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Relationship Between The Existence Of Larvae And The Incidence Of Dengue Fever In Gresik Regency In 2023

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ABSTRACT
Background of the Study: The incidence of dengue fever has grown dramatically worldwide in recent decades. Most cases are asymptomatic or mild and self-managed, and therefore the true number of dengue cases is underreported . Objective: To analyze the relationship between the presence of larvae and the incidence of dengue fever in Gresik Regency. Stages of the research method: This type of research is an observational study with a cross-sectional approach. This research was conducted in Gresik Regency. Data collection was carried out in June - August 2023. The research unit was aggregate data in each Kelurahan Kab. Gresik with a sampling technique of the total population. Analysis to determine the relationship between the presence of larvae and the incidence of dengue fever was carried out using the Pearson correlation test.

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INTRODUCTION

Dengue Hemorrhagic Fever (DHF) is an infectious disease caused by a virus and spread by a vector. The virus that causes this disease is Dengue (DENV). The vector that transmits this disease comes from the Aedes aegypti and Aedes albopictus mosquito species (1) . Severe dengue fever is a major cause of serious illness and death in several Asian and Latin American countries. There is no specific treatment for severe dengue fever. Early detection of the development of the disease associated with severe dengue fever, and access to appropriate medical care can reduce the mortality rate of severe dengue fever to below 1%. Dengue is found in tropical and subtropical climates throughout the world, mostly in urban and semi-urban areas. The global incidence of dengue fever has grown dramatically with about half the world's population now at risk (2) .

The incidence of dengue fever has grown dramatically worldwide in recent decades. Most cases are asymptomatic or mild and self-manage, and therefore the true number of dengue cases is underreported. Many cases are also misdiagnosed as other febrile illnesses (3) . Another study on the prevalence of dengue fever estimated that 3.9 billion people are at risk of dengue virus infection. Despite the risk of infection being present in 129 countries (4) , 70% of the actual burden is in Asia (5) . The number of dengue cases reported to WHO has increased more than eightfold over the past two decades, from 505,430 cases in 2000, to over 2.4 million in 2010, and 5.2 million in 2019. Reported deaths between 2000 and 2015

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increased from 960 to 4032, affecting mostly younger age groups. The total number of cases appears to be decreasing during 2020 and 2021, as well as for reported deaths. However, data are incomplete and the COVID-19 pandemic may have also hampered case reporting in some countries (2) . The largest number of dengue cases ever reported globally was in 2019. In 2020, dengue affected several countries, with reports of increasing numbers of cases in Bangladesh, Brazil, Cook Islands, Ecuador, India, including Indonesia, Maldives, Mauritania, Mayotte (Fr), Nepal, Singapore, Sri Lanka, Sudan, Thailand, Timor-Leste and Yemen. Dengue continued to affect Brazil, India, Vietnam, Philippines, Cook Islands, Colombia, Fiji, Kenya, Paraguay, Peru and, Reunion Island, in 2021 (2) .

In Indonesia in 2021 there were 73,518 cases of dengue fever with 705 deaths. Cases and deaths due to dengue fever decreased compared to 2020, which was 108,303 cases and 747 deaths. The incidence rate of dengue fever per 100,000 population showed a downward trend from 51.5 in 2019, to 40 and 27 in 2020 and 2021 (1) . The incidence rate of dengue fever per 100,000 population showed a downward trend from 51.5 in 2019, to 40 and 27 in 2020 and 2021, which could be caused by the Covid-19 pandemic. So that the detection of dengue cases was not reported and not recorded properly. WHO 2022 also stated that the COVID-19 pandemic put great pressure on health care and management systems worldwide. The combined impact of the COVID-19 and dengue epidemics can have devastating consequences on at-risk populations (2) . Delayed treatment of dengue cases can lead to fatalities such as death. The proportion of deaths to all dengue cases or known as the Case Fatality Rate (CFR) can also be used to assess the success of dengue control (1) .

