

THE MANAGEMENT OF DENGUE HEMORRHAGIC FEVER ENDEMICITY IN SEMARANG CITY, 2010–2019

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Abstract

Dengue Hemorrhagic Fever (DHF) is one of the infectious diseases that remains a public health problem in the city of Semarang. From 2010 to 2019, the number of DHF cases fluctuated, with an upward trend during certain periods. This study aims to analyze the dynamics of DHF cases in the period 2010 to 2019, as well as to examine the response of the government and the community in efforts to combat it. This study discusses how DHF cases in Semarang City fluctuate each year and what kind of response is taken to control the disease. The research method used is the historical method, which consists of four elements: heuristics, source criticism, interpretation, and historiography. Data was obtained from newspaper archives, reports, and relevant previous studies. The results of the study show that the fluctuation in dengue fever cases is also influenced by environmental factors, population density, and seasonal changes, while the government and community responses are carried out through mosquito breeding site eradication programs, fogging, and health education. Combating dengue fever requires continuous cooperation between the government and the community so that dengue fever cases can be reduced more effectively.

Keywords: Dengue fever; Endemic; Government; Citizen.

INTRODUCTION

Dengue Hemorrhagic Fever (DHF) is one of the diseases that still poses a public health challenge in Semarang and almost all cities in Indonesia. The city of Semarang, as the capital of Central Java Province, is included in the endemic areas. The incidence of this disease fluctuates from year to year. DHF is classified as an endemic disease in Indonesia. The term endemic means that the disease is always present in a certain area or is permanent, with the number of cases varying each year (Budiarto 2003). This is different from an epidemic, which suddenly appears, or a pandemic, which spreads globally. The increase in cases has been observed since 2008. From 2010 to 2019, 2010 recorded the highest number with 5,556 DHF sufferers. This placed Semarang in first place in Central Java (Nisa, Notoatmojo, and Rohmani 2013).

Dengue fever cases in Semarang City are spread across various areas. Some regions are more noticeable due to repeatedly high incidence rates. One of them is Tembalang, especially the sub-districts of Sendangmulyo, Kedungmundu, and Sendangguwo, which are often considered vulnerable areas. The causes are increased population density and many new residential areas (Supriyanto 2019). On the other hand, the Gayamsari and Pedurungan areas also experienced several spikes in cases, particularly in environments with poor sanitation. This pattern shows that the distribution of dengue fever cases in Semarang between 2010 and 2019 tended to be influenced by population growth, environmental conditions, and differences in the level of community participation in maintaining cleanliness and preventing mosquito breeding sites.

The spread of dengue fever cases is also influenced by climate change and environmental factors (Arivadany 2024). Changes in weather patterns, with rising global temperatures and high rainfall, create favorable conditions for the breeding of *Aedes aegypti* mosquitoes in Semarang. It is a fact that floods have become an annual disaster for the residents of Semarang city every rainy

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season (Adyat Ade Wijaya and Suhardi 2022). Low awareness of environmental cleanliness is an important factor, especially in densely populated settlements. Many household water puddles become breeding grounds for mosquito larvae, accelerating the spread of the dengue virus, and reducing the effectiveness of efforts by local governments to control this outbreak. This phenomenon not only impacts health but also affects the socio-economic conditions of urban communities.

As a result of the surge in Dengue Fever in 2008, which reached 5,429 cases, and in 2010, which was even higher, reaching 5,556 cases, various efforts were made by the Semarang City government to reduce the spread of the dengue outbreak during the period from 2010 to 2019. At the end of 2010, Semarang City Regional Regulation No. 5 concerning the Control of Dengue Fever Disease was issued. This was followed by Semarang Mayor Regulation (Perwali) Number 27B of 2012 regarding the Implementation Guidelines for Semarang City Regional Regulation Number 5 of 2010 concerning the Control of Dengue Fever Disease. With the issuance of Semarang City Regional Regulation No. 5, researchers can analyze the implementation of this regulation for dengue control in the community. Researchers can also analyze the responses made by the public to regulations issued by the government, and how collaboration is built between the government and the community to eradicate the disease vectors. Meanwhile, the end of 2019 was chosen because this period represents complete data before the Covid-19 pandemic that emerged in 2020, which could potentially affect reporting and the prioritization of handling other infectious diseases. Thus, the period from 2010 to 2019 is considered relevant to describe the dynamics of dengue fever cases in Semarang without the influence of major external factors such as the COVID-19 pandemic (PERDA Kota Semarang No. 5 Tahun 2010 2010).

