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IMS-Dengue Survey (Integrated management strategy for dengue) as a Diagnosis of Village Readiness in Realizing Integrated Dengue Prevention and Control

Nur Siyam[1]✉, Widya Hary Cahyati[1], Putri Tiara Rosha[1], Latifa Hanan[1], Siwi Amru Nurrochmah[1], Ardhita Sholehawati[1], Rhanindra Aviana[1], Arnayla Nezza Mariezko[1], Niken Lestari[1]
[1]Public Health Study Program, Universitas Negeri Semarang, Semarang, Indonesia

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Abstract

In 2022, Semarang City experienced a 4-fold increase in dengue cases with IR: 51.7/100,000 residents, CFR: 3.8%. The purpose of the study was to determine the readiness of village-based dengue control based on IMS-dengue criteria in realizing integrated dengue prevention and control. The study was conducted in Bandarharjo Village, a high-risk community on the outskirts of Semarang City, consisting of 30 cadres and 83 people who had stayed for at least 6 months. Samples were taken using a purposive sampling technique. Analytical survey research, data collection with questionnaires, and observation checklists. The results of an integrated dengue control survey in households show that the use of mosquito repellent is still high (94.0%) and the use of larvicide to prevent mosquitoes in water reservoirs that are difficult to clean is preferred. Good practices in the use of mosquito nets during early morning sleep 42.2%, rearing larval predatory fish 61.4%, and the use of mosquito repellent plants (39.8%) are still quite minimal. Factors related to dengue control practices are perceptions of the seriousness of dengue disease in the community.

Introduction

Prevention and control of dengue fever have been carried out since the beginning of the emergence of dengue disease and extraordinary events (outbreaks), but the prevention and control of this disease have caused a lot of resistance to the Aedes aegypti mosquito vector as in previous studies (Harapan *et al*., 2019; Arfan, Rizky and Hernawan, 2022; Siyam, Sukendra and Santik, 2022), (Hamid *et al*., 2018), and the increase in dengue disease both at the national level and Semarang City is still occurring (Siyam *et al*., 2021). Data from the Indonesian Ministry of Health shows that dengue fever in Indonesia is spread across 472 regencies/cities in 34 provinces. until the 49th week of 2020 as many as 95,893, while the number of deaths due to dengue fever until the 49th week was 661. Data from the Semarang City Health Office shows that dengue cases in Semarang City in 2022 reached 857 cases, an increase of 3 times compared to previous years. The fatality rate of dengue disease is 3.5%, meaning that 30 people died of dengue fever in 2022. DHF is a disease for which there is no cure, and also its high incidence of transmission is caused by the decline of the dengue virus from mother to egg (transovaria) (Saepudin *et al*., 2022; Wanti, Isnawati and Respati, 2022).

The three puskesmas work areas that have the highest dengue cases are Puskesmas Tembalang, Bandarharjo, and Banyumanik. One of the villages in Puskesmas Bandarharjo that is endemic to dengue fever is Bandarharjo Village, which is a suburb of Semarang City that is at high risk of dengue transmission. Based on the results of the 2022 Epeniti survey, it is reported that the Larvae Free Rate (ABJ) is still below 95%, an area that has a lot of untreated puddles, many abandoned buildings or buildings that are neglected, and has a high density of mosquitoes. The results of interviews

✉ Correspondence Address:
Sekaran, Semarang, Central Java, Indonesia 50229
Email: nursiyam@mail.unnes.ac.id

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with Lurah and the head of FKK Bandarharjo reported that 5 priority RWs need assistance in dengue control, currently due to the increasing dengue cases, namely RW 5, 6, 8, 3, and 2.

There have been many efforts made by the government to overcome the possible adverse effects of environmentally unfriendly and harmful control of the ecosystem (Hassan *et al*., 2021). The DHF prevention and control program that has been carried out is COMBI (communication for behavioral impact), but this program has been less actively implemented, while the 1 house 1 jumantik program that is currently running also experiences many obstacles (Sukesi *et al.,* 2018). In addition, the latest program being developed in various regions in Indonesia is a dengue vector control program using natural enemies from Aedes ae. i.e. using Wolbachia bacteria (Anders *et al*., 2020a). These bacteria can spay eggs produced by Aedes ae mosquitoes. to reduce the number of Aedes ae. mosquito populations in the community (Anders *et al*., 2020b). Prevention of DHF with Wolbachia bacteria has not fully received a positive response from the community (Buchori *et al*., 2022). In Semarang City itself, the controls carried out are improving waste management, Community-Based Total Sanitation (STBM), and intensifying 3M plus. Where prevention and control require many supporting aspects to make the program run in an integrated and sustainable manner.