The CFR of DHF in Indonesia showed a downward trend in the period 2012-2020, namely from 0.9% to 0.69%. However, this figure increased to 0.96% in 2021. This increase can be an evaluation for the care of DHF patients both in terms of the timeliness of treatment and the quality of health services. Especially if you see that in that year the incident rate decreased but the CFR increased. This certainly needs special attention (1) . Nationally, the CFR of DHF in 2021 reached 0.96%. This CFR exceeds the limit of 0.7% which has been set in the target of the National Dengue Control Strategy. In 2021, there were 13 provinces or 38.2% of provinces that had a CFR above 1%. This CFR is considered high because it exceeds 1%. Immediate assistance to prevent and reduce the severity and complications that cause death is needed to reduce the CFR.

Based on the distribution map and graph of national DHF cases & deaths in 2020 above, East Java Province has a high risk of DHF incidents. By ranking 3rd with a high number of cases and ranking 2nd with deaths due to DHF. In 2021, the CFR of East Java Province exceeded one, namely 1.07% (1) . And the achievement of the Free Larvae Rate in 2020 of 89%, and in 2021 of 90% is still lower than the target that has been set, namely ≥ 95% (6) . Adequate case management follow-up efforts are needed, and increasing awareness of spikes in cases in each period so that an outbreak does not occur. Based on data from the East Java Provincial Health Office, as of January 1-27, 2022, there were 1,220 DHF sufferers in East Java, with 21 deaths (CFR = 1.7%) dominated by those aged 5-14 years. The number of dengue fever sufferers in East Java as of January 1-27, 2022 included Bojonegoro Regency

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(112 people), Nganjuk Regency (82 people), Malang Regency (73 people), Ponorogo Regency (64 people), Tuban Regency (61 people), Gresik Regency (30 people). With the highest number of dengue fever deaths, namely Pamekasan Regency (3 people), Bojonegoro Regency (2 people), and Nganjuk Regency (2 people). Since the last few weeks, Gresik Regency has experienced moderate to heavy rain. We must be aware of conditions like this together because it is susceptible to *Dengue Hemorrhagic Fever* or commonly abbreviated as DBD. The development of mosquito larvae will occur when rainwater is collected and stagnates for approximately 7 days in used bottles, used glasses, flower pots, holes, etc. This DBD disease is transmitted to humans of all ages, through the bites of *Aedes aegypti* and *Aedes albopictus mosquitoes* which can be fatal if not treated properly (7) .

Dengue fever or Dengue Hemorrhagic Fever (DHF) is a disease caused by the dengue virus transmitted by the Aedes aegypti mosquito. This condition can be a serious threat to public health, especially in tropical and subtropical areas. Larvae are the early stage of the Aedes aegypti mosquito before becoming an adult mosquito that can transmit the dengue virus. Therefore, the presence of larvae can be an important indicator in monitoring and preventing the occurrence of DHF. Several studies have been conducted to examine the relationship between the presence of larvae and the occurrence of DHF, including:

1. A study in Thailand by Thammapalo and colleagues (2015) showed that the presence of larvae was significantly correlated with the incidence of dengue fever. This study was conducted in 15 houses in urban areas and 15 houses in rural areas by taking larvae samples and monitoring the incidence of dengue fever for 6 months. The results showed that houses with high larvae presence had a greater risk of contracting dengue fever.
2. A study in Surabaya City by Handayani and colleagues (2017) showed that the presence of larvae around and inside the house was correlated with the incidence of DHF. This study was conducted in 134 houses by taking samples of larvae and monitoring the incidence of DHF for 6 months. The results showed that the presence of high larvae around and inside the house increased the risk of DHF.
3. A study in Manila City by Alera and colleagues (2016) showed that the presence of larvae and the density of the larval population correlated with the incidence of dengue fever. This study was conducted in 6 cities by taking larvae samples and monitoring the incidence of dengue fever for 4 years. The results showed that cities with high larvae and larval population density had a greater risk of dengue fever.

From the literature review, it can be concluded that the presence of larvae is significantly correlated with the incidence of DHF. Therefore, DHF control needs to be done by monitoring and controlling the presence of larvae, both inside and around the house. Preventive measures such as draining unused water reservoirs, tightly closing water storage containers, and avoiding garbage accumulation around the house can help reduce the presence of larvae and reduce the risk of DHF.

