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The Utilization of Mobile-Based Information Technology in the Management of Dengue Fever in the Community Year 2019-2020: Systematic Review

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ABSTRACT

Introduction: Dengue fever is a public health problem that causes outbreaks in various regions of the country, including Indonesia, with high morbidity and mortality rates. Advances in information technology have introduced new design approaches that support patient education.

Objective: This article aims to discuss mobile-based information technology to prevent dengue fever in society using a systematic review approach.

Methods: This research method used a systematic review approach with the PRISMA protocol. The article search process was accessed on three electronic databases, namely PubMed, PLOS ONE, and Google Scholar. The keywords used in the search for journal articles are mobile applications, control of dengue fever, health promotion, and community. The articles' criteria are primary data, year of publication (January 1, 2019 - October 6, 2020), in English, peer review, full-text articles, and discuss the use of mobile applications in controlling dengue fever.

Result: The result obtained seven articles according to the inclusion criteria. The health applications consist of seven models, Mozziy, SMS, e-learning, FeverDX, Mobuzz, ThaiDengue, and VECTORS. The applications' functions are as an educational medium, a dengue reporting system, and a prediction of dengue cases.

Conclusion: The use of mobile-based health applications could improve public knowledge and increase community awareness in handling dengue fever.

Key Words: Mobile application, Dengue fever, Control of Dengue Fever, Health promotion, Health education, Community participation

INTRODUCTION

Dengue fever is a severe public health problem that causes outbreaks in Indonesia's various regions with high morbidity and mortality rates. Dengue fever is an infection caused by the dengue virus and transmitted by the *Aedes aegypti* and *Aedes albopictus* mosquitoes. Based on data from the Ministry of Health, nearly 390 million people are infected each year, until April 2020, the number of dengue cases in Indonesia has reached 39,876 cases.¹ At the beginning of 2019, data entered until January 29, 2019, 13,683 dengue sufferers, reported from 34 provinces with 132 cases of whom died. Several regions were recorded to have reported extraordinary events of dengue fever, including Manado City (North

Sulawesi) and seven districts/cities in NTT, namely East Sumba, West Sumba, West Manggarai, Ngada, South Central Timor, Ende, and East Manggarai.²

Global control strategies have been developed in the form of vector control, including chemical control, biological, and physical.³ In controlling dengue fever, Indonesia implements mosquito nest eradication. Mosquito nest eradication is a program to prevent the breeding of the *Aedes aegypti* mosquito, which acts as a carrier for the dengue virus through 3M-Plus, such as draining or cleaning water reservoirs, closing water reservoirs tightly, burying used goods, raising mosquito larvae-eating fish, spreading larvacides in water storage, using mosquito repellent and fogging using malathion and fenthion.⁴

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The success of mosquito nest program can be measured by the larva free rate. If the larva free rate $\geq 95\%$ is expected to prevent or reduce cases of dengue transmission.⁵In 2017, the larva free rate amounted to 46.7%, so that it has not met the program target.⁴Indonesia is starting to handle dengue fever by using mobile-based applications in the form of education (educational game applications) and mapping of areas with dengue cases (SICANTIK and Citra Quickbird).^{6,7,8} These applications are expected to assist in the prevention and control of dengue fever cases.^{6,7}Meanwhile, in the world, Brisbane's method is almost the same as in Indonesia, which shows successful regulation because larvae habitat is regulated and possible. Government decisions are assisted by public compliance so that mosquito control in Brisbane can affect *Aedes aegypti*.⁹For neighbouring countries such as Malaysia, they still use dengue fever control techniques with WHO recommendations, namely vector control, active disease surveillance, emergency preparedness, room capacity, and vector control training and research.^{10,11}With the results of vector control of dengue fever in Malaysia, it is considered a slow reaction.¹²Meanwhile, in Brazil, handling dengue fever has been carried out by developing unique technologies such as the transgenic mosquito and the *Wolbachia* bacteria and supported by the Brazilian national program. This control method is increasing and demonstrating the potential success that science supports.^{13,14}

In Nicaragua, researchers found maps that allow health workers to identify areas at greater risk of an outbreak. The smartphone is a product of technological innovation that offers essential features to spread the disease to follow. It can consolidate almost instantly when reports from the public use smartphone-based surveillance applications for health workers. It can shorten response times and provide authorities with a more accurate picture of the disease situation for intervention planning and execution.¹⁵

Based on the explanation above, this article will discuss mobile-based information technology to prevent dengue fever in the community using a systematic review approach.

