consume dengue mosquito larvae (advantages and disadvantages). Additionally, chemical control methods, such as sprinkling abate on water storage to prevent it from becoming a breeding ground for dengue mosquito larvae and fogging (spraying to kill adult mosquitoes), are also effective (Rakhmani & Zuhriyah, 2024).

The Indonesian Ministry of Health has been working to provide information to the community through

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counseling in a place where the community can be given information about dengue fever prevention (Faridah *et al.*, 2020). Family members present at the counseling are considered residents' representatives, while others who were not present did not receive dengue prevention information. The people who are targeted in dengue counseling make up a very small portion of the family members at home, even though it is known that knowledge is the first step in a person being able to change habits. Moreover, if the community does not understand the importance of dengue prevention, it will be difficult for the community to take dengue prevention action. Eliminating the breeding grounds for Aedes aygepty mosquitoes at home or close to the house is the most efficient method of preventing dengue fever. Therefore, a strategy is required so that information on dengue prevention can be delivered directly to family members in a time- and resource-constrained environment (Bhattacharya *et al*., 2019; Srisawat *et al*., 2022). Due to this and the requirement for accommodations during extension activities, it is very challenging to conduct counseling on a regular basis.

Therefore, an automated counseling method is required that can be directly targeted at all family members at home, particularly with the help of an automated audio system tool that can conduct counseling at a predetermined time in accordance with family members' agreements. This tool will provide direct information to family members and continuously conduct counseling within a predetermined time frame. Additionally, this automated tool aims to evaluate the efficacy of an automated audio system as a health education tool for dengue fever prevention (3M+).

METHODOLOGY

Research Design

This study utilized an experimental design with a quantitative pretest-posttest approach. The study population comprised 134 families living in Air Putih Subdistrict, Samarinda Ulu District, which has the highest number of dengue fever cases in Samarinda. The study focused on areas with recurrent dengue fever cases within the last two years, specifically RT 59 in Air Putih Subdistrict, with 134 heads of households serving as the study population. The research sample was selected randomly, and the sample size was calculated using the Slovin formula (Purwanto *et al*., 2019) as follows:

$$n = \frac{N}{1+N \cdot e^2}$$

Where:

- n = Number of samples
- N = Total population
- e = Margin of error (5%)

Given the total population (N) was 134, the sample size calculation is as follows:

$$n = \frac{134}{1+134 \cdot (0.05)^2}$$
$$n = \frac{134}{1+134 \cdot 0.0025}$$
$$n = \frac{134}{1+0.335}$$
$$n = \frac{134}{1.335}$$
$$n = 100.4$$

So, the sample was 101 households.

Questionnaire

A questionnaire that was used as the instrument had undergone validity and reliability testing on RT 42 with a total of 30 respondents. There were 16 items in this questionnaire about knowledge of dengue fever prevention. With a Cronbach's alpha score of 0.801, this questionnaire is reliable because it contains 10 valid and reliable questions out of the total 16 items. According to Sujarweni (2014), if Cronbach's alpha is greater than 0.6, the knowledge questionnaire is considered reliable (Sintani, Hendriyono, & Lestiani, 2021). With a score of > 0.6, ten of the sixteen questions were considered as reliable.

Quantitative Data Collection

Steps of data collection:

The questionnaire was tested for validity and reliability.

1. Measure the level of knowledge before receiving treatment.
2. Provide intervention with an automated audio system for 30 days.
3. Measure the level of knowledge after the intervention with the data normality test, continuing with the paired *t*-test if the data is normal and using the Wilcoxon test if the data is unusual.

Ethical Consideration

This study was approved by the review board of the Faculty of Medicine, Sultan Agung University, Indonesia with reference number 418/XII/2021/Bioethics Commission on 30th December 2021.

RESULTS

The following are the results of the effectiveness of an automated audio system for health education tool in promoting dengue fever prevention (3M+) before and after treatment:

Table 1: Presents the Effectiveness of an Automated Audio System as a Health Education Tool for Promoting Dengue Fever Prevention (3M+) Before and After Treatment

No	Statement	Pre		Post	
		n	%	n	%
1	The cause of DHF (Dengue Hemorrhagic Fever) is a virus	59	58.4%	85	84.2%
2	Mosquito bites are a source of DHF transmission	101	100%	101	100%
3	The type of mosquito that transmits DHF is Aedes.	99	98%	101	100%
4	The characteristics of the dengue mosquito are striped wings and body or with a white stripe.	98	97%	101	100%
5	The 3M + program is, to drain, cover and exploit	92	91.1%	98	97%
6	The 3M + program for closing activities are closing the trash can at home	13	12.9%	42	41.6%
7	The 3M + program, plus the use of window screens, raise larvae eating fish	83	82.2%	96	95%
8	Chemical prevention programs by administering larvacide/abate are usually used in water reservoirs.	94	93.1%	100	99%
9	Prevention of dengue fever by controlling the environment by removing solid waste regularly.	101	100%	101	100%
10	Checking larvae in flower vases containing water is the prevention of dengue fever	98	97%	100	99%

According to the table above, the type of mosquito that transmits DHF is Aedes. Before the treatment, 98% answered correctly, and following the treatment gave accurate answers, or 100%. According to the table above, the characteristics of the dengue mosquito were striped wings ones or with a white-stripe body. Before the treatment, 97% of the respondents correctly answered, and after the treatment, 100% of the respondents provided accurate answers. The 3M+ program focuses on draining, closing, and burying. Before the treatment, 91.1% answered correctly, and following the treatment, 97% answered correctly. The 3M+ program for closing activities was by closing the trash can at home. Before the treatment, only 12.9% answered correctly, and after the treatment, 41.6% answered correctly. As shown in the table above, the 3M+ program and the use of window screens both produce fish-eating larvae. A total of 95% of respondents provided the correct response after the treatment, compared to 82.2% before the treatment. Chemical prevention programs involving the administration of larvicide or abate are typically used in water reservoirs, as shown in the table above. In comparison to 93.1% before the treatment, as shown in the table above, controlling the environment by burying solid waste on a regular basis can help prevent dengue fever, compared to 93.1% before the treatment. Respondents provided 100% accurate answers both before and after the treatment.

