

HASIL CEK_17. Jurnal - Rapid Appraisals of the Transformation Strategy

by Universitas Ahmad Dahlan Yogyakarta 22

Submission date: 23-Dec-2023 11:23AM (UTC+0700)

Submission ID: 2264299529

File name: 17._Jurnal_-_Rapid_Appraisals_of_the_Transformation_Strategy.pdf (1.86M)

Word count: 4508

Character count: 25072



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To cite this article: Sulistyawati Sulistyawati, Herman Yuliansyah, Tri Wahyuni Sukesi, Arfiani Nur Khusna, Surahma Asti Mulasari, Fatwa Tentama, Bambang Sudarsono & Fanani Arief Ghozali (2023) Rapid Appraisals of the Transformation Strategy Required to Sustain Dengue Vector Control During and After the COVID-19 Pandemic in Indonesia, Risk Management and Healthcare Policy, , 93-100, DOI: [10.2147/RMHP.S391933](https://doi.org/10.2147/RMHP.S391933)

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Rapid Appraisals of the Transformation Strategy Required to Sustain Dengue Vector Control During and After the COVID-19 Pandemic in Indonesia

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Purpose: This research aimed to observe the gap for improvement in dengue vector control during COVID-19, considering two stakeholders: the government and society. We formulated two research questions: 1) How is the government managing dengue vector control during the COVID-19 pandemic? 2) What is the situation of dengue disease, its vectors, and vector control in the community?

Methods: This study uses multiple approaches: policy review, social listening using Twitter analysis, and interviews. A policy review was employed to capture the journey of dengue vector control in Indonesia from dengue found in Indonesia until the COVID-19 pandemic. Twitter data captured public opinions through social media about dengue and vector control. Interviews involved program implementers that consider knowing the situation in the field of dengue and its vector control. The informant was selected through purposive sampling.

Results: To control dengue disease, the Indonesian government has released regulations about dengue vector control that adjusts the COVID-19 situation, but vector control is still not running optimally, resulting in the data supply for policy not running well.

Conclusion: Dengue cases continued during the COVID-19 pandemic, even in some places stated an outbreak occurred. Vector control does not work correctly during the COVID-19 pandemic due to social restrictions. It is recommended to encourage the implementation of community empowerment through one house, one jumatik, which is equipped with self-reporting to mitigate and respond to similar situations as the pandemic.

Keywords: dengue, COVID-19, vector control, policy, pandemic

Introduction

Dengue is a vector-borne disease caused by the dengue virus carried by the *Aedes aegypti* mosquito.¹ This disease is still a big problem in tropical countries, including Indonesia, which is known to be endemic to this disease. WHO stated that in 2020 – the year that COVID-19 began to spread – several countries, including Indonesia, reported an increase in dengue cases.¹ This indicates that with the emergence of COVID-19, a new challenge in handling dengue disease can even be said to be a double burden for countries that have previously struggled to eradicate dengue.² Several studies indicate that during COVID-19, one of which stated that the number of dengue cases decreased by approximately 16% during the COVID-19 pandemic.³ Reports from some ASEAN countries in 2020 followed a similar pattern: the number of dengue cases in 2020 was lower than in 2019. One of them is Indonesia, where cases were twice as high in 2019 as the previous year (137,760), while it was reported to have decreased in 2020 (95,893).⁴ Furthermore, this needs to be investigated further whether it is due to the lockdown effect so that there is no interaction with positive hosts or underreporting cases^{5,6} or because of people reluctant to health seeking.

Referring to the existing health system in Indonesia, the Indonesian government adopted a decentralized system. In this context, health programs, including dengue control, are broadly designed by the center and then carried out at lower levels to be adjusted to the context of the region, including in the budget allocation.⁷ If we look further, the dengue program in Indonesia is carried out by two main stakeholders, namely the government as a regulator and the community as both the subject and object of the dengue program.⁸ The government and its staff's domain is to create appropriate programs based on data and implement them with the community.