METHOD

The research method used a systematic review approach based on the PRISMA (Preferred Reporting Items for Systematic Review and Meta-Analysis) protocol.¹⁶ The PRISMA protocol is used to identify research articles relevant to the purpose of writing articles. The article search process was accessed on three electronic databases, namely PLOS ONE, PubMed, and Google Scholar. The keywords used in the search for journal articles are mobile applications, control of dengue fever, health promotion, and community.

The criteria for the articles used are primary data, year of publication (January 1, 2019 - October 6, 2020), in English,

have gone through the peer review stage, full-text articles, and discuss the use of mobile applications in controlling dengue fever. Data extraction was carried out through the identification stage by searching for articles from the database, screening to determine the period, feasibility, and screening in determining the title of the item to be selected based on inclusion criteria. The search results for articles are then grouped by: (a) research location, research design, respondent involvement, and research results, (b) article frequency distribution based on socio-demographic factors, and (c) health applications based on components, strengths, weaknesses, benefits, and recommendations for improvement.

The descriptive narrative analyses are based on the utilization of information technology in the health sector, advantages and weaknesses of using information technology in the health sector, the effect of information technology media on increasing knowledge of dengue fever, the effect of education with mobile-based media on knowledge of dengue fever, and the influence of knowledge of dengue fever on changes in dengue fever management behaviour.

RESULT

The selection results based on keywords and following the PRISMA protocol obtained 36,187 articles. Furthermore, at the screening based on the year of publication (January 1, 2019 - October 6, 2020), there were 5,474 articles. Screening of journals in English, full text, and the peer review phase obtained from PLOS ONE, PubMed, and Google Scholar, received 212 articles. An eligibility study was conducted to eliminate articles that did not meet the established inclusion criteria. In the last stage, seven articles were obtained according to the inclusion criteria.

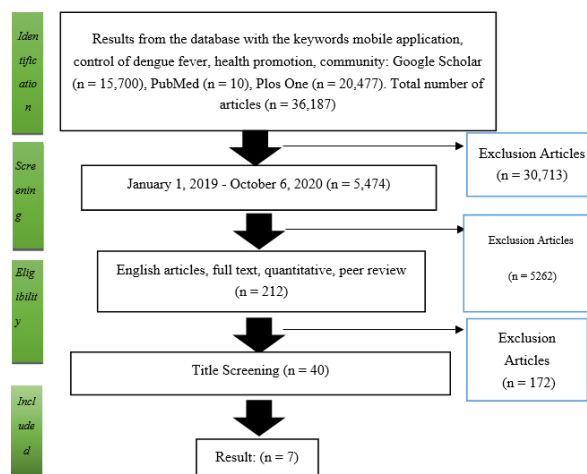


Figure 1: Literature search results based on the PRISMA protocol.

Table 1: Description of articles based on research location, research design, the involvement of respondents, and research results

| No. (Article Code) | Researchers' Name | Title | Research sites | Year | Research Design | Respondents | Summary Results |
|--------------------|---------------------------------------|--|----------------|------|--|---|---|
| 1 | Marquez Herbuela et al. ¹⁷ | An Integrated mHealth App for Dengue Reporting and Mapping, Health Communication, and Behavior Modification: Development and Assessment of Mozzify | Japan | 2020 | Longitudinal analysis | Fifty people took the application usability test. Public health professionals (n = 5) Environmental and health researcher (n = 23) Non clinical participants (application end users) (n = 22) | Fifty participants of the application usability test (aged 19 - 45 years, 60% male, 78% can accept applications, 68% can install applications on their respective phones). Public health experts, environmental and health researchers, end users can accept applications well and feel satisfied |
| 2 | Bhattarai et al. ¹⁸ | The addition of mobile SMS effectively improve dengue prevention practices in community: an implementation study in Nepal | Nepal | 2019 | Non-randomized quasi-experimental design | 300 participants | There is a relationship between education and mobile application media (mobile SMS) on the level of knowledge (p = 0.000) |
| 3 | Mahalingam et al. ¹⁹ | Mobile Health Intervention for Vector Control in Dengue Prone Areas in Malaysia | Malaysia | 2019 | <i>Cross-Sectional</i> | 379 participants | There is a significant relationship in educational activities with mobile-based application media to the incidence of dengue fever (p-value <0.05) |
| 4 | Rodríguez et al. ²⁰ | Acceptability and usability of a mobile application for management and surveillance of vector-borne diseases in Colombia: An implementation study | Colombia | 2020 | Implementation study | 20 General Practitioners | An application that can assist medical personnel and stakeholders in the management of acute febrile syndromes such as arbovirus infection |
| 5 | Lwin et al. ¹⁵ | Sri Lanka Epihack: Development of A Mobile Surveillance Tool For Dengue Fever | Sri Lanka | 2019 | Case study | The app's 16 end-users include physicians, public health monitors, and general users | The Application developed consists of 4 (four) dengue fever reporting components, namely digitizing data in hospitals, digitizing data from health agency reports, data consolidation and analytics, and education. |

