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The Influence Of Larvae-Free Rate (ABJ) On The Incidence Of Dengue Fever Cases In The Work Area Of UPTD Puskesmas Juanda, Samarinda City

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ABSTRACT
Dengue Hemorrhagic Fever (DHF) is a disease caused by dengue virus infection transmitted through the bite of the Aedes aegypti mosquito. This disease has clinical manifestations of bleeding, which can lead to shock and death. Controlling DHF has become a national priority due to the increasing spread of the disease and the frequent occurrence of outbreaks. Delayed treatment is often a major cause of the high mortality rate. Therefore, preventive efforts are crucial to reducing the incidence of DHF. This study aims to determine the influence of the Larvae-Free Index (LFI) on the incidence of DHF in the working area of the UPTD Puskesmas Juanda. The research population includes residents of RT in Air Hitam and Gunung Kelua subdistricts affected by DHF, with a total sample of 99 respondents. The study employed a survey method using questionnaires and a cross-sectional research design. Data analysis using Fisher's Exact test showed a significant correlation between LFI values and DHF cases (p-value = 0.04). These findings indicate that increasing LFI can contribute to reducing the incidence of DHF. This study highlights the importance of implementing mosquito breeding eradication programs (PSN) to improve LFI as a preventive measure in DHF control.

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INTRODUCTION

Dengue virus infection, which causes dengue hemorrhagic fever (DHF), can lead to shock and even death. The spread of DHF is currently expanding, with outbreaks (KLB) continuing to occur, making the handling of this disease a national priority that needs to be improved (Ministry of Health of the Republic of Indonesia, 2018). The number of deaths due to delayed treatment shows how quickly this disease progresses and how often it has fatal consequences. Therefore, prevention efforts to reduce the incidence of DHF are extremely important (Sukohar, 2014). Southeast Asia is one of over 100 countries endemic to DHF, with an estimated 390 million cases occurring annually worldwide (WHO, 2018).

The Community Health Center (Puskesmas), as a functional organizational unit, is responsible for providing comprehensive and integrated health services. Active community

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involvement and the proper application of developed science and technology are crucial for Puskesmas to provide services that are fair, affordable, and economically valuable. Without compromising healthcare services to the public, both the government and the wider community can share the cost to achieve optimal health, as outlined in the Ministry of Health of Indonesia's report in 2009. The main role of Puskesmas is to serve the community through two major health service programs: Public Health Efforts (UKM) and Individual Health Efforts (UKP). As a medical institution, Puskesmas is at the forefront of public health services, especially in the prevention and treatment of diseases. Therefore, health facilities interact directly with the community when dealing with DHF cases. Prevention, surveillance, and control of DHF are integral parts of Puskesmas efforts to reduce the incidence of DHF.

Air Hitam and Gunung Kelua sub-districts are operational areas of Puskesmas Juanda. In 2023, there were 60 DHF cases, with 43 cases occurring in Air Hitam and 17 cases in Gunung Kelua. Each sub-district is divided into 35 RTs in Air Hitam and 38 RTs in Gunung Kelua. In Air Hitam, the number of cases decreased from 76 to 44 cases. The monitoring of the larval-free rate (ABJ) in Air Hitam was 80.5%, and in Gunung Kelua, it was 83.5% in 2023 (secondary data). According to the Indonesian Ministry of Health Regulation No. 50 of 2017, the standard quality benchmark for Aedes aegypti larvae with a larval-free rate (ABJ) should be above 95%. Based on the information above, the researcher is interested in conducting a study on the impact of the larval-free rate on DHF cases in the working area of UPTD Puskesmas Juanda, Samarinda City.

METHODS

This study employs a descriptive quantitative approach aimed at providing a clear explanation of the conditions under investigation, specifically the impact of larval-free rates on dengue hemorrhagic fever (DHF) cases in the working area of Puskesmas Juanda, Samarinda City. The descriptive quantitative method is used to objectively describe the existing phenomena based on available data, utilizing a cross-sectional technique. This allows for data collection at a specific point in time to illustrate the relationship between the independent and dependent variables (Notoatmodjo, 2018).

The research is conducted in the working area of UPTD Puskesmas Juanda, which includes Air Hitam Village and Gunung Kelua Village in Samarinda City. This area was chosen due to its significant number of DHF cases and the availability of data related to larval-free rates, which can be analyzed to assess the relationship between these rates and the occurrence of DHF.

