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Correlation between The Epidemiological Investigation Activities and Larva Free Index on the Incidence Rate of Dengue Haemorrhagic Fever

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Abstract

The Webinar for handling Dengue Haemorrhagic Fever (DHF) in the COVID-19 pandemic situation explained that several COVID-19 cases encountered at the beginning of 2020 were initially diagnosed as cases of DHF. For this reason, it is necessary to monitor the number of DHF cases and the factors that influence the risk of developing dengue so that the DHF cases can be suppressed. Several efforts to control DHF include carrying out epidemiological activity and monitoring the number of Aedes Aegypti DHF mosquitoes through the larva free index indicator. The purpose of this study was to find out the correlation between epidemiological investigation activity and the larva free index on the Incidence Rate (IR) of DHF in Tegal City in 2020. This research is an analytic study with a cross sectional design. The unit of analysis is the village (27 villages). The results showed that there was a correlation between epidemiological activities and the number of IR DHF (p-value: 0.033 ; r: 0.411). Likewise, it was found that there was a correlation between larva free index and IR DHF (p-value : 0.043 ; r: 0.392). Therefore, it is necessary to increase the percentage of epidemiological activity and the larva free index in each village, so that the risk of DHF in the village is getting smaller.

Keywords: Dengue Haemorrhagic Fever, the Larva Free Index , Epidemiological Investigation activities

1. Introduction

Dengue Haemorrhagic Fever is an endemic disease that appears in the tropics and subtropics, including in Indonesia. In 2019, the incidence of Dengue Haemorrhagic Fever in Indonesia increased to 51.48% compared to 2018 which was 24.75%.[1] The need for controlling Dengue cases, including during the COVID-19 pandemic, is stated in the Circular Letter of the Ministry of Health number HK.02.02/IV/2360/2020 about the Implementation of Prevention and Control of Dengue Haemorrhagic Fever in a COVID-19 Pandemic Situation. It stated that there was a cross-reaction with flaviviruses and other non-specific viruses (including COVID-19). So for patients who have a positive dengue IgM serologic examination.[2] Several cases of COVID-19, in the beginning, were found with a diagnosis as dengue fever.[3] It is necessary to monitor the number of dengue cases, among others, through dengue surveillance activities.[4]

Dengue Haemorrhagic Fever surveillance itself is the process of collecting, processing, analyzing, and interpreting data, as well as disseminating information to program organizers, agencies and related parties systematically and continuously about the Dengue Haemorrhagic Fever situation and conditions that affect the increase and transmission of the disease so that action can be taken control efficiently and effectively. One of the aims of implementing Dengue Haemorrhagic Fever Surveillance is to monitor the trend of Dengue Haemorrhagic Fever disease and follow-up on Dengue Haemorrhagic Fever case reports by carrying out Epidemiological Investigation activities and taking necessary counter measures.[5]

The epidemiological investigation activities itself is the activity of tracking other sufferers/suspects and checking for mosquito larvae that transmit dengue hemorrhagic fever in the patient's/suspect's house and surrounding houses within a radius of at least 100 meters, as well as public places that are estimated to be a source of further spread of the disease. If the Epidemiological Investigation activities results are positive (found 1 or more other Dengue Haemorrhagic Fever sufferers and/or 3 suspected Dengue Haemorrhagic Fever, and larvae are found ($\geq 5\%$) then focused countermeasures are carried out (fogging, counseling, mosquito nest eradication and selective larvicidation), because if negative is carried out Counseling, Eradication of Mosquito Nests and selective larvicidation.[5] By implementing The Epidemiological Investigation activities, the occurrence of dengue transmission can be known/identified early so that it does not spread to a wider area so that the greater the Epidemiological Investigation Activities value in a place, the smaller the risk of transmission dengue fever in that place.