Table 1: (Continued)

| No. (Article Code) | Research-ers' Name | Title | Research sites | Year | Research Design | Respondents | Summary Results |
|--------------------|-----------------------------|---|----------------|------|--------------------------------------|--|---|
| 6 | Somboon-sak ²¹ | Development Innovation to Predict Dengue Affected Area and Alert People with Smartphones | Thailand | 2020 | Qualitative and quantitative studies | 400 participants | Applications are used for the prediction of dengue cases and alert people via smart-phones. |
| 7 | Ocampo et al. ²² | VECTOS: An Integrated System for Monitoring Risk Factors Associated With Urban Arbovirus Transmission | Colombia | 2019 | Multivariable analysis | 1240 participants Buga City (n = 372) Giron City (n = 437) Yopal City (n = 431) | Applications are used to identify areas that have risk factors for dengue fever. |

Table 1 shows the varied study locations have become a global problem from the risk factor of travel history to endemic countries. Each article's research design is different due to differences in the objectives and research questions;

then, it affects the research results. The diversity of research respondents was carried out among general users, general practitioners, and public health inspectors.

Table 2: Article Frequency Distribution Based on Sociodemographic Factors

| Factor | Research result | | | |
|--|-----------------|-----------|-----------|------------|
| | Category | Code | Frequency | % Articles |
| Age | Available | (1,2,3) | 3 | 42.9% |
| | Not available | (4,5,6,7) | 4 | 57.1% |
| Gender | Available | (1,2,3) | 3 | 42.9% |
| | Not available | (4,5,6,7) | 4 | 57.1% |
| Average article frequency distribution | | | | 42.9% |

Based on table 2, sociodemographic data on age and gender factors can be seen from journals 1, 2, and 3. Meanwhile,

journals 4, 5, 6, and 7 sociodemographic data are not available.

DISCUSSION

Utilization of Information Technology in the Health Sector

People are increasingly using the use of information technology at various economic and social strata levels.²³ To overcome challenges in the health sector due to limited resources and sustainability, the strategy that can be taken is increasing information and communication technology (ICT).²⁴ In recent years, in fighting dengue, public health authorities worldwide have adopted new technology and developed and implemented a different digital vector surveillance system where public members can participate in some form of active surveillance of mosquitoes in the field.¹⁵

Given the complexities of modern medicine, it cannot be denied that information technology will increase the quality

of health care.²⁵ The world health organization has urged its member countries to develop the infrastructure for information and communication technology (ICT). The use of ICTs in health care has shown great potential in improving the quality of life by facilitating community support for independent living.²⁶

Technology information has the potential to improve the quality, safety, and efficiency of health services. Delivering quality health care requires providers and patients to integrate complex information from multiple sources. For example, Telehealth uses telecommunications technology to provide health-related services and information supporting patient care, administrative activities, health education, health services, and private information.²⁷ Mirzayi and Rafe stated that Health Information Technology (HIT) is an information processing applica-

Table 3: Description of Health Applications based on Components, Strengths, Weaknesses, Benefits, and Recommendations for Improvement