From these problems, researchers have the idea to predict village readiness in dengue control in Bandarharjo Village based on IMS-dengue as a basis for integrated dengue prevention and control. The principle of dengue control must be carried out in an integrated manner, meaning that dengue control must pay attention to all aspects that affect the incidence of dengue disease so that dengue control can be sustainable. Integrated control includes aspects of Dengue Severity, Dengue outbreak opportunity, biological-social environment, household prevention, and control behavior, Larvae Surveillance System by Health cadres, the role of stakeholders, climate, and regional vulnerability. In addition, integrated prevention and control must also prioritize the sustainability of ecosystems and the environment (Nguyen-Viet *et al*., 2015). Integrated control also combines eco-bio and social aspects of strategies to achieve low risk of dengue (Sommerfeld & Kroeger, 2012; Kittayapong *et al*., 2012).

To avoid outbreaks and worse health and environmental problems, identification of areas at risk of dengue is important. Areas that are prone to dengue fever can be a priority location for comprehensive prevention and control of dengue hemorrhagic fever that looks at various risk criteria that may be prioritized for prevention. So, predictions of village readiness need to be made. DHF prevention and control must involve the community or community because community readiness is the key to the success of dengue control. People are people who have lived and understand the environment they live in and understand the culture or habits of residents carried out every day. It is the community that must be able to actively participate in realizing the prevention and control of the disease they need (Waleckx *et al*., 2015). The amount of community readiness in dengue control must be immediately identified to immediately get appropriate treatment as well. The risk of vulnerability to dengue severity, the opportunity for outbreaks, the risk of environmental hazards, climate, and regional vulnerability are basic aspects, while community behavior, the role of stakeholders, health workers, and cadres in dengue control become capital in the sustainability of integrated prevention and control programs (Arunachalam *et al*., 2012; Sulistyawati *et al*., 2019). So, the purpose of this study is to identify integrated prevention of dengue fever, its knowledge, solutions to dengue fever, and the understanding of the community and cadres on dengue mosquito larvae surveillance.

Methods

The study was conducted in the Suburban area of Semarang City, Bandarharjo Village, with a focus on RW 5, 6, 8, 3, and 2 which are areas with the highest cases and have the lowest ABJ. The inclusion criteria are high-risk dengue communities on the outskirts of Semarang City / who live in the Bandarharjo Village area of Semarang City (at least 6 months). The criteria for cadres are cadres who are responsible for dengue control in the RW where the research has stayed for at least 6 months and can read

and write. Household samples were calculated using the slovin formula, and 99 samples were obtained, because the completeness of the data was only obtained in 83 household samples. The cadre sample is determined by purposive sampling, i.e. 6 cadres each representing each RW with a total number of 30 cadres.

The research design is survey research, with a quantitative descriptive approach. Research Data generated: data on the implementation of dengue prevention and control in households in an integrated manner, data on integrated dengue prevention knowledge by cadres and heads of families, data on understanding of dengue solutions for heads of families, data on understanding of dengue solutions for health cadres, data on understanding of the larvae index surveillance system on heads of families, data on understanding of the larvae index surveillance system on health cadres.

The research instruments were a questionnaire (questionnaire modified from Nontapet *et al*. Study, 2022 (Nontapet *et al*., 2022) and checklist of observations by respondents. Data collection techniques by filling out questionnaires are filled directly by respondents. The results of the research data are presented by univariable analysis for respondent characteristics (demographic picture of respondents), research data are described in percentage distribution and presented in the form of tables and narratives. The research has received a Letter of Ethics from the Health Research Ethics Commission of Universitas Negeri Semarang no. 306/KEPK/EC/2023 dated July 13, 2023.

Results and Discussion

The research was conducted on July 14-September 2023 in Bandarharjo Village, Semarang City. The research involved PKK mothers as health cadres, village health forums (FKK), and village stakeholders. The following are the results of an integrated control action survey on DHF.

