

Educating dengue hemorrhagic fever to Jumantik Cadres using mobile application for mosquito nest eradication

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ABSTRACT

Dengue Haemorrhagic Fever (DHF) cases are rising due to community efforts to eliminate mosquito nests. This impacts how people act. Community educators known as "Jumantik cadres" are using the YARSI University DHF Counseling Mobile Application. This app was created by YARSI University researchers in 2019-2020 and was introduced in Ciseeng village on July 29, 2021. Fifteen cadres learned to use it both online and offline. They were tested with surveys about DHF knowledge. Results showed limited understanding after using the app (e.g. only 13.3% understood headaches, 40% knew about nausea). Interviews also helped understand app use. Interestingly, 40% knew about the *Aedes aegypti* mosquito's life cycle. Some wrong ideas persisted (26.7% thought birds' drinking spots couldn't breed mosquitoes, and 53.3% understood mosquito bites). The YARSI app was liked for being easy to use. It helps Jumantik cadres educate and increase awareness about DHF. By using this app, they can share knowledge and fight against DHF more effectively.

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1. INTRODUCTION

The infectious disease Dengue Fever (DHF), caused by the dengue virus and spread through the bites of female *Aedes aegypti* or *Aedes albopictus* mosquitoes, is characterized by sudden high fever and bleeding symptoms. In Indonesia, dengue fever often leads to outbreaks with a significant number of fatalities. With increased mobility and population density, along with societal attitudes toward environmental hygiene and lack of awareness about disease prevention techniques, the number of cases tends to increase and spread (Idrus et al., 2021).

According to the report from the Indonesia's Ministry of Health (Kementerian Kesehatan) in 2022, the documented cases of DHF until February 20, 2022, were recorded at 13,776 cases. During that period, 145 people died due to DHF. In 2016, DHF cases in Indonesia reached 204,171 cases, then decreased in 2017 and 2018 to 68,407 and 65,602 cases, respectively. The numbers increased again in 2019 to 138,127 cases, decreased to 103,509 cases in 2020, and further decreased to 71,044 cases in 2021. In 2021, the Bogor Regency had the highest number of DHF cases with 2,203 cases (Kemenkes RI, 2022). The Ciseeng

Health Center, Bogor district has an outreach program to residents about DHF and realizes it through Posyandu activities (Puskesmas Ciseeng, 2022). The number of DHF case data in Bogor district shows that DHF cases are still quite high and need serious handling.

One of the DHF management programs that aims to break the transmission chain by controlling *Aedes* mosquitoes is the Mosquito Nest Eradication (MNE) program. MNE activities are conducted through the 3M-Plus approach to reduce breeding sites of *Aedes aegypti* mosquitoes, which act as dengue virus vectors. This is combined with other activities such as maintaining mosquito larvae-eating fish, applying abate powder to water storage containers, and using mosquito repellents (Kemenkes RI, 2018). Community active participation as part of health behavior is influenced by aspects of knowledge and exposure to information. Exposure to information is closely related to increasing knowledge and knowledge is closely related to changes in behavior (Syamul et al., 2022). So far, monitoring for larvae in people's homes has relied on Jumantik (*Juru Pemantau Jentik*; Larvae Monitors) cadres and the Puskesmas. However, these two resources have limited human resources and time. Therefore, with increasing public knowledge about DHF, it is hoped that the active participation of the community will increase in monitoring *Aedes* mosquito larvae.

According to a systematic review study conducted by Ernawati et al. (2021) there are at least seven new applications developed by researchers in various countries in the past two years (2019-2020) for managing DHF, including applications aimed at educating the general public. This information is based on research findings. Mobile SMS, Mobile e-learning, ThaiDengue, VECTOS, Mobuzz, Mozzify, and FeverDx are among the applications falling into this category (Ernawati et al., 2021). Digital applications also assist the work of paramedics in enhancing healthcare services to the community (Ernawati et al., 2022). The downside of digital applications is the risk posed to less experienced users. Users might be deceived into downloading apps containing malware, or violating privacy by offering dubious medical information and advice (Boulos et al., 2014).

Multimedia is part of technological advancement used across education, communication, business, and health sectors as a means to share information. Interactive multimedia, in particular, offers users the opportunity to access products, services, and enjoyable, engaging information tailored to their interests and needs (Suryawan et al., 2019). Advances in information technology need to be utilized by stakeholders in the health sector to increase the effectiveness of health education activities, including education about DHF. The purpose of this paper is to educate Jumantik cadres about DHF with the help of mobile application media in the Ciseeng area, Bogor Regency.