Previous studies on dengue fever have mostly focused on epidemiology, environmental health, and other health studies. One example is a study by the Ministry of Health that discusses the spread of diseases caused by the *Aedes Aegypti* mosquito. There were also studies on Mosquito Nest Eradication (PSN) conducted by healthcare workers, as well as the effectiveness of programs organized by other healthcare professionals (Kementerian Kesehatan RI 2023). Epidemiological studies also examined case distribution based on time, patient age, and environmental factors in several areas such as Tembalang, finding seasonal patterns with case peaks during the rainy season (Lidia Ariska 2016). There are also studies on program evaluation and policy implementation based on the Semarang City Regional Regulation Number 5 of 2010, which focus on the Tembalang District (Lestari and Suryaningsih n.d.). These studies are still partial, limited by region, and sometimes only cover certain aspects. This research aims to analyze the dynamics of Dengue Fever cases in Semarang City that occurred between 2010 and 2019 by examining the factors causing the emergence of the disease, the efforts of the Semarang City local government to tackle the cases, the social responses generated by the community, as well as community participation in addressing dengue cases. This study also aims to provide a historical perspective on dengue fever, particularly in the capital city of Central Java, Semarang. Historical analysis of the number of cases, policies implemented, and community involvement is expected to provide an overview of the factors that influence and hinder efforts to combat outbreaks. Thus, both the government and the community can use this writing as a basis for evaluation to plan more effective strategies to combat dengue fever. This research is not only focused on the aspect of historical reconstruction, but also on interdisciplinary understanding that can be used as a reflection for current public health policies. Studying collective experiences helps communities in specific cities face dengue fever, and the relationship between environmental health and urban life can be enriched. This knowledge is important to raise public awareness that dengue fever is not only a medical phenomenon, but also a social event that affects interaction patterns and the adaptive capacity of the community. This research serves not only as an academic report, but also as a social reflection that is relevant to the wider society.

RESEARCH METHOD

Historical research is a process of collecting, analyzing, verifying, and interpreting data or information related to events that occurred in the past. Historical research usually aims to understand changes, developments, and continuity of events within a certain time context. This study uses qualitative methods involving the use of primary sources in the form of newspapers published between 2010 and 2019, local regulations on dengue fever enacted by the government, and secondary sources in the form of previous studies such as books, articles, and other interpretations. Several experts also mention that historical research must go through several stages, such as topic selection, heuristics, verification, interpretation, and historiography (Wasino and Hartatik 2018).

Kuntowijoyo also divides historical research methods into four categories: heuristics or source collection, source criticism, interpretation, and historiography. The primary sources used by the researcher are newspapers published between 2010 and 2019 issued by local newspaper companies in Semarang, such as *Suara Merdeka*. The secondary sources used by the researcher are previous studies relevant to the chosen topic. These secondary sources include books on the history of health, books discussing the spread of dengue fever, and articles that discuss the spread of dengue fever in other cities and the spread of dengue fever in certain years, so the researcher can use these secondary sources as references. The researcher also uses interview methods with residents of Semarang whose families have previously contracted dengue fever in those years as additional sources. After all the sources are collected, the researcher compares one source with another (critique) to produce a more objective writing. Then the next step taken by the writer is to reinterpret (interpretation) the obtained results according to the writer's perspective to create a historical work that can be accounted for (historiography) (Kuntowijoyo 2013).

RESULT AND DISCUSSION

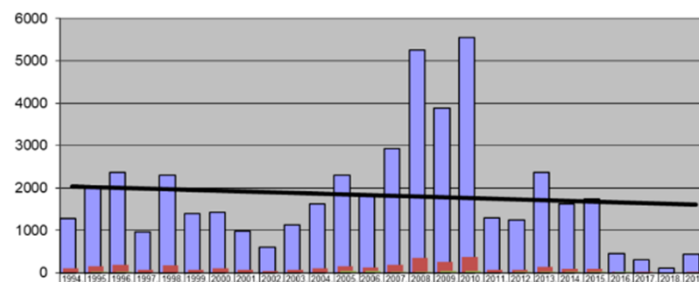
The Dynamics of Dengue in Semarang City

Dengue Hemorrhagic Fever (DHF) is one of the contagious diseases affecting people in various regions of Indonesia, including Semarang. As a disease transmitted by the *Aedes aegypti* mosquito vector, dengue fever has fluctuating rates of spread and can have serious health impacts, especially in areas with unfavorable environmental conditions. Throughout its course, dengue fever incidents show annual fluctuations in cases, with certain months experiencing sharp increases. In 2008, there were 5,249 reported cases, followed by another increase in 2010 with 5,556 cases. These data indicate that DHF remained a health threat that required continuous intervention from both the government and the community at that time (Dinas Kesehatan Kota Semarang 2011).