Indonesia takes vector control through community empowerment in vector monitoring because this program is considered more efficient and offers sustainability.⁹ Vector monitoring is a vital part of vector surveillance which becomes evidence-based for determining the distribution, density, and larval habitats.^{10,11} In Indonesia, vector surveillance is conducted through the Jumantik program, a squad monitoring the existence of larvae by entering the house in the society.^{9,12} Jumantik cadre collects and reports the data in the field periodically to the village, which is forwarded to the health center to calculate the larva indices, including house index, breteau index, and container index, which are considerations in making vector control policies. The role of vector monitoring activity in policy development is presented in Figure 1.

So far, the Jumantik program as vector surveillance has been running well. Nevertheless, problems arise when COVID-19 blows, and the government implements social and physical distancing to limit interaction to avoid COVID-19 transmission. The social restriction impacts the absence of door-to-door larva inspection by the Jumantik cadre. On the other hand, this data is an essential source for determining dengue prevention measures in the community. Based on all backgrounds, we observed the gap for improvement in dengue vector control during COVID-19 from 2 stakeholders, namely the government and society (Figure 2). We formulated two research questions: 1) How is the government managing dengue vector control during the COVID-19 pandemic? 2) What is the situation of dengue disease, its vectors, and vector control in the community?

Materials and Methods

Study Design

This study uses multiple approaches: policy review, social listening using Twitter analysis, and interviews. A policy review was employed to capture the journey of dengue vector control in Indonesia. Twitter data figured out the public opinions about dengue and vector control. Interviews involved dengue program implementers that were selected through purposive sampling. The informant in this study was the person in charge of the dengue program at the primary health

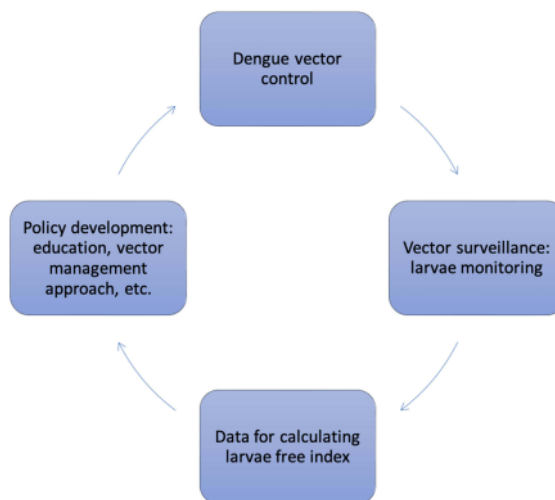


Figure 1 Vector control and policy development framework.



Figure 2 The developed framework used during the research.

center and health office, who was responsible for vector control in society and bridged communication to the health office related to proper dengue intervention in a particular area.

Data Source, Data Collection, Sample, and Analysis

The data collection process is summarized in [Table 1](#). We did this research through multiple approaches: policy review, social listening via Twitter, and interview.

Ethical Consideration

The ethical approval was given by Universitas Ahmad Dahlan Ethical Board (#012205052). Inform consent was obtained before the interview started. The informant was informed that all analyses performed would be anonymized for publication purposes.

Results

Policy Review

These policy reviews were conducted to draw the journey of dengue prevention in Indonesia. This review was a development from previous research conducted by Sulistiyawati (2020),⁸ which was added to the latest policy by the Indonesian government in controlling dengue vectors during the COVID-19 pandemic¹³ ([Figure 3](#)).

To control dengue, Indonesia has chosen to control the dengue vector in several ways: chemistry, physics, and biology. However, since 1992, chemical control has been gradually reduced and focused on vector control through the movement of cleaning mosquito nests. In 2015 (5 years before the pandemic), the government released the one house one jumantik program, which actively involved the community responsible for cleaning larvae in mosquito breeding sites at their home. Once COVID-19 exploded, the government issued a regulation to adapt to the situation; subsequently, the one house-one Jumantik program was forced with social distancing.