2. METHODS

The application used in the activities is an Android-based mobile application titled "Dengue Fever Awareness University of YARSI," developed by a research team from YARSI University in the years 2019-2020. The application can be downloaded from the Play Store (<https://play.google.com/store/apps/details?id=com.pencegahan.dbd>). The application has also obtained Intellectual Property Rights (HKI) with registration number EC00201972929 dated September 26, 2019.

Within the application, there is content covering the understanding of Dengue Fever (DHF) and its prevention. This includes information about DHF symptoms, modes of DHF transmission, characteristics of *Aedes aegypti* mosquitoes, the timing of *Aedes aegypti* mosquitoes feeding on human blood, the life cycle of *Aedes aegypti* mosquitoes, artificial breeding sites for DHF mosquitoes, natural breeding sites for DHF mosquitoes, and methods to eradicate mosquito breeding grounds.

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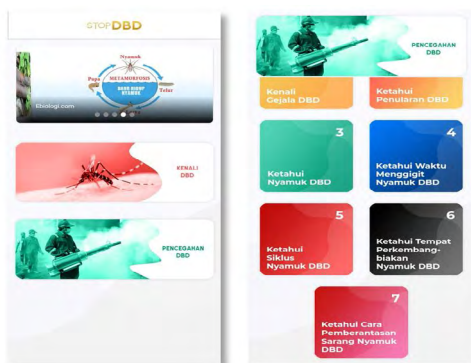


Figure 1. YARSI University android-based dengue counseling mobile application display

The activity took place in Ciseeng Village, Bogor Regency, on July 29, 2021. The participants of the activity were 15 Jumantik cadres. The participants received training on how to install the application and navigate through its menus. The training on installing the application and its usage was conducted online via a Zoom meeting. This was done due to the high number of COVID-19 cases at the time and to prevent the spread of the COVID-19 virus if the training were conducted in a shared indoor space. The participants were divided into different locations for the activity. Throughout the training, facilitators were available to assist participants in case they encountered any difficulties while installing the application or using it.

Table 1. Participants' characteristics

Variables	Categories	n	%
Age	17 – 23	6	40
	24 – 29	5	33.3
	30 - 35	4	26.7
Gender	Female	13	86.7
	Male	2	13.3
Education	Junior High School (SMP)	3	20
	Senior/Vocational High School (SMA/SMK)	7	46.7
	College/University	5	33.3
Occupation	Housewives	7	46.7
	Self-employed	5	33.3
	Private employees	3	20
Activities	Others	2	13.3
	Organization administrators/members	13	86.7
Income (per month)	≤ IDR 3,742,276	14	93.3
	> IDR 3,742,276	1	6.67
DHF History	No	15	100
	Yes	0	0

The evaluation of knowledge about Dengue Fever (DHF) was carried out using a questionnaire. The questionnaire consisted of 30 questions covering topics such as the causes of dengue fever, its

symptoms, dangers, modes of transmission, the timing of *Aedes aegypti* mosquitoes feeding on human blood, the meaning of the 3M approach, characteristics of DHF mosquitoes, the function of fogging, the function of abate, breeding sites of *Aedes aegypti* mosquitoes, simple DHF prevention methods, the frequency of draining bathtub containers for DHF prevention, the life cycle of *Aedes aegypti* mosquitoes, mosquitoes that bite humans, mosquito nesting sites for dengue fever, and ways to prevent dengue fever. Meanwhile, the evaluation of application usage was conducted through in-depth interviews to determine the ease of use and utility of the application. Data collection on knowledge after using the application was carried out online using a Google Form questionnaire.

3. RESULTS AND DISCUSSION

Results

Table 1 shows that the 15 participants in counseling activities mostly have an age range of 17-23 years by 40%, female sex by 86.7%, last formal education SMA/SMK by 46.7%, work as a housewife by 46.7%, actively participating in activities in the environment of 86.7%, income below the UMR d" Rp. 3,742,276, - 93.3%, and all participants had no history of dengue fever.