The increase in dengue fever cases in Semarang is closely related to the rainy season. According to local media reports, dengue cases mostly occur during rainy periods, along with the rise in standing water that can potentially serve as breeding grounds for disease vectors (Awal Tahun, 122 Pasien DBD, Tiga Meninggal 2019). The city of Semarang has several areas that consistently experience standing water and flooding every year, especially when rainfall levels are high. Some areas recorded as locations with a high risk of flooding include Ngaliyan District, Genuk District, Gayamsari, and parts of Pedurungan (Pemetaan Tingkat Kerawanan Banjir di Kota Semarang Menggunakan Metode Overlay Dengan Scoring Berbasis Sistem Informasi Geografis 2023). Floods that occur can even last for several days, thereby prolonging the period of environmental conditions that support the life cycle of *Aedes aegypti* mosquitoes. This situation could be an opportunity for an increase in dengue fever cases while also emphasizing the importance of environmental management, flood mitigation, and raising public awareness about disease prevention practices in endemic areas. There must still be anticipation by the community to continue practicing healthy living behaviors, even though during the dry season dengue fever cases tend to decrease. In the dry season of 2009, precisely in August, the number of dengue fever patients was still under control, at least at Telogorejo Hospital, with only 12 dengue fever patients recorded up to August (Musim Kemarau, Pasien DB Menurun 2009).

The population density in Semarang City has also been known to continue increasing in the following years since 2010. According to census data, since 2010, Semarang City's population has reached 1,527,433 people and has continued to rise in subsequent years (Badan Pusat Statistika Kota Semarang 2018). The emergence of various housing developments, which have increasingly appeared in Semarang City year by year, has also contributed to the city's growing population density, thereby becoming a factor in the increased risk of Dengue Fever transmission, along with other contributing factors (Yunita Rohmawati 2024). The process of developing residential areas leads to new houses that are not yet inhabited, creating new environmental problems. In empty houses, leftover paint cans, buckets, and other construction materials capable of holding rainwater are usually found. These water puddles then become ideal breeding sites for *Aedes aegypti* mosquitoes, the primary vectors of dengue fever.

Meanwhile, according to the regional health report in 2010, Semarang still faced issues of low sanitation access and public hygiene behavior. This is evident from the still high percentage of households that do not have wastewater disposal facilities, which increases the likelihood of creating damp and unmanaged environments that support the mosquito life cycle. This continues to occur even as the government emphasizes the importance of improving sanitation, increasing access to clean water, and healthy living behaviors to break the disease chain. In the context of urban development, the expansion of new residential areas not only brings modernization to a region but also ecological consequences that require serious attention. New residential areas that are not yet fully functional as dwellings actually become vulnerable points for dengue fever transmission due to the many potential mosquito breeding sites. Thus, the dynamics of urban development in Semarang at that time showed a close connection between the growth of the physical environment, public health quality, and government policies in controlling endemic diseases such as dengue fever (Waspadai DB, Diare, dan Tifus 1997).



Source: (Dinas Kesehatan Kota Semarang 2019).

At the beginning of 2010, the cases of dengue fever were still at a high level. According to the Semarang City Health Office in 2010, due to a very significant increase of 5,556 cases, Semarang declared dengue fever a public health emergency. This means that more intensive handling from the local government is required for dengue fever control. Some high-risk areas, such as Tembalang, recorded the highest number of dengue cases among other areas in Semarang. Initially, this condition led to the assumption that higher-altitude areas might influence the high spread of the disease (Dinas Kesehatan Kota Semarang 2011).