| No (Code) | Name Application | Component Advantages | Deficiency | Benefits | Recommended improvements |
|-----------|--------------------------------|---|---|--|---|
| 1 | Mozzify ⁷ | Real-time surveillance, health communication, and behaviour modification. | It has an up-to-date system for reporting and mapping dengue cases, health communications (news, chat-based communication forums, and in-app educational videos), links to the local and international health agency addresses, and addresses of the closest hospital s, and materials on dengue fever prevention. | It has an up-to-date system for reporting and mapping dengue cases, health communications (news, chat-based communication forums, and in-app educational videos), links to the local and international health agency addresses, and addresses of the closest hospital s, and materials on dengue fever prevention. | <p>Application is not available for Android devices, Little choice of Language Predictive surveillance provision Inclusion of other mosquito-borne diseases.</p> <p>Increase awareness Increase knowledge Change attitudes about dengue fever, health-care-seeking behaviour, and the desire to prevent dengue fever among users.</p> <p>Availability of applications on Android Availability of applications in various languages, not only English Able to predict the location of the number of dengue cases based on previous data There are games in the Application Availability of applications in loading diseases transmitted by other mosquitoes Availability of application usage briefs They have fixed application technical problems.</p> |
| 2 | SMS and pamphlets ⁸ | Reminder for prevention and handling of dengue through SMS and pamphlets | <p>It is easier to promote awareness of dengue prevention problems via SMS and be read repeatedly. Does not cost a lot Respondents considered that receiving cellular messages could help prevent dengue in an informative and reliable manner. The contents of the message can be used as a reference for dengue fever prevention practices. It is easier to reach the target population without cellular data or Wi-Fi signals.</p> | <p>One respondent mentioned that sometimes the SMS could be annoying because reminders are sent twice a day. There is no interaction from message recipients via mobile SMS because this option is not available in this intervention. Not all areas, especially the mountainous and hilly geographical areas of Nepal, can be reached due to the limited network coverage</p> | <p>Reminders are sent once a day so as not to bother the SMS recipient too much. There are interaction options from the recipient of the message. Improve network coverage quality</p> <p>SMS provides an attractive opportunity for health promoters to engage personally with large groups of people regardless of their cellphone model and at a relatively low cost. Cell phone services can facilitate disseminating health knowledge and acceptable practices by reducing transaction costs, providing quick access to information for a large population, and improving public service delivery.</p> |

Table 3: (Continued)

| No (Code) | Name Application | Component Advantages | Deficiency | Benefits | Recommended improvements |
|-----------|-------------------------|--|------------|---|---|
| 3 | e-learning ⁹ | Information on dengue fever by e-learning | | The cellphone that most people already have can be a tool for providing integrated E-learning and innovation education | The number of respondents who were included was small due to a lack of funds Mobile e-learning can have a positive impact on preventing and controlling dengue |
| 4 | FeverDx ²⁰ | Guidance for general practitioners on the approach and management of patients with suspected arbovirus infection, as well as case reports. | | Use of FeverDx in areas where arbovirus is potentially endemic or hyperendemic can assist general practitioners and stakeholders in the management of acute febrile syndromes such as arbovirus infection | This research is currently ongoing; therefore, more initiatives are needed to evaluate the development of mHealth in different contexts to find out the real impact of this technology and to generate evidence on its performance in the field of research and health as well as further research with larger sample size and with participation. other health centres need to be put in place to support these initial findings FeverDX to strengthen care processes and facilitate disease detection and reporting to improve adherence to clinical practice guidelines for the preventive management of common diseases such as arbovirus in health care |
| 5 | Mobuzz ⁵ | Digital data consolidation Digital map of the potential for the spread of dengue fever based on the global positioning system (GPS) Digital educational information about dengue fever | | Health workers can be more efficient in consolidating community reports on the presence of dengue fever cases The community is facilitated in receiving information in the form of distribution maps in their area and education about dengue cases The community can easily report the incidence of dengue fever that occurs in their area | Make efforts to combat dengue more efficient and effective The Application is still felt slow, tends to have bugs when the Application is running, and the GPS position is inaccurate. |

Table 3: (Continued)

| No (Code) | Name Application | Component Advantages | Deficiency | Benefits | Recommended improvements | |
|-----------|---------------------------|--|------------|---|--|---|
| 6 | Thai Dengue ²¹ | Prediction of dengue fever, disease spread, disease map, and prediction of mosquito density and risk-prone areas. | | It is used to distinguish and find certain mosquito-borne diseases and generate alerts or notifications in an emergency to prevent outbreaks and alert the public via smartphones. | The architectural design of the ThaiDengue Application started with data from the Bureau of vector-borne diseases for the past five years. | Able to predict the location of dengue fever cases, control the spread of the disease, and predict mosquito density and risk-prone areas. Monitor dengue fever in the area and make people aware at a high level. |
| 7 | VECTOS ²² | Information and mapping of epidemiological data, entomology of <i>Aedes aegypti</i> mosquitoes, environment, and demographics (population density) | | The combined analysis of epidemiological and entomological data in the geographic information system on the VECTOS application provides better insight into routinely collected data and identifies heterogeneity of risk factors between environments. | Lack of updated application information in unclear legal proceedings against national health entities to allow technology tools to capture official information. Lack of knowledge of software components among officials. Inadequate collection of primary data | The Vectos system strengthens the vector control program in Evidence-based decision making and in the design and enhanced follow-up of vector control strategies. It is hoped that future versions can collect additional variables and link to the modelling mathematics to obtain, for example, early warning of increased transmission, warning of increased risk due to changes in serotype profile, and the threshold for mosquito abundance for transmission. |

tion that involves computer hardware and software that can be used to manage information about individuals and groups of patients' health and medical care.²⁸