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MATERIALS AND METHODS

This type of research is an observational study with a cross-sectional approach. This research was conducted in Gresik Regency. Data collection was carried out in June - August 2023. The research unit is aggregate data in each Kelurahan of Gresik Regency with a sampling technique of the total population. The research unit taken is the District level, with a total of 17 Districts in Gresik Regency.

The calculation of mosquito larvae density is done by calculating several indicators of mosquito larvae density, namely the Free Larvae Number (ABJ) using the percentage formula from the comparison of houses where no larvae were found in the water reservoir to all respondent houses examined, then calculating the House Index (HI) indicator, namely the percentage of the comparison of houses where larvae were found in the water reservoir to all respondent houses examined. Data on the incidence of DHF was obtained from the number of DHF cases in Gresik Regency per Sub-district. Analysis to determine the relationship between the presence of larvae and the incidence of DHF was carried out using Pearson correlation.

RESULTS & DISCUSSION

Dengue Hemorrhagic Fever (DHF) is an infectious disease caused by a virus and spread by vectors. The virus that causes this disease is *Dengue* (DENV) . The vector for transmitting this disease comes from the *Aedes aegypti* and *Aedes albopictus mosquito species.* (1) . *Dengue* is a serious disease and a major cause of death in several Asian and Latin American countries. *Dengue* is found in tropical and subtropical climates throughout the world, mostly in urban and semi-urban areas (2) . In his theory, HL Blum (1974) explained that there are four factors that influence the occurrence of a disease, namely genetic factors, behavioral factors, environmental factors and health service factors (8) . Health levels are determined by 40% environmental factors, 30% behavioral factors, 20% health service factors, and 10% genetic factors (heredity). Several factors that influence the incidence of DHF include namely, environmental factors such as altitude, air temperature, pH of water reservoirs, home environment (distance between houses, house layout, type of container, altitude and climate), biological environment, and social environment [1][2]. low maternal education[3]. The habit of not wearing clothes that cover the whole body[2]. Nutritional status and age[4]. The presence of vectors, domicile, environment, breeding place, resting place, and attitude[6]. Therefore, It is important to carry out prevention by reducing the presence of mosquito larvae and improving environmental sanitation. The following are the results of the distribution of gender of dengue fever cases in the last 5 years:

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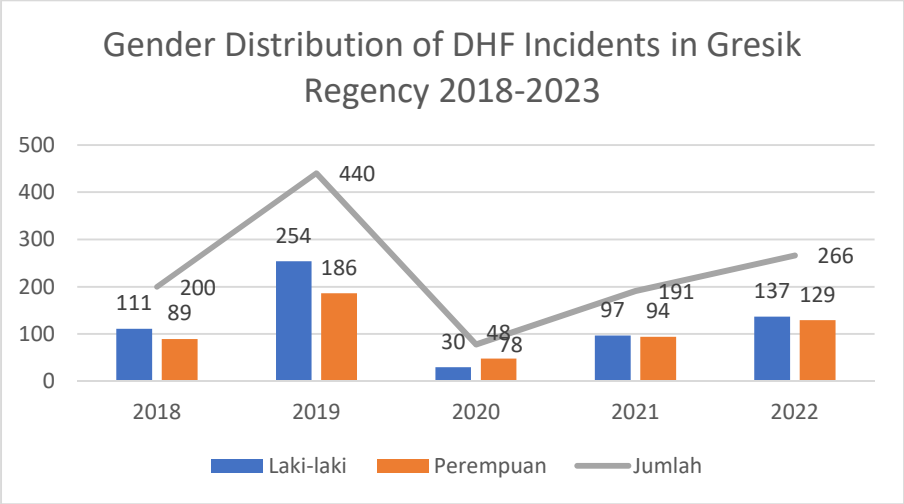

Figure 1. Distribution of gender of dengue fever cases in the last 5 years.