However, looking at the developments from 2016 to 2019, the pattern of dengue fever cases appears to be different. In 2018, the highest number of cases occurred in the Pedurungan District, which is located in a moderately elevated area. On the other hand, areas with the lowest number of cases came from various elevation categories, such as Tugu and Central Semarang Districts (low areas), Mijen (high area), and South Semarang (moderate area) (Dinas Kesehatan Kota Semarang 2019). From this data, it can be concluded that the elevation of an area does not have a clear impact on the spread of dengue fever in Semarang City. Other factors such as population density, environmental cleanliness, and community behavior play a larger role in influencing the spread of dengue fever over time.

Response to Dengue Cases in Semarang City

The local government then took action by implementing Regional Government Regulation No. 5 of 2010 on September 17, 2010. This regulation is carried out under the responsibility of the P2P Section of the Semarang City Health Office, through guidance, supervision, and evaluation. This regulation is implemented through several structured steps and in collaboration with various parties. The local government, health facilities, community leaders, and residents all play important roles in its implementation. One of the main steps in control efforts is epidemiological surveillance, which involves the rapid monitoring and reporting of dengue fever cases. Health facilities are required to report newly occurring cases within less than 24 hours to enable rapid action for prevention and transmission control. After a case report, an investigation is conducted by examining the environment within a minimum radius of 100 meters from the patient's house to identify the source of transmission and the level of mosquito larvae presence (PERDA Kota Semarang No. 5 Tahun 2010 2010).

In addition, health education, community meetings, and the routine implementation of the PSN 3M Plus Program are carried out as preventive measures through community activities. Weekly inspections of mosquito larvae or monitoring of mosquito larvae are conducted by healthcare personnel to ensure that residents' homes are free from mosquito larvae. If a positive case is detected, targeted fogging must be carried out no later than within 5 x 24 hours to kill adult mosquitoes that could spread the virus. Mass fogging is conducted if the number of cases increases significantly to the point of becoming an Extraordinary Event (KLB). In addition to environmental measures, this regional regulation also governs the management of healthcare services for patients, both outpatient and inpatient, to reduce mortality rates. Medical personnel also make a diagnosis of Dengue Hemorrhagic Fever (DHF) for symptoms of dengue fever that appear, such as fever, to increase vigilance. Therefore, the control of dengue fever under this regional regulation not only relies on medical measures but also encourages active community participation and the implementation of a clean and healthy lifestyle to prevent the spread of the disease. One of the measures recommended by the government is the maintenance of betta fish as natural predators for mosquito larvae. The government also issues warnings about peak mosquito activity, which occurs from 9:00 to 10:00 in the morning and from 3:00 to 4:00 in the afternoon (Pemprov Harus Pro Aktif Tanggulangi DBD 2019).

At the beginning of 2010, the city government allocated a budget of 1.5 billion for the dengue fever prevention and control program, included along with other budgets for disease control. This year, the government also urged residents to continue using mosquito repellents and provided abate to distribute to the community. With this budget, the government tried to provide fogging assistance for various villages in Semarang City, but the results were not yet optimal due to the rather complicated assistance request process. This year, the people of Semarang also began planting lavender, zodia, and basil as preventive plants to stop mosquitoes from breeding (Untuk DBD Dianggarkan Rp 1,5 Miliar 2010).

The people of Semarang also play an important role in monitoring and reporting cases of dengue fever in their communities, not just the government. The people of Semarang make several complaints through local mass media. Complaints can also be made through neighborhood associations (RT/RW) or local health centers (puskesmas) near their homes. One of the places frequently used for complaints to gain public attention is the complaint column in the local daily newspaper *Suara Merdeka*, which serves as a space for residents to voice concerns about the environment, health, or public services. In December 2010, a local newspaper in Semarang published residents' complaints about residential areas that had not received fogging services for a long time through a section that is usually sent by residents to convey their grievances. The complaint described the public's concern about the increase in dengue fever cases, especially during the rainy season, when the population of *Aedes aegypti* mosquitoes tends to rise. Through such public forums, residents express their need for faster and more equitable vector control measures. The presence of the complaint also illustrates how local mass media serves as a bridge between the community and the government in addressing environmental and public health issues (Piye Jal 2010).

Public complaints at that time also served as an important reminder for the local government to improve its response to dengue fever cases. Uneven fogging can increase the risk of transmission, especially in densely populated residential areas that are difficult to control independently by the local residents. Therefore, these complaints not only reflect the concerns of the villagers but also emphasize the need to evaluate the dengue control system, including coordination among various agencies, logistical readiness, equitable preventive measures, and the sustainability of prevention programs. This shows that active community participation, supported by proactive media and government, can improve public health stability in areas endemic to dengue fever, such as Semarang (Piye Jal 2010).