Dengue fever is an infection caused by the dengue virus, which spreads from person to person through the bite of the *Aedes aegypti* (Ae. Aegypti).[6] Therefore the vector density of *Aedes Aegypti* also needs to be monitored through periodic flick checks. Periodic larva inspection is carried out regularly every week or at least once in 3 months by each Public Health Center in every village/ward. The examination was carried out on 100 samples of houses/buildings which were chosen randomly so that the Larva free index was known.[5] The higher the value of Larva free index in a place, it is hoped that the risk of transmission will be smaller in that area. Epidemiological measures that are often used in dengue control activities are Incidence Rate (IR), Case Fatality Rate (CFR), Attack Rate (AR). Incidence Rate is a measure that shows the speed of occurrence/cases (new) of the disease in the population. The more Incidence indicates the more new cases. With more and more new cases in a place, of course, the risk of transmission in that place is getting bigger.[5]

This study aimed to see the correlation between the activities of Epidemiological Investigations Activities and the larva-free index with the Incidence Rate of Dengue Haemorrhagic Fever in Tegal City and the village as the unit of analysis. The results of the study can be used as an evaluation of the success of the Dengue Haemorrhagic Fever control/eradication program in reducing the risk of Dengue Haemorrhagic Fever transmission through indicators of the percentage of implementation of Epidemiological Investigations activities and the percentage of Larva free index by village/ward in Tegal City in 2020.

2. Methods

This research is an analytic study with a cross-sectional design and the unit analysis is village/ward. The samples in this study were all villages in the city of Tegal, amounting to 27 villages. The analysis was conducted to decide the correlation between epidemiological investigation activities and the incidence of dengue fever according to urban areas in Tegal City using the pearson product moment correlation test. The correlation test was also carried out to decide the relationship between Larva free index and the incidence of dengue fever. The existence of a relationship is started if the test results show a p-value < 0.05 with 95% Confident Interval. The level of correlation is also measured by looking at the value of the correlation coefficient (r). The correlation coefficient value shows a measure of the strength of the linear relationship between two variables.[7]

The direction of the relationship can be seen from the positive-negative value of a correlation. If the correlation value is positive, it indicates that the greater the value of a variable, the greater the value of other variables. While the negative correlation value means that the greater the value of a variable, the smaller the value of other variables.[8] The strength of the relationship between two variables qualitatively can be divided into three areas, namely: (1) $r = 0.0 - < 0.3$ indicates a weak relationship; (2) $r = 0.3 - < 0.7$ indicates a moderate relationship; and (3) $r = 0.7 - 1.0$ indicates a strong relationship.[8]

The percentage of Epidemiological Investigations was calculated by multiplying the number of Dengue Haemorrhagic Fever cases that were followed up by Epidemiological Investigation activities multiplied by the number of Dengue Haemorrhagic Fever cases in each village/ward multiplied by 100%. Meanwhile, the Larva free index itself is calculated by dividing the number of houses/buildings where larvae were not found divided by the number of houses or buildings inspected multiplied by 100%. [5]

3. Results and Discussion

In the health program to eradicate infectious diseases, there are five categories of interventions that need to be considered, namely surveillance, discovery, treatment, prevention, and promotion to overcome the health problem or disease in question. Surveillance is the main intervention priority because surveillance is useful to make sure that continuous and quality information is produced so that it can be used as a basis for consideration for making decisions in taking effective and efficient control or counter measures. It is necessary to monitor the number of dengue cases, among others, through dengue surveillance activities. [12]

Delivered by Dr. Siti Nadia Tarmizi M.Epid, Director of Prevention and Control of Vector & Zoonotic Infectious Diseases at the Directorate General of P2P, Ministry of Health, RI, in the Adinkes Webinar, May 5, 2020 that the implementation of prevention and control of Dengue Haemorrhagic Fever in the COVID-19 pandemic situation according to the Circular of the Director-General of P2P of the Ministry of Health of the Republic of Indonesia Number: HK.02.02/IV/2360/2020 dated April 6, 2020, covering the implementation of fogging, epidemiological investigations and diagnosis of Dengue Haemorrhagic Fever. [4] It was also conveyed that any positive results from establishing a Dengue Haemorrhagic Fever diagnosis must be followed up with Epidemiological Investigations. Data from epidemiological investigations to show the potential for further transmission and spread of Dengue Haemorrhagic Fever and types of prevention. Epidemiological investigation data related to fogging, abatization, mosquito nest eradication and counseling data to decide the accuracy of the types of countermeasures with the results of epidemiological investigations. [2]

Before carrying out the correlation test between Epidemiological Investigation activities and the incidence of Dengue Haemorrhagic Fever and the relationship between Larva free index and the incidence of Dengue Haemorrhagic Fever, it is necessary to know the description of Epidemiological Investigation activities, Larva free index, and the Incidence Rate of Dengue Haemorrhagic Fever by village/ward in Tegal City as shown in the table below:

Table 1. Analysis of the Description of The Incidence Rate of Dengue Haemorrhagic Fever, Larva free index, and Epidemiological Investigation

No	Sub-districts (village)	Number of dengue cases	IR	Larva free index	% The Epidemiological Investigation activities
1.	Mangkukusuman	0	0.00	0.00	0
2.	Mintaragen	2	1.18	1.10	0
3.	Panggung	4	1.33	3.70	25
4.	Slerok	4	2.37	2.56	0
5.	Kejambon	1	0.81	4.50	0
6.	Tegalsari	2	0.83	2.95	100
7.	Kraton	5	3.21	1.23	80
8.	Muarareja	1	1.41	1.50	100
9.	Pekauman	2	2.44	1.75	0
10.	Debong Lor	0	0.00	0.00	0
11.	Kemandungan	1	2.60	5.70	100

12.	Pesurungan Kidul	0	0.00	0.00	0
13.	Debong Kidul	1	1.80	0.10	100
14.	Bandung	2	3.24	2.70	0
15.	Tunon	3	4.59	2.90	100
16.	Keturen	3	6.09	3.63	67
17.	Kalinyamat Wetan	0	0.00	0.00	0
18.	Randugunting	6	3.14	1.73	17
19.	Debong Tengah	2	1.50	4.00	0
20.	Debong Kulon	2	4.06	0.90	50
21.	Margadana	8	5.02	3.81	50
22.	Kalinyamat Kulon	1	1.63	5.80	100
23.	Sumur Panggang	2	2.73	5.37	50
24.	Pesurungan Lor	2	3.76	3.60	50
25.	Kaligangsa	2	1.68	3.20	0
26.	Krandon	1	1.37	3.20	0
27.	Cabawan	0	0.00	0.00	0
Average			2.58		65.93

¹⁷ Based on Table 1 It can be seen that the highest incidence rate is in Keturen Village (IR: 6.09), followed by Margadana (IR: 5.02) and Tunon (IR: 4.59). There are only 6 urban villages that carry out Epidemiological Investigations activities 100%, 5 sub-districts do not carry out Epidemiological Investigation activities because there are no cases of Dengue Haemorrhagic Fever in their place, while the rest are villages that carry out Epidemiological Investigations activities under 100% as many as 15 villages. The villages that carried out 100% Epidemiological Investigations activities were the of Tegalsari, Muarareja, Kemandungan, Debong Kidul, Tunon, and Kalinyamat Kulon.

To see the relationship between Epidemiological Investigation and Larva free index activities on the incidence rate of dengue fever, the Pierson Product Moment correlation test was carried out and the following results were obtained:

Table 2. Correlation between Epidemiological Investigation and Larva free index activities with Incidence Rate Dengue Haemorrhagic Fever