Based on the image above, it is known that the highest cases are more often experienced by the male gender. The incidence of dengue fever decreased in 2020, but began to increase again until 2022. This can also be influenced by the Covid-19 pandemic where health surveillance is more focused on the Covid-19 pandemic and also many people do not check themselves at health facilities. The following are the results of the distribution of DHF incidents per sub-district in Gresik Regency in 2018-2022:

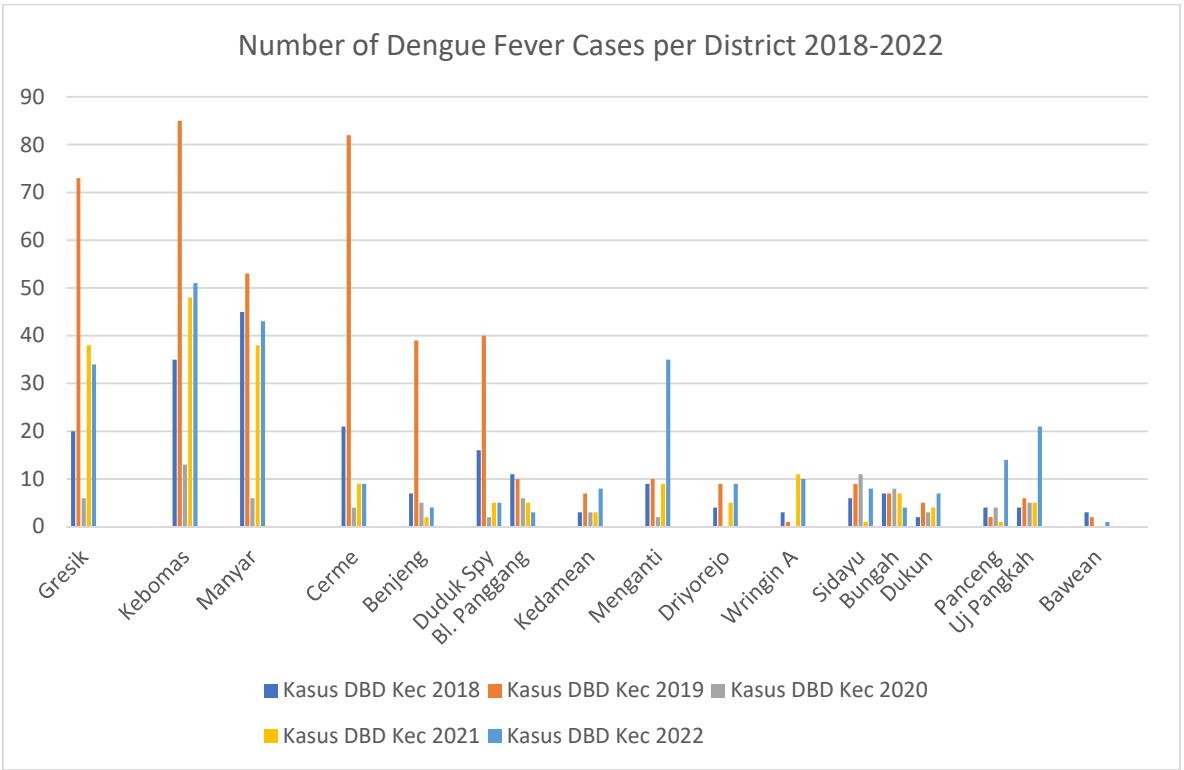

Figure 2. Distribution of DHF incidents per sub-district in Gresik Regency in 2018-2022.

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Based on the image above, it is known that the highest cases often occur in Gresik, Kebomas, Manyar, Cerme, Menganti Districts. With the lowest District in Bawean District. The following are the results of the distribution of ABJ per sub-district in Gresik Regency in 2018-2022:

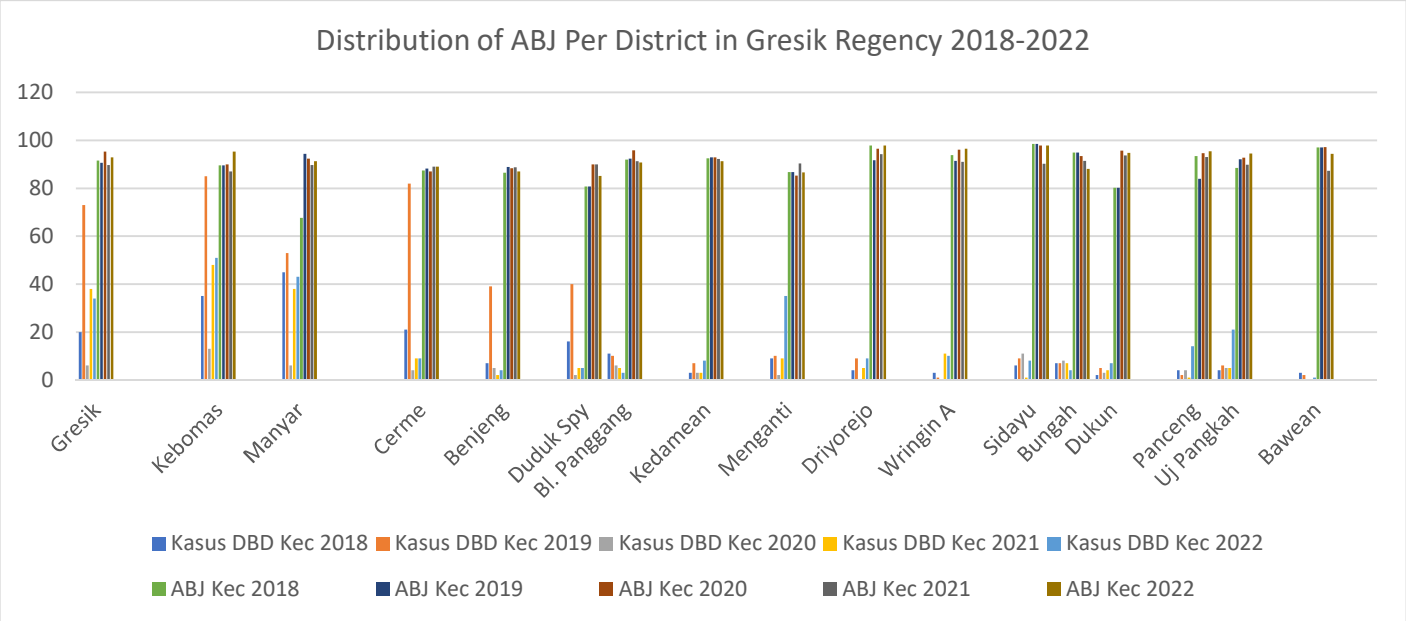

Figure 3. Distribution of ABJ per District in Gresik Regency in 2018-2022.

Based on the image above, it is known that the Larvae Free Number in Gresik Regency has been quite fluctuating in the last 5 years. The lowest number was in 2018 in Manyar District. The following are the results of the distribution of the House Index (HI) per sub-district in Gresik Regency in 2018-2022:

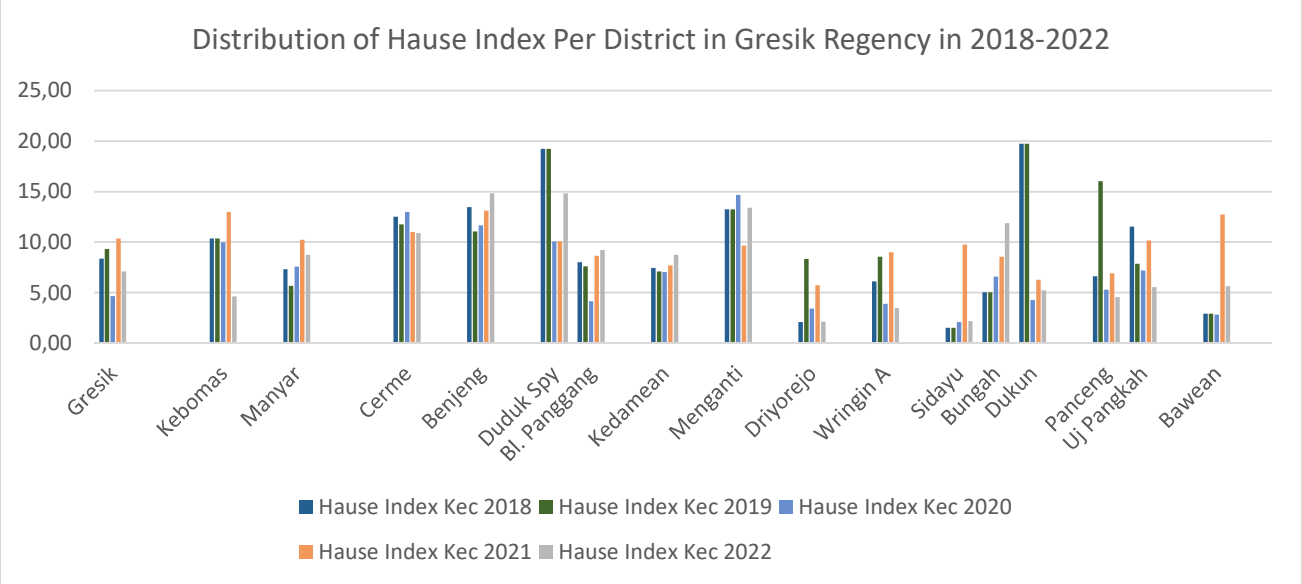

Figure 4. Distribution of HI per District in Gresik Regency in 2018-2022.

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Based on the image above, it is known that the House Index in Gresik Regency which often increases is in Duduk sampeyan and Dukun Districts. The lowest House Index value is in Sidayu District. From the data obtained for the data with the latest year, an analysis was carried out, namely 2022. To determine the relationship, a Pearson correlation analysis was carried out, the following are the results of the Pearson correlation analysis:

Table 1. Results of Pearson Correlation Analysis of DHF Incidents with ABJ and House Index in Gresik Regency in 2022

		Dengue Fever 2022 Events	ABJ 2022	HI 2022
Dengue Fever 2022 Events	Pearson Correlation	1	0.068	-0.086
	P-value		0.794	0.743
ABJ 2022	Pearson Correlation	0.068	1	-0.995**
	P-value	0.794		0.000
HI 2022	Pearson Correlation	-0.086	-0.995**	1
	P-value	0.743	0.000	

Interpretation of Pearson correlation output in the table above can be seen that:

a. Looking at the level of strength or closeness of the relationship between variables
From the output above. The level of strength of the relationship or correlation between the DHF Incident variable and ABJ is 0.068 or can be said to be weak. Because it is far from the number 1. The level of strength of the relationship or correlation between the DHF Incident variable and HI is -0.086 or can be said to be weak. Because it is far from the number 1. The level of strength of the relationship or correlation between the ABJ variable and HI is -0.995** or can be said to be very strong. An asterisk (**) means that the correlation is significant at a significance level of 1% or 0.01.

b. Looking at the direction of the relationship between variables
The correlation coefficient number based on the output above if it is positive, then the relationship between the two variables is unidirectional. Thus, it can be interpreted that an increase in the incidence of DHF will be followed by an increase in ABJ. Likewise, an increase in the incidence of DHF will be followed by an increase in HI. However, for the case of the correlation between ABJ and HI, it is not unidirectional, thus it can be interpreted that an increase in ABJ will be followed by an increase in HI.

c. See whether the relationship that occurs is significant or not.
Based on the output above, the significance value or Sig. (2-tailed) < 0.05 is obtained, then it can be interpreted that there is a significant relationship. However, if the significance value or Sig. (2-tailed) > 0.05, then it is not significant. In this case, the significant correlation is the relationship between ABJ and House Index.

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CONCLUSION AND SUGGESTIONS

With a significance level of 5%, the analysis results show a negative and very strong relationship between the Larvae Free Rate (ABJ) and the House Index, with a correlation value of -0.995. This relationship indicates that the higher the ABJ value, which means the more houses are free from mosquito larvae, the lower the House Index value, which is the number of houses found to contain larvae. An increase in ABJ directly reflects the effectiveness of mosquito nest eradication efforts (PSN) in reducing the presence of larvae in the environment, thereby significantly reducing the potential for the spread of diseases such as Dengue Fever (DBD). This very strong relationship emphasizes the importance of implementing mosquito control programs consistently and comprehensively. Programs such as community education, regular check-ups by health workers, and the implementation of 3M Plus (Draining, Closing, and Recycling) need to be continuously improved to support the achievement of higher ABJ. In addition, public awareness is a key factor in maintaining environmental cleanliness and ensuring that there are no puddles of water that have the potential to become mosquito breeding grounds. By actively involving the community, the effect of controlling these larvae will not only have an impact on increasing ABJ but also significantly reduce the House Index, which can ultimately reduce the incidence of DHF in the area.

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