The government also launched the One House, One Jumantik Movement (GSRSJ), but this program has not been running optimally either. Under this program, each household is required to have and fill out a jumantik card every week to facilitate inspections and data collection related to mosquito larvae activity. Then, the neighborhood coordinator will report to the program holder in each area. However, many residents who have a jumantik card still do not fill it out or do not complete it, so it is necessary for the neighborhood coordinator to directly guide each resident. In Candilama, Semarang City, residents have also been encouraged to practice the 3M method and to sprinkle abate, but it turns out that mosquito larvae are still found in some households' water containers. Some members of the community indeed appear to be not yet motivated to follow the recommendations from the government or the local health center (Nariswara et al. 2021).

Despite citizens having little awareness of health, cases of dengue fever in several regions of Indonesia have been recorded to have decreased significantly after 2010. The number of dengue fever cases dropped sharply from 5,556 cases in 2010 to 1,303 cases in 2011. This decline has had a positive impact on various regions, particularly in reducing the number of hospitalizations and easing the burden on the healthcare system. Although outbreaks still occur in some areas, the incidence of dengue fever tends to be lower and more controlled than in previous years (Dinas Kesehatan Kota Semarang 2012).

During the holiday travel season, especially approaching Eid al-Fitr, areas around airports, stations, and ports usually become the most crowded, and the movement of people becomes faster. These locations not only serve as arrival centers for travelers but also as strategic locations for local governments to set up health posts. These posts are established to address various health issues commonly experienced by travelers after long journeys. According to reports from health workers in the field, most travelers who use these services tend to experience similar illnesses, such as headaches, coughs, colds, and physical fatigue due to long journeys. Crowded travel conditions, changes in weather, and lack of rest during the journey are factors that cause these health problems (Ambulans Siaga di Setiap Posko 2013).

In 2013, the Central Java Health Office took several preparatory steps to provide the best healthcare services for homecoming travelers returning to their hometowns, considering the high volume of public transportation. About 310 community health centers remained open 24 hours a day to handle emergency care needs, and around 873 community health centers stayed open during regular working hours to ensure balanced healthcare service distribution across the region. In addition, along the homecoming routes in Central Java, the Health Office set up around 69 special health posts in various strategic locations. For travelers needing minor medical care, these posts served as quick medical check-up points and rest areas (Ambulans Siaga di Setiap Posko 2013).

The Health Department emphasizes that most travelers experience symptoms of illnesses originating from their respective hometowns and not from diseases contracted during the journey. Therefore, the public is urged to ensure that their health is maintained before starting long trips. Residents are also asked to keep their home environment clean, particularly by ensuring there is no standing water inside or around their homes. This appeal is being stressed more strongly because 2013 is still a period with relatively high cases of dengue fever (Ambulans Siaga di Setiap Posko 2013). Data shows that throughout that year, there were 2,364 cases of dengue fever in Central Java, indicating that the transmission of this disease is still active and requires vigilance from the community. Data shows that throughout that year, there were 2,364 cases of dengue fever in Central

Java, indicating that the transmission of this disease is still active and requires vigilance from the public.

In 2014, health data from the city of Semarang showed that dengue fever cases during the period of March to April reached 105 cases per month. This indicates an increase in *Aedes aegypti* mosquitoes during the rainy season. Then in 2015, in February, as many as 212 residents of Semarang were bitten by these mosquitoes, resulting in 3 deaths. Dengue fever sufferers were not only children but also adults (212 Warga Semarang Menderita DBD di Awal Tahun, 3 Meninggal Dunia n.d.). According to Semarang General Hospital data in 2015, in January there were 133 dengue patients receiving treatment, and in early February there were 40 child patients, 17 of whom were still being treated (Dinas Kesehatan Kota Semarang 2015). In many cases, transmission is suspected to occur in school environments, which are areas for learning where interactions last for quite a long time. The crowded classroom conditions, less than ideal ventilation, and the presence of standing water around educational facilities often become factors that allow *Aedes aegypti* mosquitoes to breed and attack children. The mayor of Semarang at that time also emphasized the importance of eliminating mosquito breeding grounds through cleanliness and prevention through environmental management. He also added clarification regarding public misconceptions about fogging as the main solution. According to him, fogging only kills adult mosquitoes, while it is ineffective against small mosquitoes or larvae and has the potential to increase mosquito resistance (Wibisono 2019).