The population of the study consists of residents from Air Hitam Village, which comprises 4 neighborhood units (RT), and Gunung Kelua Village, consisting of 2 RTs, both of which fall under the operational scope of UPTD Puskesmas Juanda. The total population in these villages includes all residents involved in monitoring larval-free rates and handling DHF cases. The sample for this study includes 99 respondents, with 50 respondents from Air Hitam Village and 49 respondents from Gunung Kelua Village. The sample was selected using a purposive sampling technique, focusing on residents who are involved in monitoring larval-free rates and who possess relevant information about DHF cases in the area.

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Data collection techniques employed in this study include the use of questionnaires to gather information from respondents regarding larval-free rates (ABJ) and DHF cases in their respective villages, documentation to collect secondary data on DHF cases recorded at Puskesmas Juanda during 2023, and interviews to gain deeper insights into the implementation of ABJ monitoring and DHF case management in the Puskesmas working area.

The data collected will be analyzed using both descriptive and inferential statistical techniques. Descriptive analysis will be used to illustrate the characteristics of the sample, such as demographics and the level of awareness regarding the importance of larval-free rate monitoring. Additionally, data on ABJ and DHF case frequencies will be presented using tables and graphs. To examine the relationship between the independent variable (larval-free rate) and the dependent variable (DHF cases), Pearson correlation will be used to determine the strength and direction of the relationship. Finally, simple linear regression analysis will be employed to assess the influence of the larval-free rate on DHF cases.

RESULTS AND DISCUSSION

Univariate Analysis

This study was conducted in Air Hitam Village (RT.13, RT.32, RT.7, and RT.14) and Gunung Kelua Village (RT.7 and RT.9) within the working area of UPTD Puskesmas Juanda, Samarinda City. The research employed a descriptive quantitative approach with a cross-sectional design. Data collection was carried out on 96 respondents, representing a sample from Air Hitam Village, which included 5 RTs with 64 respondents, and Gunung Kelua Village, which included 2 RTs with 32 respondents.

The instrument used in this study was a larval-free rate survey sheet (ABJ), which focused on the number of ABJ found in water storage containers in the RTs of Air Hitam Village and Gunung Kelua Village. The survey was distributed by the researcher to respondents during the monitoring of mosquito larvae (jentik) in the sampled RTs. According to Permenkes RI No. 50, 2017, the standard quality benchmark for Aedes aegypti larvae density is an ABJ rate of more than 95%.

Distribution of DHF Cases by Age in the Working Area of UPTD Puskesmas Juanda, Samarinda City

Based on the survey results conducted in the UPTD Puskesmas Juanda area, the number of DHF cases was recorded according to the respondents' ages. Below is the percentage of DHF cases by age:

Table 1. Proportion of DHF Cases by Age in the Working Area of UPTD Puskesmas Juanda, September and October 2024

No	Age (in years)	Number	%	Respondents
1	1-2 years	2	16.7%	DHF: 2, Non-DHF: 10, Total: 12
2	3-4 years	1	8.3%	DHF: 1, Non-DHF: 11, Total: 12
3	5-10 years	4	33.3%	DHF: 4, Non-DHF: 8, Total: 12
4	11-30 years	4	33.3%	DHF: 4, Non-DHF: 8, Total: 12
5	31-70 years	1	8.3%	DHF: 1, Non-DHF: 11, Total: 12

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No	Age (in years)	Number	%	Respondents
Total DHF		12	100%	

Table 1 shows that the highest percentage of DHF cases by age group occurred in the 5-10 years and 11-30 years age groups (children, adolescents, and young adults), with a percentage of 33.3% for each group.

Distribution of DHF Cases by Gender in the Working Area of UPTD Puskesmas Juanda, Samarinda City

Based on the survey results conducted in the UPTD Puskesmas Juanda area, the number of DHF cases was recorded according to the gender of the respondents. Below is the percentage of DHF cases by gender:

Table 2. Proportion of DHF Cases by Gender in the Working Area of UPTD Puskesmas Juanda, September and October 2024

No	Gender	Number	%	Respondents
1	Male	6	50%	DHF: 6, Non-DHF: 6, Total: 12
2	Female	6	50%	DHF: 6, Non-DHF: 6, Total: 12
Total		12	100%	

The data obtained in September-October 2024 from UPTD Puskesmas Juanda shows that there were 6 cases of DHF (50%) in males and 6 cases of DHF (50%) in females.