Table 1. Characteristics of Health Cadres (n: 30)

Cadre Characteristics	% (n)
Education	
Basic	10.0 (3)
Middle	83.3 (25)
High	6.7 (2)
Age	
31-40 th	6.7 (2)
41-50 years	43.3 (13)
51-60 th	43.3 (13)
>61 th	6.7 (2)
Work	
Employee	13.3 (4)
Merchant	3.3 (1)
Housewives	83.3 (25)

Source: Primary Data, 2023

Table 2. Integrated Control Action on Dengue Fever by Health Cadres (n: 30)

No.	Environmental and Behavioral Control Actions	Yield (%)
1	Provide closed trash cans and keep them clean	100
2	Managing waste and used items	53.3
3	Emptying/draining the bathtub/container that can be a breeding place for mosquitoes at least once a week in your own home	96.7
4	Monitor the mosquito larvae in public places and unoccupied houses/buildings	63.3
5	Installing wire gauze on the ventilation of the house	53.3
6	Keeping fish to eat mosquito larvae in ponds that are difficult to clean (Shafique et al., 2019)	56.7
7	Not hanging clothes	53.3
8	Wearing mosquito nets when sleeping in the early afternoon	36.7
9	Use lotion / burnt medicine/mosquito repellent only when necessary	63.3
10	1 family member participates in monitoring the presence of mosquito larvae once a week in their own homes and residents' homes	53.3
11	Planting mosquito-repellent plants	53.3
12	All people must do PSN 3M Plus regularly and simultaneously	100
13	Check your health immediately if you find symptoms such as DHF	100
14	Report to cadres or kelurahan if they find residents or families who have symptoms of DHF	93.3
15	Actively participate in environmental service work	100

Source: Primary Data, 2023

Table 1 shows the characteristics of respondents from health cadres. The Health Cadres who participated in filling out the questionnaire were 30 people. Health cadres in Bandarharjo Village are mostly secondary educated (junior high, high school, and equivalent) (83.3%). Most were aged 41-60 years (86.6%). Twenty-five people (83.3%) were housewives.

Table 3 shows that the percentage of households with only primary education is 26.1% (30). Sixteen respondents (19.3%) lived in rented houses. The average number of people living per household was five (4.49). Most households have piped water inside the house (92.8%). However, 20.5% (n = 17) reported daily or weekly disruptions to piped water supply. People consider DHF to be a serious problem (83.1%), and this means that there are still some people who think DHF is not a health problem that is feared by the community. The assumption of dengue people is not a serious problem during the COVID-19 pandemic (66.3%).

Integrated control actions against DHF by Health cadres are shown in Table 2. The practice of using mosquito nets (36.7), installing wire gauze on house ventilation (53.3%), and the use of mosquito repellent plants is still low (53.3%). The use of mosquito repellent plants is still small because of the limited availability of space. Mosquito nets are less desirable based on residents' information due to the hot weather.

Table 3. Socio-Demographic Information from Survey Respondents (n=83)

Socio-Demographics	% Household (n)
Head of household < 26 years old	8.4% (7)
Living in a contract house	19.3% (16)
The head of the household has only basic education	36.1% (30)
The head of household has secondary education	63.9% (53)
Work as Laborer	31.3% (26)
Work as a private employee/entrepreneur	37.3% (31)
Another job	28.9% (24)
Income below minimum wage before the Pandemic	63.9% (53)
Income below minimum wage during the Pandemic	83.1% (69)
Water and Garbage Access	
Households do not use water pipe sources	7.2% (6)
The plumbing does not work well	20.5% (17)
Garbage pick up 1-3 times a week	47.0% (34)
No garbage collection	12.0% (10)
Housing Condition	
House ventilation uses window/door	48.2% (40)
House ventilation uses a fan	51.8% (43)
Wall material from wood/bamboo	6.0% (5)
Road access rocky/ soil	19.3% (16)
Knowledge and perception	
There were family members/neighbors infected with DHF / Chikungunya 6 months ago	9.6% (8)
Knowledge that dengue is transmitted by mosquitoes	100% (83)
Consider dengue to be a serious problem in the community	83.1% (69)
Consider dengue to be a serious problem in the community in the COVID-19 Pandemic era	66.3% (55)
Implementation of DHF Prevention different before and during the COVID-19 pandemic	32.5% (27)
Expenditure mosquito control different before and during the COVID-19 pandemic	24.1% (20)