In Thailand, there is a technology called a geographic information system (GIS). The technology is an initiative to support dengue fever control with an automated computer-based system to capture, retrieve, manage, display, and analyze large amounts of spatial and temporal data in a geographic context. Roads, residential buildings, and other relevant data can be obtained and mapped to form a base map layer using Arcview GIS software.²⁹Data with mapping in an area and monitoring the severity of dengue cases can be quickly identified. Epidemiological analysis of the Application can reduce the impact severity when an outbreak occurs.³⁰

Advantages and Weaknesses of Using IT in the Health Sector

The use of technology in the dengue epidemic in several journals has made research participants get practical and satisfactory information. In Japan, the Mozzify Application (Table 3) has succeeded in getting the research participants' satisfaction. 37 of the 50 people whose data were taken gave a value of 4 out of 5 indicators of satisfaction.¹⁷Even in Thailand, an application called ThaiDengue Application (Table 3) succeeded in providing satisfaction to the 400 people tested.²¹

Information technology application-based systems can increase public awareness to take preventive measures, especially dengue fever attacks.³¹ An application called RadarAedes App was even developed independently by a local community in Brazil to assist local governments in monitoring their area from the potential spread of dengue fever infection.³²

Technology-based preventive measures provide users with various information about dengue fever, such as case reports, spread areas, and preventive procedures.¹⁷In Nepal, a study was conducted that compared the community who received information on knowledge of dengue virus prevention conventionally with those who received information from applications based on short message services (SMS), and it turned out to have significant results compared to people who received conventional information.¹⁸

An application-based early warning system was developed and tested in Brazil, Malaysia, and Mexico to make the early warning system more effective and efficient for dengue fever cases. As a result, this system proved to be pragmatic in making the early warning system more effective and efficient.^{31,33} In Saraphi, Thailand, a digital data collection application called GIS, which functions to collect geographic data, was tested. It was proven that the data collected was more accurate and undoubtedly more efficient.³⁴ A digital data collection application called GeoApps, which was tested in Brazil,

has been proven to be able to collect data related to health in this case, including dengue fever cases to make it faster and more efficient and to be able to help Brazil's integrated health service provider (SIAB).³⁵

Effect of Information Technology Media on Increasing Knowledge of Dengue Fever

Over the past ten years, mobile phones have provided innovative and cost-effective strategies for the global health community to address dengue prevention and management challenges. Marquez's research in 2020, the Mozzify Application (Table 3) is useful as an integrated strategic health intervention system that promises to report and map dengue fever cases, and disseminating information about dengue among the general public and health professionals.¹⁷

Besides, there is also a Mobile Short Message Service (SMS), a low-cost health promotion intervention that can increase knowledge and implementation in preventing dengue in affected communities. Mobile SMS is a practical, acceptable, and appropriate health intervention tool to improve dengue fever prevention in the community. These interventions can be used as promising tools in health education regarding dengue and other diseases. People are accustomed to using mobile phones daily, so shifting health promotion via SMS is an appropriate and realistic step.¹⁸

In addition to helping the more comprehensive community access information more quickly, information technology media can also be designed to make it easier for doctors and medical personnel to increase compliance with clinical practice guidelines in managing and preventing diseases such as arbovirus infection in health care settings. For example, the mHealth FeverDx Application shows adequate performance in simulated emergency consultations. The guide module allows general practitioners to quickly get an offline reference to practical clinical guides for acute fever symptoms such as Zika, dengue, Chikungunya, and various infections commonly found in tropical regions.²⁰

In the future, researchers must develop more modern designs to become more interesting virtual games for children.³⁶Advances in information technology have introduced new design approaches that support health care delivery and patient education. Health care information technology can empower patients and support the transition from a role in which the patient is a recipient of passive care services to an active role in which the patient is informed, has choices, and is involved in the decision-making process.³⁷