Distribution of DHF Cases by Village in the Working Area of UPTD Puskesmas Juanda, Samarinda City

Based on the survey results conducted in the UPTD Puskesmas Juanda area, the number of DHF cases was recorded according to the village of the respondents. Below is the percentage of DHF cases by village:

Table 3. Proportion of DHF Cases by Village in the Working Area of UPTD Puskesmas Juanda, September and October 2024

No	Village	Positive DHF	Negative DHF	Total Respondents
1	Air Hitam Village	8	42	50
		66.7%	48.2%	
2	Gunung Kelua Village	4	45	49
		33.3%	51.8%	
Total		12	87	99

The data obtained in September and October 2024 from UPTD Puskesmas Juanda shows that in Air Hitam Village, there were 8 DHF cases (66.7%), and in Gunung Kelua Village, there were 4 DHF cases (33.3%). The highest number of DHF cases in September and October was found in Air Hitam Village, at 66.7%.

Distribution of DHF Cases According to the Time of Occurrence in the Working Area of UPTD Puskesmas Juanda, Samarinda City

Based on the survey results conducted in the UPTD Puskesmas Juanda area, the number of DHF cases was recorded according to the time of occurrence. Below is the percentage of DHF cases by month of occurrence:

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Table 4. Proportion of DHF Cases by Time of Occurrence in the Working Area of UPTD Puskesmas Juanda, September and October 2024

No	Month	Negative DHF Respondents
	September	8 (66.7%)
	October	4 (33.3%)
Total		12 (100%)

The data obtained according to the time of occurrence in the working area of UPTD Puskesmas Juanda shows that the highest number of DHF cases occurred in September, with 8 cases (66.7%), while the lowest number occurred in October, with 4 cases (33.3%).

ABJ Examination Implementation in the Working Area of UPTD Puskesmas Juanda, Samarinda City According to the Number of Containers

Based on the survey results conducted in the UPTD Puskesmas Juanda area, the number of containers owned by respondents was recorded. Below is the percentage of respondents according to the number of containers:

Table 5. Proportion of ABJ According to the Number of Containers in the Working Area of UPTD Puskesmas Juanda, September-October 2024

No	Container	Number	Percentage
1	1-3 containers	86	86.9%
2	3-6 containers	13	13.1%
3	>6 containers	0	0%
Total		99	100%

Table 5 shows that the highest number of containers recorded during the ABJ survey was 86 containers (86.9%) in the 1-3 container range, while the lowest was 13 containers (13.1%) in the 3-6 container range.

ABJ Examination Implementation in the Working Area of UPTD Puskesmas Juanda, Samarinda City According to Occupation

Based on the survey results conducted in the UPTD Puskesmas Juanda area, the occupations of the respondents were recorded. Below is the percentage of respondents according to their occupation:

Table 6. Proportion of ABJ According to Occupation in the Working Area of UPTD Puskesmas Juanda, 2024

No	Occupation	Number	Percentage
1	Trader	16	16.2%
2	Entrepreneur	67	67.7%
3	Student	2	2.0%
4	Pupil	2	2.0%
5	Civil Servant	7	7.1%
6	Retired	3	3.0%
7	Unemployed	3	3.0%
Total		99	100%

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Table 6 shows that the highest number of respondents during the ABJ survey was in the "Entrepreneur" occupation category, with 67 respondents (67.7%), while the lowest number was in the "Student" and "Pupil" categories, with 2 respondents (2.0%) each.

ABJ Examination Implementation in the Working Area of UPTD Puskesmas Juanda, Samarinda City According to Education Level

Based on the survey results conducted in the UPTD Puskesmas Juanda area, the respondents' education levels were recorded. Below is the percentage of respondents according to their education:

Table 7. Proportion of ABJ According to Education Level in the Working Area of UPTD Puskesmas, 2024

No	Education Level	Number	Percentage
1	Junior High School (SMP)	8	8.1%
2	Senior High School (SMA)	74	74.7%
3	Associate's Degree (D3)	8	8.1%
4	Bachelor's Degree (S1)	8	8.1%
5	Still in School	1	1.0%
Total		99	100%

Table 7 shows that the highest level of education among the respondents during the ABJ survey was Senior High School (SMA), with 74 respondents (74.7%), while the lowest education level was "Still in School" with 1 respondent (1.0%).