As shown in the table above, checking for larvae in water-filled flower vases is part of dengue fever prevention. Following the treatment, 99% of respondents provided the correct response, up from 97% before.

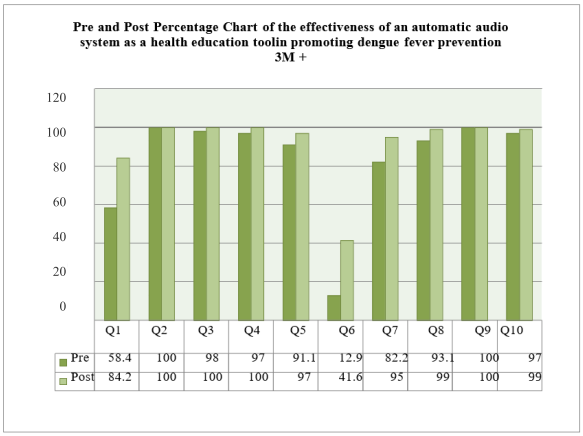

Figure 1: Percentage of Answers to Questions Before and After the Automatic Intervention of the Audio Dengue Fever Prevention System

In the above picture, it can be seen that there is a difference in the level of knowledge of respondents before and after giving audio visual treatment regarding dengue prevention. There is an increase in knowledge about preventing dengue fever after being given an intervention of an automatic audio device.

Prior to performing the various tests, a normality test needs to be conducted. If the data are normally distributed, the paired *T*-test will be used; otherwise, the Wilcoxon test will be employed. As for the results of the normality test, it was discovered that the pretest was 0.006 and the posttest was 0.000 0.05, indicating that this data was not normally distributed and the Wilcoxon test had to be used for the difference test. The results of the Wilcoxon test obtained a significance of 0.012 <0.05; there was a difference before and after being given treatment with a positive value, indicating that this tool was effective in changing knowledge of dengue fever prevention (3M+).

DISCUSSION

The results of the study after treatment with an automated audio system to change knowledge of dengue fever on each question asked by the researcher are as follows: When someone is exposed to an external stimulus, their knowledge can start changing. This is supported by numerous studies that show a change in a person's knowledge after receiving health education, as research conducted in America discovered that knowledge increases after receiving health education (Bus *et al*., 2024; Amalia, Said, & Nambiar, 2024). After receiving health education from outside sources, either independently or in groups, someone's health knowledge will change (Riesmiyatiningdyah, Putra, & Sulistyowati, 2021). Health education increases a person's knowledge, but it cannot be obtained continuously and only lasts for a limited period of time (Moldt *et al*., 2023). As a result, health education can be delivered continuously through automated health education technology, enabling people's knowledge to expand. The results of health education research using an automated audio system revealed a significant change in knowledge, particularly regarding dengue fever prevention. This tool can be used to educate both those who are ill and those who are not, by spreading awareness of other diseases and enhancing the knowledge of those who are affected by them or who know them well. This is in line with research that says that to change knowledge, it is necessary to use electronic media so that someone can regularly receive health education, as in research on pregnant women using audio equipment that can increase knowledge (Nuraeni *et al.*, 2023). With the help of this tool, it is expected that public awareness will rise and that the country's health status will gradually improve.

Last but not least, an automated audio system serves as a highly effective tool, especially for educating the nursing community about dengue fever prevention, offering accessibility, reach, consistency, engagement, cost-effectiveness, tailored content, and scalability (Yusuf *et al*., 2023). By providing convenient access to information that nurses can listen to while multitasking, such a system ensures consistent messaging across different shifts and locations, enhancing knowledge retention and reducing the risk of miscommunication. Its engaging content and

interactive features further enhance learning, while its scalability and ability to deliver tailored content accommodate the evolving needs of the nursing community (Hosseinnejad *et al*., 2022). Additionally, the flexibility of automated audio systems allows for updates and adaptations to current health guidelines and emerging research, keeping the information relevant and accurate. Overall, an automated audio system represents a cost-effective and efficient approach to disseminating crucial health education on dengue fever prevention to nurses, ultimately contributing to improved public health outcomes. This approach not only supports individual learning but also fosters a culture of continuous professional development within the healthcare sector.

Limitations

The study's small sample size limits its generalizability, highlighting the need for long-term follow-up to assess sustained knowledge retention and behavioral change. Future research should also consider technological accessibility issues to enhance the study's scope and applicability.

CONCLUSION

From the present study it is seen that there was a significant improvement in knowledge of dengue fever prevention before and after utilizing an automated audio system as an educational tool. This tool has the potential to enhance knowledge and assist in preventing various illnesses. By improving comprehension and retention among nursing professionals, this initiative will empower frontline healthcare providers to effectively combat dengue fever, leading to positive public health outcomes. Future studies can utilize this tool to further elevate knowledge levels and prevent other diseases. Implementing an automated audio system for dengue fever education among community nurses offers a cost-effective, scalable, and engaging method, enabling widespread distribution of customized content.

Conflict of Interest

The authors declare that they have no conflict of interests.

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