The Effect of Education with Mobile-based Media on Knowledge of Dengue Fever

Knowledge is an essential determinant that becomes the final determinant of health behaviour, such as attitudes, subjective norms, risk perception, and independence often begins

with knowledge.³⁸ The utilization of knowledge about dengue fever to the community using the mHealth application in videos, diagnosis, management, management of dengue and mosquito vector control methods, and having an online discussion forum. This feature can increase awareness of symptoms, management of dengue fever, and vector control.¹⁷ The use of e-learning in education is easier to understand and can provide information quickly so that health education can be received via mobile phones.¹⁹ This shows that the quality of active dengue fever prevention behaviour increases after health education with mobile application-based media.^{39,40} The effect of education on knowledge of dengue fever is in line with research conducted by Ernawati et al. in 2019, which said that there was a relationship between knowledge and exposure to information in the vector control of dengue mosquitoes (p-value = 0.000) dengue fever in Koper Village, Kresek District, Tangerang Regency.⁴¹ In the research of Elsa et al. in 2017, health education for the community can increase the level of knowledge and participation in eradicating mosquito nests (p-value = 0.000).⁴² Education does not necessarily change people's knowledge. As found in research conducted by Ernawati et al. in 2018, there is no difference in knowledge about dengue fever before and after counselling conducted to homemakers in Serdang, Kemayoran, and Jakarta (p-value = 0.087).⁴³

The Influence of Knowledge of Dengue Fever on Changes in Dengue Fever Management Behavior

Knowledge of the mosquito that spreads dengue fever and its control is an essential factor in controlling transmission.⁴⁴ Although efforts have been made to stop dengue outbreaks in various parts of the world and particularly in tropical countries such as India and Southeast Asian countries, concerning the importance of entomological surveillance, The findings of the current literature study agree that behaviour in controlling dengue fever during an outbreak is also very crucial.⁴⁵ The knowledge possessed by a person to promote positive behaviour change in the prevention and control of dengue fever tends to share information and achievements with family and friends.⁴⁶

Lack of awareness of dengue problems tends to reduce behaviour in preventive measures.⁴⁷ Lack of awareness of dengue symptoms in the community can lead to delays in patients getting appropriate medical attention.⁴⁸ Public knowledge and preventive behaviour regarding the causes, transmission, prevention, and treatment of dengue fever are significant socio-cultural factors that have influenced dengue fever control measures.⁴⁹ Behavioral-influenced activities must be supported by proper education regarding a healthy home environment that will reduce the risk of spreading dengue fever.⁵⁰

The health belief model is a model of social cognition that is widely used to predict health behaviour. This model shows that a change in behaviour or action can be expected if a person feels at risk or susceptible to disease (perceived vulnerability).⁵¹ People who feel they are at risk of dengue fever immediately visit a health care provider compared to those who feel otherwise.⁵² Health care-seeking behaviour is also greatly influenced by the inadequacy of primary health care facilities in providing adequate services to dengue fever patients.⁵³

People with better knowledge are more likely to have a more severe attitude towards dengue and better prevention practices.⁵⁴ Knowledge of dengue fever symptoms, modes of transmission, prevention practices, and disease management tends to change their belief that dengue fever is a severe and threatening disease.¹⁷ This is in line with research conducted by Ernawati et al. found that increased knowledge can improve mosquito nest eradication behaviour in Kresek village, rural areas (t-value = 4.68) and information sources mosquito nest eradication behaviour in Kresek village, Tangerang Regency, Indonesia (t-value = -3.32).⁵⁵

CONCLUSION

There are seven mobile-based health applications developed in 2019-2020, namely Mozzify, SMS, e-learning, FeverDX, Mobuzz, ThaiDengue, and VECTOS. The application functions as an educational medium (Mozzify, SMS, e-learning, and Mobuzz), a reporting system (FeverDX, ThaiDengue, and VECTOS), and prediction of dengue cases (ThaiDengue and VECTOS). As an educational medium, health applications that have been tested on the public are proven to be accepted by the community and can increase people's knowledge. The use of mobile-based dengue fever health applications can help increase community early awareness in handling dengue fever. However, not all people can access these health applications because there is limited internet coverage.

RECOMMENDATION

The research results need to be followed up by the government in each country using these health applications worldwide. The limited reach of the internet network, which can become an obstacle in the use of health applications by all society components, also needs to get the local government's attention so that a solution to the problem is immediately sought.

Authors' Contribution: The document should identify all individuals who meet authorship requirements as authors and who are willing to accept public responsibility for the

material, design, or revision of the manuscript. The manuscript was revised and reviewed by all contributors and given the final okay by them as well.

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