ABJ Examination Implementation in the Working Area of UPTD Puskesmas Juanda, Samarinda City According to RT (Neighborhood Unit)

Based on the survey conducted on the community in the UPTD Puskesmas Juanda area, the ABJ values were recorded according to the RT (neighborhood unit) where DHF cases occurred. Below is the data on the number of houses inspected, the number of positive and negative buildings, and the ABJ score:

Table 8. ABJ Scores in the Working Area of UPTD Puskesmas Juanda, Samarinda City, 2024

No	RT	Number of Houses Inspected	Number of Positive Buildings	Number of Negative Buildings	ABJ (%)
1	13	13	3	10	77%
2	7	12	2	10	83%
3	32	12	2	10	83%
4	14	13	1	12	92%
Kel. Air Hitam	50	10	40	84%	
5	9	12	4	8	67%
6	7	13	2	11	85%
7	26	12	2	10	83%
8	14	12	1	11	83%
Kel. Gunung Kelua	49	10	39	80%	
Total		99	20	79	83%

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Table 8 shows that the ABJ score in the UPTD Puskesmas Juanda working area during September and October 2024 was 80%. This indicates that the ABJ score in the UPTD Puskesmas Juanda area is still below the standard ABJ value required. According to the Indonesian Minister of Health Regulation No. 50/2017, the standard ABJ score for Aedes aegypti larvae-free areas should exceed 95%.

Bivariate Analysis

Bivariate analysis was conducted to determine the relationship between two variables: the independent variable and the dependent variable. The effect of the ABJ score on the occurrence of DHF cases in respondents can be observed in the table below:

Table 9. The Effect of ABJ on DHF Cases at UPTD Puskesmas Juanda, Samarinda City, 2024

Variable	DHF	Total	OR	p
	Sick	Not Sick		
ABJ Positive (Not Good)	6 (37.5%)	10 (62.5%)	16	7.700 (2.079-28.520)
ABJ Negative (Good)	6 (7.2%)	77 (92.8%)	83	
Total (N)	12	87	99	

Based on table 9 the results of the analysis show that out of 16 respondents with positive ABJ (not good), 6 (37.5%) experienced DHF. In contrast, for negative ABJ (good), only 6 (7.2%) respondents experienced DHF. The Chi-square test was not suitable due to unmet assumptions, specifically that more than 20% of the cells had expected frequencies below 5. Therefore, the Fisher's Exact Test was used. The result of the Fisher's Exact Test showed a p-value of 0.04, indicating a statistically significant relationship between ABJ and DHF cases. Furthermore, the odds ratio (OR) calculated was 7.700, meaning that individuals with positive ABJ (not good) had 7.7 times higher odds of contracting and transmitting DHF compared to those with negative ABJ (good). This indicates a significant association between the ABJ score and the occurrence of DHF in the UPTD Puskesmas Juanda working area.

Univariate Analysis

DBD Incidence by Age in UPTD Juanda Health Center Area

The incidence of DBD based on age in the UPTD Juanda Health Center area is highest in the 5-10 years and 11-30 years age groups, with both at 33.3%. This is due to the high mobility of children, adolescents, and young adults, making them highly vulnerable to DBD transmission. This finding aligns with a study by Mutiara Tri Handayani Rizaldi (2020), which concluded that children have not yet developed a strong immune system and are more susceptible to DBD. In that study, the highest number of DBD cases was seen in children, whose immune systems are not fully developed, and they are often outside, increasing their exposure.

DBD Incidence by Gender in UPTD Juanda Health Center Area

The incidence of DBD by gender in the UPTD Juanda Health Center area is evenly distributed between males and females, each at 50%. This is because the Aedes aegypti mosquito, the primary vector for DBD, does not discriminate between genders when transmitting the disease. This finding aligns with the research by Mutiara Tri Handayani Rizaldi (2020), which found no significant relationship between gender and DBD transmission.