Social Listening Analysis from Twitter

A total of 7419 yields from Twitter. After screening duplicates, we got 2411 tweets included in the analysis. [Table 2](#) summarizes our social listening analysis conducted through Twitter data showing that dengue is still a big problem during the COVID-19 pandemic.

Many people provide awareness of dengue because cases in their area are increasing with some types of statements, such as being in dengue season and dengue increase because of overcrowding of population density.

Dengue Cases in Bengawan City Increased Sharply in the Middle of This Year.

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 13
Table 1 Data Source, Method of Data Collection, Sample, and Analysis

Domain	Data Source	Method of Data Collection	Sample	Method of Data Analysis
Government - regulator	Policy review	Modification of previous research and addition with dengue vector control in the COVID-19 era	Several policies included since 1968	Document reviews
Society	Social Listening via Twitter	Crawling tweets used Python programming with the Twitter API Key and the keyword "demam berdarah."	A total of 7419 Tweets were extracted with the time frame of Tweets 22/7/2022-7/8/2022	Data were analyzed using a qualitative approach with thematic analysis to develop a theme.
Program implementer	Interview	Interview using semi-structured interview through face-to-face interview with a purposive sampling among the dengue program implementer	Two dengue program implementers in PHC and health office	Field notes were generated and analyzed using thematic analysis.

The population density in South Jakarta and the shady temperature are the reasons for dengue cases rising (in this location).

Looks like now the dengue season again; my friend is also hospitalized because of dengue; I hope he gets well soon.

Dengue Case Increasing, Bekasi City Government Asks the Public to Be Aware.

The category of illness found in society is an abstraction to articulate that dengue incidents still occurred during COVID-19. This was captured from the survivor's Tweet and those who told us the situation around him.

I went to Bandung when I wasn't feeling well and ended up with dengue yesterday.

From these symptoms, it's clear I was attacked by dengue; I hope I'm not hospitalized.

Yesterday, on Eid al-Adha, I brought my sister to be treated for dengue.

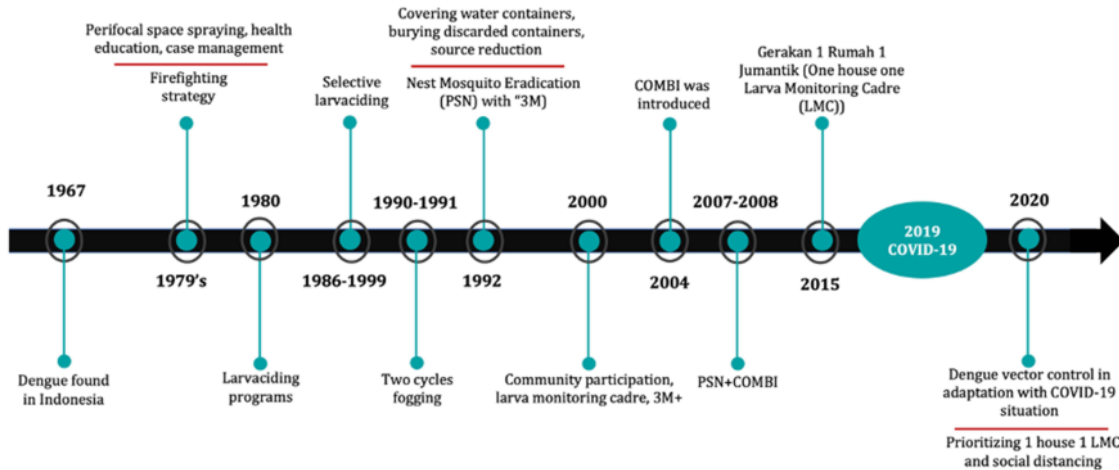


Figure 3 The journey of dengue vector control in Indonesia.

Next is the category mortality and outbreak occurred, which comes from two subcategories: some dengue patients die, and dengue outbreaks arise in some places. This category illustrates that fatalities happened and, in some areas, declared a dengue outbreak.