In 2015, there was an increase in dengue fever cases compared to the previous year. The Semarang city government stated that this number ranked third in Central Java, followed by Magelang and Jepara. The number of cases per month could reach 133 (Dinas Kesehatan Kota Semarang 2015). However, in 2016, this number dropped to an average of 37 cases per month, which was a significant decrease. Dengue fever cases continued to rise during the rainy season until early 2016. March recorded the peak with 63 patients that year, and July recorded the lowest cases with 21 patients, showing a significant decrease during the dry season (Dinas Kesehatan Kota Semarang 2016). In 2017, the number of dengue fever cases fell again to 299 from 448 cases the previous year (Dinas Kesehatan Kota Semarang 2017). This decline can be associated with the implementation of more organized local health policies following the Semarang City Regional Regulation of 2010 on Dengue Fever Control, as well as increased community participation in mosquito breeding site eradication programs. Education on the 3M practices (Draining, Covering, and Burying) and other environmental cleanliness efforts is beginning to show results (PERDA Kota Semarang No. 5 Tahun 2010 2010).

The Larvae-Free Index (ABJ) is one of the important methods for monitoring the potential spread of Dengue fever in various regions. This indicator is calculated by determining the percentage of houses or buildings where *Aedes aegypti* mosquito larvae are not found. According to national standards, an area is considered larvae-free if the value is at least 95%. It has long been used by the government and health workers as a tool to monitor environmental conditions and to show how concerned the community is about mosquito nest eradication. Therefore, the emergence of ABJ in Semarang City not only reflects the state of environmental cleanliness at that time but also becomes part of the city's history in handling dengue fever (Ciptono et al. 2021).

Health records indicate that ABJ in Semarang reached 91.7% in 2018, slightly increasing to 91.88% in 2019. Although this achievement has not yet met the national standard, it is still considered quite good given the challenges faced during the 2010s. At that time, Semarang experienced the growth of new residential areas, changes in urbanization patterns, and disparities in sanitation access across regions. These factors also affected the environment, so the increase in ABJ to nearly 92% is considered evidence that health education efforts, mosquito eradication programs, and community participation are beginning to show results. In addition, this achievement was considered one of the administrative successes by the local government at that time. According to epidemiological research, the development of ABJ shows that the household environment plays an important role in the spread of dengue fever. However, broader environmental factors still need to be studied further to gain a better understanding (Ciptono et al. 2021).

CONCLUSION

Dengue Hemorrhagic Fever (DHF) has become an endemic public health issue. The nature of this disease, which is present every year, makes DHF an endemic disease, even though it fluctuates with each season. DHF can change its status to an epidemic if there is an abnormal spike above the usual average. In the period from 2010 to 2019, the highest increase occurred in 2010 with 5,556 cases. The pattern of case occurrences, which tends to be unpredictable during certain periods, shows that DHF is not only a medical issue but also related to community behavior, environmental conditions, and population density. During the rainy season, this disease tends to increase. However, during the dry season, the disease does not completely disappear either. This disease persists over a very long period, and its fluctuations each year indicate that the measures taken have not been fully effective in completely breaking the chain of transmission.

The government has shown a fairly strong commitment to handling dengue fever, especially when implementing the 2010 Semarang City Regional Regulation on Dengue Fever Control. On the community side, citizen participation in maintaining environmental cleanliness is important in order to reduce the number of dengue fever cases. In addition, the discovery of mosquito larvae in homes, schools, and new residential areas shows that healthy living behaviors have not yet been fully adopted by the community. Therefore, future solutions for handling dengue fever need a more preventive, sustainable, and environmentally based approach. Local governments need to further encourage sanitation management, flood mitigation, and monitoring of new residential areas that could potentially become mosquito breeding hotspots. Health education programs also need to be carried out both in schools and in the community, not only in response to increasing cases but also continuously as part of health policies integrated with local government policies. In addition to the role of the government, the success of dengue fever control also lies in the hands of the community by actively participating and, of course, with support from the mass media, which serves as a public communication platform. Community involvement in early reporting, practicing clean and healthy living, and environmental monitoring are key elements in breaking the chain of disease transmission. With the collaboration between government policies, community awareness, and of course, support from the mass media, dengue fever control in Semarang City is expected not only to trigger reactive measures against outbreaks but also to build a stronger and more sustainable response system in the future.

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