Source: Primary Data, 2021

Table 4. Integrated Control Action on Dengue Fever by Family (n = 83)

Community-integrated control action	%households
Draining the bathtub once every 1 week	96.4% (80)
Closing existing water reservoirs	94.0% (78)
Manage waste	88.0% (73)
Managing/burying used tires/bottles in the environment around the house so that they are not flooded with water	74.7% (62)
Change the water in the flower vase/bird drinking water regularly at least once every 1 week	85.5% (71)
Keeping fish on a pond that is difficult to clean	61.4% (51)
Not hanging clothes	84.3% (70)
Wearing mosquito nets when sleeping in the early afternoon	42.2% (35)
Using larvicide/Abate to kill larvae in water reservoirs	77.1% (64)
Using lotion/burn/mosquito repellent spray to repel mosquitoes	94.0% (78)
Check the presence of mosquito larvae once a week in your own home/people's homes	98.8% (82)
Keeping mosquito-repellent plants	39.8% (33)

Source: Primary Data, 2023

The results of an integrated dengue control survey in households are shown in Table 4. The use of mosquito repellent, both repellent, mosquito coil, and spray is still high (94.0%). In addition, a high use of larvicide to prevent mosquitoes in water reservoirs that are difficult to clean. Good practices in the use of mosquito nets during sleep early in the afternoon (42.2%), maintenance of larval predatory fish (61.4%), and use of mosquito repellent plants are still quite minimal (39.8%).

Table 5. Understanding of Integrated Control

Comprehension Criteria	Yield % (n)
Cadre	
Understanding Integrated Control	60.0 (18)
Understanding of DHF solutions	56.7 (17)
Understanding of larvae monitoring surveillance systems	70.0 (21)
Household	
Understanding Integrated Control	46.7 (14)
Understanding of DHF solutions	43.3 (13)
Understanding of larvae monitoring surveillance systems	66.7 (20)

Source: Primary Data, 2023

Table 6. Factors affecting Community Integrated Control Practices (n=83)

Variable	Category	DHF Control Practices		P-value
		Good	Less	
Perception of DHF Seriousness	Serious	42	14	0.000*
	Not Serious	2	25	
Information Barriers	Not being an obstacle	24	27	0.251
	Become an obstacle	20	12	
Education Level	High School or More	26	27	0.465
	Basic Education/equivalent	18	12	
Home Ownership	Own	39	28	0.096
	Hire/Contract	5	11	

Source: Primary Data, 2023

Table 5, understanding larval monitoring surveillance systems in cadres has the highest value (70%) compared to understanding dengue solutions and integrated control. The understanding of the head of the household with the highest value is also in the larval monitoring surveillance system (66.7%), while the understanding of integrated control and dengue solutions is still limited, this is related to Table 6, where the variable of Community Perception related to the seriousness of DHF is a factor related to the Integrated Control Practice of the Community in dengue control.

The determinants that influence the prevention and control of dengue fever are very diverse. Health Cadres spearhead the community's movement to carry out mosquito nest eradication activities (Siyam *et al.,* 2022). Health cadres as key communities in carrying out their duties are influenced by many factors, starting from factors related to internal/individual, factors of facilities and infrastructure, factors of cost availability, and support of stakeholders, communities, and health workers. In addition, social capital is a determining factor in the sustainability of the implementation of the duties of health cadres (Tapia-Conyer *et al.,* 2012; Asri & Festi, 2017; Siyam *et al.,* 2022). Internal factors of Health cadres can be knowledge factors (Harapan *et al*., 2018; Kumaran *et al*., 2018; Sulistyawati *et al*., 2019; Msellemu *et al*., 2020; Rahman *et al*., 2021), perception (Zaki *et al*., 2017), motivation (Shafie *et al*., 2023), from cadres. Several studies reveal that education affects cadre performance (Mitchell-Foster *et al*., 2015; Nontapet *et al*., 2022). Good stakeholder support will improve the morale and performance of cadres (Nontapet *et al*., 2022).