Dengue fever case in Asmat Regency has risen dramatically in the past month; the Asmat Regency Government has determined an outbreak of dengue fever.

DBD cases in the Yogyakarta City soared as long as two patients died

Many cases of dengue in Solo, some of them die.

During COVID-19, people said they felt anxiety about dengue because of the pain and trauma of experiencing dengue in the past. So, they were afraid of getting infected again; even when they felt dengue symptoms, they were worried.

In the next few days, hopefully, it won't be fever anymore because if I still have a fever, I have to go for the blood test. I'm afraid of getting dengue for the second time.

On Monday last week, I was shocked because of a fever; I was afraid of dengue. But after checking in the hospital, thank God I'm fine.

Friends, if you have a brother or nephew who has a fever and red spots appear on the skin and tongue, please run to the hospital immediately.

In addition, people expressed their afraid of the pain and symptoms of dengue. They also spoke about concerns or fears with the presence of mosquitoes. However, they did not specifically mention *Aedes aegypti*.

Many mosquitoes make me sick with dengue; I'm suspicious about getting dengue again.

In the first month of class, I got dengue because there were a lot of mosquitoes in my class.

Because I got dengue some time ago, I'm terrified of mosquitoes, afraid to open the window, and I always put mosquito repellents.

The last category is that dengue prevention is still being carried out during COVID-19, either educating the public or carrying out actual activities such as fogging.

Table 2 Twitter Data Analysis Themes

Theme	Category	Sub-Category
Dengue still be a severe problem during COVID-19	Alertness to dengue	Warning about dengue cases increasing
	Illness found in society.	Suffering from dengue or informed there is positive dengue around them
	Mortality and outbreak occurred.	Dengue patient dies
		Dengue outbreaks occurred in some places.
	Anxiety to dengue	I am feeling pain or trauma because of having dengue in the past.
		Worried because I have the dengue symptoms
	Worries to dengue vector	State a lot of mosquitoes around them
Dengue prevention is still needed.	Doing dengue prevention	

In order to prevent the spread of dengue fever, mass fogging activities are carried out in the Singgi environment of the Gulling House.

The Papua Provincial Health Office (Dinkes) is intensifying counseling on preventing the transmission of dengue fever.

An integrated team from Petojo Selatan village, Gambir sub-district, Central Jakarta, held an eradication of mosquito nests (PSN).

Gap Identified and Interview

From two processes of data collection, namely policy review and social listening via Twitter, several problems in dengue control during the COVID-19 pandemic; namely, dengue still occurs in the community during COVID-19. This result was confirmed by an interview informant, a dengue program implementer at the primary health centers, who stated that dengue persisted during COVID-19.

(During COVID-19) Dengue still occurs even though they have decreased compared to 2019. In our PHC, they were 62, 48, and 12 cases for 2019, 2020, and 2021 respectively. (Female, PHC dengue officer)

Although the government has issued regulations to prevent dengue during the pandemic, it is not running optimally in society. It was confirmed from the interview with a dengue officer at a primary health center.

(During the pandemic) eradication of mosquito nests (PSN) runs by prioritizing social distancing, but superficially...because Jumantik coordinator only monitors containers outside the house, containers inside the house were asked to the owner. For reporting per house (one house one Jumantik) by homeowners, some reporting some not – usually they reported using WA (Female, PHC dengue officer)

Even though the eradication of mosquito nests is trying to be carried out during the pandemic, still, the impact does not have a maximal effect on policy because the manual reporting system cannot run normally. As a result, the data that is the basis for evidence-based policymaking is not well provided. Dengue officers confirmed this at the PHC and the provincial health office.