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DBD Incidence by Location in UPTD Juanda Health Center Area

DBD outbreaks are also influenced by local behaviors related to health and environmental hygiene. Stagnant water can become a breeding ground for the primary DBD vector, Aedes aegypti. Locations like used tires with stagnant water, open rainwater collection containers, and uncovered water storage are still present in the UPTD Juanda Health Center area. According to Yuningsih (2018), other factors contributing to DBD outbreaks include slow government action in identifying and handling DBD cases and insufficient community support for the government's mosquito nest eradication program (PSN). In UPTD Juanda Health Center's area, the highest number of DBD cases was recorded in the Air Hitam Village (66.7%), followed by Gunung Kelua Village and the Puskesmas Juanda area. This is likely due to the lack of community awareness in implementing the 3M Plus initiative for DBD prevention. The community-based 1-house 1-mosquito-larvae check program aims to track and eliminate mosquito larvae through the PSN 3M PLUS initiative, with the participation of every household. The National Ministry of Health (Kemenkes RI, 2015) supports this program.

DBD Incidence by Time of Occurrence in UPTD Juanda Health Center Area

The study, conducted in September and October, found the highest number of DBD cases in September (66.7%). In Indonesia, the dry season occurs from March to September, with relatively low humidity, while the rainy season lasts from October to February. The high incidence of DBD in September may be linked to the behavior of residents storing water openly, using tires with stagnant water, and a lack of awareness of PSN during the dry season. Several studies have explored the impact of the rainy season on DBD incidence. Research by Ismah et al. (2021) found that two climatic factors, temperature and rainfall, significantly affect DBD incidence. According to their study, the highest number of DBD cases occurs during the rainy season, particularly in September, October, and November, due to water accumulation attracting the DBD vector. Irwan, Arifin, and Sari (2021) also support this by demonstrating that rainfall creates breeding grounds for the mosquito vector, increasing its population and raising the incidence rate of DBD. Effective environmental management is necessary to prevent the rise in mosquito vector populations, as poor drainage and improper water storage can lead to breeding grounds for mosquitoes, ultimately spreading DBD (WHO, 2019).

Number of Containers in UPTD Juanda Health Center Area

DBD outbreaks can also occur due to improper environmental management. Stagnant water in containers like used tires and open rainwater storage can become breeding grounds for Aedes aegypti. A study in UPTD Juanda Health Center area revealed that 86.9% of containers identified during the survey were in the 1-3 container range. Containers used for water storage, such as baths, drums, dispensers, buckets, used tires, and small containers for watering plants, were found both inside and outside houses in Air Hitam and Gunung Kelua Villages. Some of these containers were covered, while others were not, with uncovered containers containing mosquito larvae.

ABJ Scores from the Survey in UPTD Juanda Health Center Area

Global efforts to control DBD rely heavily on vector control, though traditional methods have shown limited effectiveness. Many countries still face challenges in DBD control due to

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insufficient funding for operational research and a lack of robust long-term solutions (WHO, 2020). However, the implementation of PSN, which is monitored through ABJ surveys, has significantly reduced DBD cases even when ABJ scores are below the required standard. Sandra et al. (2019) support this by showing that poor PSN behavior increases DBD incidence. The ABJ score is used to monitor Aedes aegypti populations and evaluate vector control measures. In the UPTD Juanda Health Center area, ABJ surveys were conducted in Air Hitam and Gunung Kelua Villages, covering four RTs (neighborhood units) in each village. The average ABJ score in these areas was 83.8%, which is below the national standard of 95%. The research by Chandra (2019) notes that ABJ is determined by the number of homes free from Aedes aegypti larvae. In areas where ABJ scores are lower, the risk of DBD transmission is higher, as larvae are present in water containers that are not properly covered. Despite the variation in ABJ scores across RTs, the overall score remains below the national norm of ≥95%, contributing to the persistence of DBD in the area.

Bivariate Analysis

Based on statistical data, the influence of the free mosquito larvae index (ABJ) on the incidence of Dengue Hemorrhagic Fever (DBD) cases in the working area of the UPTD Puskesmas Juanda was observed. The highest frequency of DBD cases was found in areas with positive ABJ values (indicating poor conditions) at 37.5%, with a p-value of 0.04 and an odds ratio (OR) of 7.700. This indicates that there is a significant relationship between the presence of mosquito larvae (ABJ) and the occurrence of DBD cases. The spread of the disease has a 7.700 times higher risk in places where Aedes aegypti mosquito larvae are found in water containers near residential areas compared to areas with negative ABJ (without mosquito larvae). Consequently, dengue fever transmission is likely to occur from an infected person to a healthy person through the Aedes aegypti mosquito vector, especially if larvae are present in water reservoirs.