Prevention and control of dengue disease that has high effectiveness must use the concept of integrated vector control (Tapia-Conyer *et al.,* 2012), for in the implementation of assessment or identification of risk predictions for dengue events must also include factors that affect the incidence of dengue disease as a whole and integrated so that aspects of dengue control carried out by all elements of society, Stakeholders, health workers, and the government can be right on target and as needed. For this reason, it is important to predict village dengue risk based on IMS-dengue to realize integrated dengue prevention and control. To create a community that is ready to be prepared for the prevention and control of dengue fever (Arunachalam *et al*., 2012; Kittayapong *et al*., 2012; Sommerfeld & Kroeger, 2012; Nguyen-Viet *et al*., 2015; Waleckx *et al*., 2015; Musesengwa *et al.,* 2017).

Integrated dengue control is an interrelated control between all elements that affect the incidence of disease including the host agent and its environment. Not only focusing on the ecosystem as a place where humans live in their environment. The integrated concept here is that disease control is inseparable between humans and the biological, physical, chemical, social, economic, and cultural environment (Rida *et al*., 2023; Siyam *et al*., 2023). It is integrated here that disease control must be carried out by all levels of society without exception by combining various evidence-based control techniques and prioritizing environmental safety (Kittayapong *et al*., 2012; Mitchell-Foster *et al*., 2015), (Mungall-Baldwin, 2022). The support of health cadres/volunteers in dengue surveillance will increase the success of integrated dengue control (Nontapet *et al*., 2022).

Integrated control can be carried out by the community to improve the effectiveness of disease prevention and control activities (Tapia-Conyer *et al.,* 2012). Disease control that is still fragmented will hinder the success of dengue control. The principle of environment-based disease control is very dependent on the integration of various control techniques, both mechanical control such as environmental management, biological control, chemical control, and technological engineering which has recently begun to be implemented (Sommerfeld & Kroeger, 2012; Buchori *et al*., 2022). However, how sophisticated and advanced the control carried out must not forget the importance of maintaining good practices in environmental sanitation control which is a breeding ground for mosquitoes. In essence, control must focus on the community as a subject that must be involved to protect the environment to avoid diseases that may occur (Selvarajoo *et al*., 2020).

Healthy living practices that prioritize

environmental sanitation management and good dengue prevention behavior by the community must always be fostered and improved (Wilson *et al*., 2020). This practice is commonly done by the community, namely draining the bathtub, managing garbage, and not hanging clothes. Meanwhile, the use of biology in dengue control still must be improved, such as the use of larva-eating fish, mosquito-repellent plants, and vegetable larvicide. Other good practices that are still low are the use of mosquito nets while sleeping and the installation of wire gauze to prevent mosquitoes from entering the house. People prefer to use practical methods, namely chemical prevention, such as the use of lotions, mosquito coils, and sprays to avoid mosquito bites. Chemical prevention has been proven to cause resistance to vectors, health problems, and environmental hazards (Bowman *et al.,* 2016).

Understandings related to DHF solutions, the seriousness or danger of DHF, larval monitoring surveillance systems, and related to integrated control are important to be improved at all levels of society, both in the community, cadres, stakeholders, and health workers, as well as related parties (Nontapet *et al*., 2022; Nontapet, Maneerattanasak, *et al*., 2022). It is intended to obtain optimal results from prevention and control activities and realize integrated control in the community. So that the incidence of dengue fever can be suppressed, and a safe environment can be realized.

Conclusions

The results of an integrated dengue control survey in households show that the use of mosquito repellent, both repellent, burn and spray is still high (94.0%). In addition, a high use of larvicide to prevent mosquitoes in water reservoirs that are difficult to clean. Good practices in the use of mosquito nets during sleep early in the afternoon (42.2%), maintenance of larval predatory fish (61.4%), and use of mosquito repellent plants are still quite minimal (39.8%). Understanding the surveillance system of larval monitoring in cadres has the highest value (70%) compared to understanding dengue solutions and integrated control. The understanding of the head of the household with the highest score is also in the larval monitoring surveillance system (66.7%), while the understanding of integrated control and dengue solutions is still limited. Factors related to dengue control practices are perceptions of the seriousness of dengue disease in the community. The implementation of integrated control by the community is still quite lacking because it prioritizes chemical control. The research recommends increasing the understanding of cadres and the community related to integrated control and solutions to dengue handling so that dengue control can be carried out completely.

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