The larva inspection report was working (during the pandemic); the larva free number was also calculated but cannot be used as a reference because it does not represent the situation on the field. (Female, PHC dengue officer)

Reporting of larva inspection does not stop during the pandemic, but the quantity was decreased. So, larva free rate (ABJ) cannot be calculated (Male, Provincial dengue officer)

Discussion

Dengue, which is still globally exacerbated by the spread of COVID-19 that has implications for social restrictions, has become a severe problem in Indonesia's routine dengue vector control programs. During the COVID-19 pandemic, the government enforced vector control by emphasizing social distancing. However, this does not seem to be running well either. Seeing this situation, the gap for improvement during COVID-19 in dengue vector control in Indonesia remains unclear. Identifying the dengue situation and the vector control works during a pandemic will facilitate the development of the innovation and may improve responses to currently available interventions.

We want to know the gap for improvement between expectation and reality in dengue vector control during the pandemic seen by the government and society. Through a combination of policy review and social listening that triangulate with an interview, we identified that the Indonesian government had issued a regulation on vector control during the pandemic. However, dengue cases still occur in some locations, and even in some locations, outbreaks were declared. Vector control does not run optimally due to social restrictions, so larva inspection reports cannot be used as a reference in decision-making.

The dengue case during the pandemic still existed, although it tends to decrease in quantity, this was confirmed by social listening via Twitter and approved by the dengue officer. This result follows another study in Asia, India, Latin

America, and Malaysia, which stated that dengue cases during the COVID-19 pandemic decreased, presumably due to limited human movement. Hence, the hosts stayed home so they did not infect others.^{5,6,14} On the other hand, this decline in cases should also be suspected to the public's reluctance to visit health facilities due to fear of contracting COVID-19.¹⁵ So it could be that the case looks slightly reduced because of the many underreported cases.⁵ However, different conditions were reported by several regions of Indonesia, which stated there was an increase in dengue cases at the beginning of the COVID-19 pandemic, including in Bali and East Java.^{16,17}

Regarding mosquitoes, this study shows people's complaints about the presence of mosquitoes during COVID-19. People even said there were lots of mosquitoes around them and even felt afraid because they had been infected with dengue. Several studies reported that the COVID-19 pandemic, coupled with social restrictions, caused the increase in mosquito densities^{18,19} due to the stop of dengue vector control movement. This means that the risk of humans being bitten by mosquitoes also increases.²⁰ Accordingly, the mosquito population was difficult to control then the population was increasing.

The complaint about the number of mosquitoes was related to the vector control empowerment program not running effortlessly during the COVID-19 pandemic due to social restrictions, as stated by previous research.²¹ Social restriction policy also impacts disease control policies and dengue vectors that rely on larvae inspection data that require entry into the house. Since 2015 the Indonesian government has launched vector control through household-based community empowerment (one house, one jumantik). Still, not all regions have implemented this program – some are entering the socialization phase but have not yet implemented it. In regions that have implemented one house-one jumantik, the data flow from households during the COVID-19 pandemic was not correctly reported, so it is clear that the data supply for policies is disrupted. Therefore, seeing the importance of vector control and the one house one jumantik program as an effective community empowerment model, it is necessary to support an independent reporting system at the household level. Thus, the flow of larva inspection data does not rely on manual report form as has been done so far. This is undoubtedly a momentum to support vector control programs during a pandemic or even after the pandemic as mitigation of similar conditions in the future.

Conclusion

COVID-19 implies the dengue case and vector control. The society reported that Dengue disease remain occurred during the pandemic. They also stated the existence of mosquitoes around them. The social restriction is associated with disrupting routine vector control that runs inspection by entering the house. This situation impacted the data supply for a policy generally referring to societal larvae monitoring. We recommend developing one house one jumantik reporting system as room for improvement of vector control in adaptation to COVID-19 and social restriction.

Acknowledgments

This study has received funding from the Ministry of Education and Culture, the Republic of Indonesia, with grant number 030/PB.PDUPT/BRIn.LPPM/VI/2022. We thank Mrs. Arkana and Mr. Regha from the health office of Yogyakarta for their helpful discussion during the research.

Disclosure

The authors report no conflicts of interest in this work.

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