According to the Indonesian Ministry of Health (2002), mosquitoes can breed in various places such as water tanks, tree holes, rock cavities, leaf stems, coconut shells, banana stems, and bamboo debris. The incubation period for the dengue virus is short, ranging from three to seven days, during which the virus infects humans (Sutaryo, 2005). As a result, the incidence of dengue will continue to rise if mosquito larvae are not controlled.

Research by Wati (2009) on DBD cases where Aedes aegypti larvae were found in water containers showed a p-value of 0.001. This study suggests a correlation between DBD cases in Ploso Village and Pacitan Village with the presence of Aedes aegypti larvae in water containers. Sumekar's research (2007) also supports these findings, as it showed a relationship between DBD cases and the presence of Aedes mosquitoes in Raja Basa Village. The lower the occurrence of DBD, the better the situation. This supports the hypothesis that a higher ABJ value indicates the absence of mosquito larvae in the area. Therefore, dengue fever transmission is more likely when the ABJ is low. This research indicates that there is a significant relationship between the influence of ABJ and DBD cases.

The participation of health workers is crucial to encourage the community to implement the "one house, one jumantik" (G1R1J) movement, a program aimed at fostering the practice of the PSN (3M Plus) activities: draining, covering, and burying water storage containers,

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along with additional measures like installing wire mesh on ventilation, using mosquito nets, applying larvicides, and planting mosquito-repelling plants like lemongrass and lavender. To reduce the number of DBD cases, the presence of Puskesmas (Community Health Centers) is essential. The UPTD Puskesmas Juanda has several initiatives to control DBD, including:

1. Total sanitation program based on community involvement.
2. Periodic larvae monitoring with the help of jumantik cadres.
3. G1R1J activities carried out by household owners.
4. PE (environmental) activities conducted by health workers and jumantik coordinators or cadres.
5. PSN 3M Plus education and outreach.
6. Larvicide application.
7. Fogging/spraying.
8. Training for jumantik cadres and RT larvae coordinators.

These efforts are crucial in controlling the DBD outbreak and preventing further transmission.

CONCLUSION

Based on the research findings and discussions, the researcher can draw several conclusions regarding the identification of dengue fever (DBD) cases and the larva-free index (ABJ) in the working area of UPTD Puskesmas Juanda, Samarinda City. First, the occurrence of DBD cases by age shows that in September and October 2024, the highest cases occurred in the age groups of 5-10 years and 11-30 years, each with 33.3%. In terms of the subdistrict, Air Hitam Subdistrict had the highest number of DBD cases, at 66.7%. Additionally, the study found that the month of September recorded the highest number of cases, at 66.7%. Second, regarding the larva-free index (ABJ), the survey revealed that the majority of containers found in the area had between 1-3 containers, with 86.9% of findings. These containers were found both inside and outside the homes in the Air Hitam and Gunung Kelua Subdistricts, such as bathtubs, drums, dispensers, buckets, and used tires. Most of these containers were uncovered, and Aedes aegypti larvae were found in the uncovered containers. The survey results indicated that the ABJ value in these two subdistricts was 83.8%, which is still below the standard threshold of 95% as stipulated in the Minister of Health Regulation No. 50/2021. Third, statistical tests revealed a significant relationship between ABJ and the occurrence of DBD cases, with a p-value of 0.04. The risk of contracting dengue fever for individuals with Aedes aegypti larvae in water containers near their homes is 7,700 times higher compared to those without mosquito larvae, particularly in areas with negative ABJ. Therefore, to reduce ABJ levels and prevent the occurrence of DBD, several actions should be taken, including intensifying the PSN 3M Plus program to enhance public understanding of the importance of DBD control, implementing the G1R1J activity to monitor larvae in every household, and strengthening intersectoral cooperation between the subdistrict, RT, and Puskesmas to conduct communication, information, and education (KIE) on DBD prevention and ABJ monitoring through G1R1J.

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