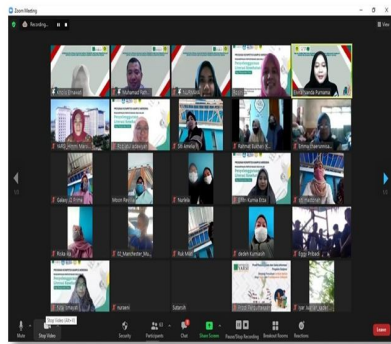


Figure 2. Training activities for online application use

Figure 3. Jumantik Cadres participants take group photo after application trial

Mobile Application Use and Benefits

Based on the interviews conducted with participants after they had installed the application on their individual smartphones, a considerable number of participants found it relatively easy to complete the installation process and navigate through the application's menus. Among these participants, those with a high school education (four individuals) and tertiary education (five individuals) backgrounds reported minimal difficulties. However, another group of participants (consisting of three individuals with a middle school education and three individuals with a high school education) expressed some challenges in both installing and utilizing the application. Furthermore, five individuals faced issues during the training session due to their smartphones not supporting the application's installation. To address this problem, they resolved it by borrowing smartphones from other family members. It is worth noting that all participants unanimously acknowledged the application's significant utility. They recognized its potential to assist them effectively in their roles as Jumantik cadres, acting as community educators within their respective residential areas.

Participant Knowledge after Using the Mobile Application

Table 2. Distribution of Participant Knowledge Frequency after Use of the Mobile Application

Questionnaire Items	Answers (n = 15 participants)	
	True	False
Causes of dengue fever	13 (86.7%)	2 (13.3%)
Sudden fever as a sign of dengue fever	12 (80%)	3 (20%)
Headache as a sign of dengue fever	6* (40%)	9 (60%)
Joint / bone / muscle pain as a sign of dengue fever	11 (73.3%)	4 (26.7%)
Upper abdominal pain as a sign of dengue fever	2* (13.3%)	13(86.7%)
Bleeding as a sign of dengue fever	7* (46.7%)	8 (53.3%)
Coughing blood, bloody stools, and others as signs of dengue fever	3* (20%)	12 (80%)
Dangers of dengue fever	14 (93.33%)	1 (6.67%)
Spread of dengue fever	15 (100%)	0 (0%)
Time when Aedes aegypti mosquitoes feed on human blood	8* (53.33%)	7 (46.67%)
Understanding of the 3M approach	14 (93.33%)	1 (6.67%)
Characteristics of dengue mosquito (Aedes aegypti)	15 (100%)	0 (0%)
Function of fogging	6* (40%)	9 (60%)
Function of abate	13 (86.7%)	2 (13.3%)
Breeding sites of Aedes aegypti mosquitoes	14 (93.3%)	1 (6.7%)
Eradicating larvae as a simple prevention method for dengue fever	11 (73.3%)	4 (26.7%)
Discarding potential mosquito breeding containers as a simple prevention method for dengue fever	11 (73.3%)	4 (26.7%)
Frequency of emptying bathtub containers as a prevention measure for dengue fever	14 (93.3%)	1 (6.7%)
Life cycle of Aedes aegypti mosquitoes	5* (33.3%)	10 (66.7%)
Mosquitoes that bite humans	12 (80%)	3 (20%)
Uncovered water containers (water jars) as breeding sites for dengue mosquitoes	14 (93.3%)	1 (6.7%)
15 (100%)		
Bathtubs as breeding sites for dengue mosquitoes	12 (80%)	3 (20%)
Bird feeders as breeding sites for dengue mosquitoes	4* (26.7%)	11 (73.3%)
Water-filled discarded cans as breeding sites for dengue mosquitoes	12 (80%)	3 (20%)
Water-filled discarded tires as breeding sites for dengue mosquitoes	13 (86.7%)	2 (13.3%)
Preventing dengue fever by regularly emptying bathtubs at least once a week	13 (86.7%)	2 (13.3%)
Preventing dengue fever by covering water storage containers that can serve as mosquito breeding sites	12 (80%)	3 (20%)
Preventing dengue fever by burying / cleaning discarded items that can hold water	14 (93.3%)	1 (6.7%)
Preventing dengue fever by applying mosquito larvicide to water storage containers / bathtubs every 3-4 months	11 (73.3%)	4 (26.7%)
Preventing dengue fever by introducing mosquito larva-eating fish into fish ponds	9* (60%)	6 (40%)

*True answers total d" 60.

Table 2 indicates that out of the 30 questions, 21 questions received correct answers from participants with scores above 60, while 9 questions received low correct answer rates (scores d" 60). These questions pertained to the following topics: dengue fever symptoms (headache 40%, upper abdominal pain 13.3%, bleeding 46.67%, coughing blood 20%), fogging usage to kill adult mosquitoes (40%), life cycle of *Aedes aegypti* mosquitoes (33.3%), potential breeding sites in bird feeders (26.7%), timing of *Aedes* mosquito bites (53.3%), and introducing mosquito larva-eating fish into fish ponds as a dengue fever prevention measure (60%).

Discussion

Dengue education media in rural communities with mobile applications

This activity is based on the current technological advancements that are inseparable from societal life. Various pieces of information can now be easily accessed thanks to technological progress (globalization). During this activity, all participants unanimously agreed that the application was highly beneficial and would assist them in their future roles as Jumantik cadres, serving as community educators in their respective residential areas.

Selwyn (2011) mentioned that the use of digital technology can aid and enhance an individual's thinking processes and knowledge. The internet/web is a prime example of digital technology. The internet can make information presentation more engaging. Information is readily accessible anytime, anywhere, and by people of all ages. Because this information can be accessed easily, it contributes to enhancing an individual's cognitive processes, knowledge, and thinking skills. The same sentiment is stated by [Herbuela et al. \(2020\)](#) who developed the mobile application "Mozzify." The aspiration is for the application to facilitate the broader and easier dissemination of information, thereby alleviating the healthcare workers' tasks in enhancing awareness, knowledge, and attitude change regarding dengue fever.

The results of the activity revealed that some participants encountered challenges due to their smartphones not supporting the application installation. According to [Subiakto \(2013\)](#), the development of technology, especially information technology, has not been accompanied by equitable progress. Uneven development and dissemination of technology and information within society have led to digital disparities, particularly in rural communities ([Subiakto, 2013](#)). Based on a survey conducted by the Research and Development Agency of the [Kementerian Komunikasi dan Informatika Republik Indonesia \(2017\)](#), internet users in Indonesia accounted for 45% of the total population, distributed around 32.50% in rural areas and 61.83% in urban areas ([Kementerian Komunikasi dan Informatika Republik Indonesia, 2017](#)).

Hadiyat found that there is still insufficient support for information technology, such as the internet, at the district level, including the necessary infrastructure and services. At the district level, only a few individuals have access to advanced technical devices; most rely on basic smartphones capable only of making calls and sending messages. Hadiyat also noted that this situation is influenced by the fact that people at the district level are predominantly of lower to middle economic status, leading them to view access to and ownership of technological devices, such as the internet, as less of a necessity ([Hadiyat, 2014](#)).

The activity results show that participants who found the application usage easy had a high school education (four individuals) or higher education (five individuals). On the other hand, another group of participants (comprising three individuals with a middle school education and three with a high school education) found the installation and usage slightly challenging. According to data from the [Kementerian](#)

[Komunikasi dan Informatika Republik Indonesia \(2017\)](#), smartphone usage skills are predominantly held by those aged 20-29 with higher education degrees, where approximately 83.97% have a bachelor's degree, while the percentage decreases with lower education levels: high school education at 61.64%, middle school education at 35.53%, and elementary school education at 9.82%.

Information exposure, increased knowledge, and behavior change

The results of the activity showed that out of 21 of the 30 questions on the knowledge evaluation questionnaire after using the application the participants' scores were good, namely above 60. Even though knowledge was not measured before using the application, the application could help participants to understand DHF material and prevention of DHF transmission through mosquito vector control *Aedes aegypti*.

Information, knowledge, and health behavior are closely related. According to Notoatmojo, sharing information can increase one's wisdom. Knowledge can increase one's awareness, so that they act according to their knowledge. Because it is based on self-understanding without coercion, changes in behavior based on good knowledge, awareness and attitudes will last for a long time ([Notoatmodjo, 2014](#)).

The findings of this activity are also in accordance with the results of the activities of [Ramdhani et al. \(2022\)](#) who conducted DHF counseling using video media for the community in Kesepatan Village, Cilincing, North Jakarta. The results of the activity showed that only 8 respondents (14.5%) had good knowledge before counseling, and after counseling, those who had good categories increased to 25 respondents (45.5%). The results of the bivariate analysis showed a p value = 0.000, which means that there was an influence of counseling about DHF using video media on increasing the respondents' knowledge. The study conducted by [Avenis et al. \(2015\)](#), employing a quasi-experimental design involving 80 mother respondents, reveals that there is a significant difference in maternal knowledge levels about dengue fever before and after the health education program.

4. CONCLUSION AND RECOMMENDATIONS

The conclusion of the activity was that the knowledge of jumantik cadres in the rural area of Ciseeng, Bogor Regency after being given education with the media 'YARSI University Dengue Extension Mobile Application' could increase most of the cadre participants' knowledge about DHF and prevention of transmission through PSN. Most of the participants were also able to install and use the application and all participants thought that the application was useful and could help them with their duties as citizen educators.

Suggestions for the next activity are that there needs to be an application trial by measuring knowledge before counseling interventions are carried out with application media and application trials for people in urban/urban areas as well as a comparative analysis of the results between rural and urban areas.

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