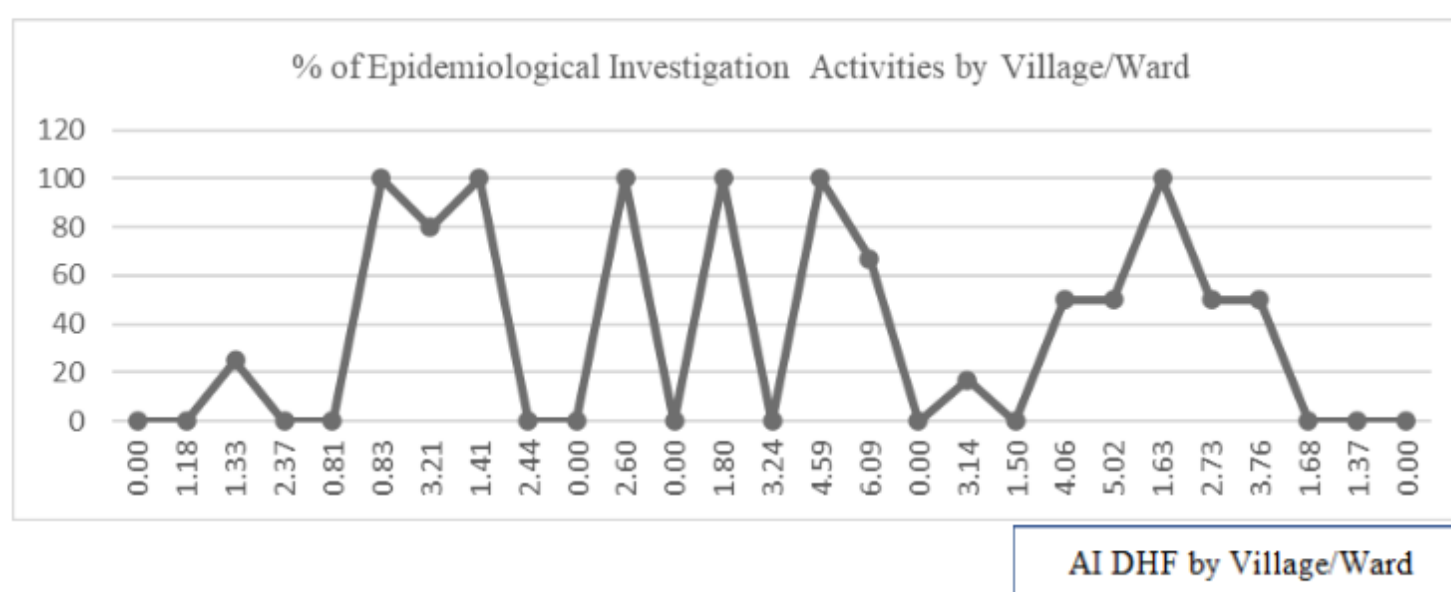
		Incidence rate	Hypothesis Conclusion
The Epidemiological Investigation Activities	Pearson correlation	0.411	Medium correlation
	Sig. (2-tailed)	0.033	There is a correlation
	N	27	
The Larva Free Index	Pearson correlation	0.392	Medium correlation
	Sig. (2-tailed)	0.043	There is a correlation
	N	27	

The incidence rate of a disease in a certain place indicates the risk of contracting the disease in that place. The greater the Incidence Rate of an area, the greater the risk of transmitting disease in that area. If each case is immediately followed up with Epidemiological Investigation activities, it can be detected earlier if there is a spread of Dengue Haemorrhagic Fever cases so that it should be able to reduce the number of Dengue

Haemorrhagic Fever cases that seem. The Incidence rate in the area is also getting smaller because the number of cases can be reduced. From Table 2, it can be seen that there is a correlation between Epidemiological Investigation activities and the incidence rate of dengue fever which is indicated by the p-value: 0.033 (less than 0.05). explained that there was a relationship between the implementation of fogging focus (p-value = 0.00), Epidemiological Investigation activities (p-value = 0.00), counseling (p-value = 0.00), patient discovery and assistance (p-value = 0.00) with the incidence of Dengue Haemorrhagic Fever.

The level of correlation that occurs between Epidemiological Investigation activities and the incidence rate of Dengue Haemorrhagic Fever is a moderate relationship with a positive direction as indicated by the Pearson correlation value of 0.411. The correlation between the two variables can be seen in the following figure:

Figure 1. Graph of Correlation between Epidemiological Investigation activities and Incidence Rate Dengue Haemorrhagic Fever



From Figure 1 above, it can be seen that most of the Epidemiological Investigation activities in the urban villages in Tegal City are still below 100%. Villages with 100% Epidemiological Investigation activities tend to have lower incidence rates, namely 0.83, 1.41, 2.60, 1.80, and 1.63. Meanwhile, sub-districts with Epidemiological Investigation activities less than 100% tend to do higher Dengue Haemorrhagic Fever incidence rates of 4.06, 5.02, 3.76b, and even reach 6.09. However, in certain sub-districts, namely Tunon Village, the incidence rate is higher even though PE activities have been carried out at 100, which is 4.59. Therefore, the relationship between the Epidemiological Investigation activity variable and the incidence rate is moderate. The inconsistency in the level of relationship between the two variables is probably due to the large incidence of Dengue Haemorrhagic Fever which is influenced by many factors, not only by Epidemiological Investigation activities. Other factors that influence the number of dengue cases and accelerate the risk of dengue transmission include environmental factors, agent factors, and host factors. The balance of these three factors can affect the decrease or increase in the incidence of dengue cases.[13]

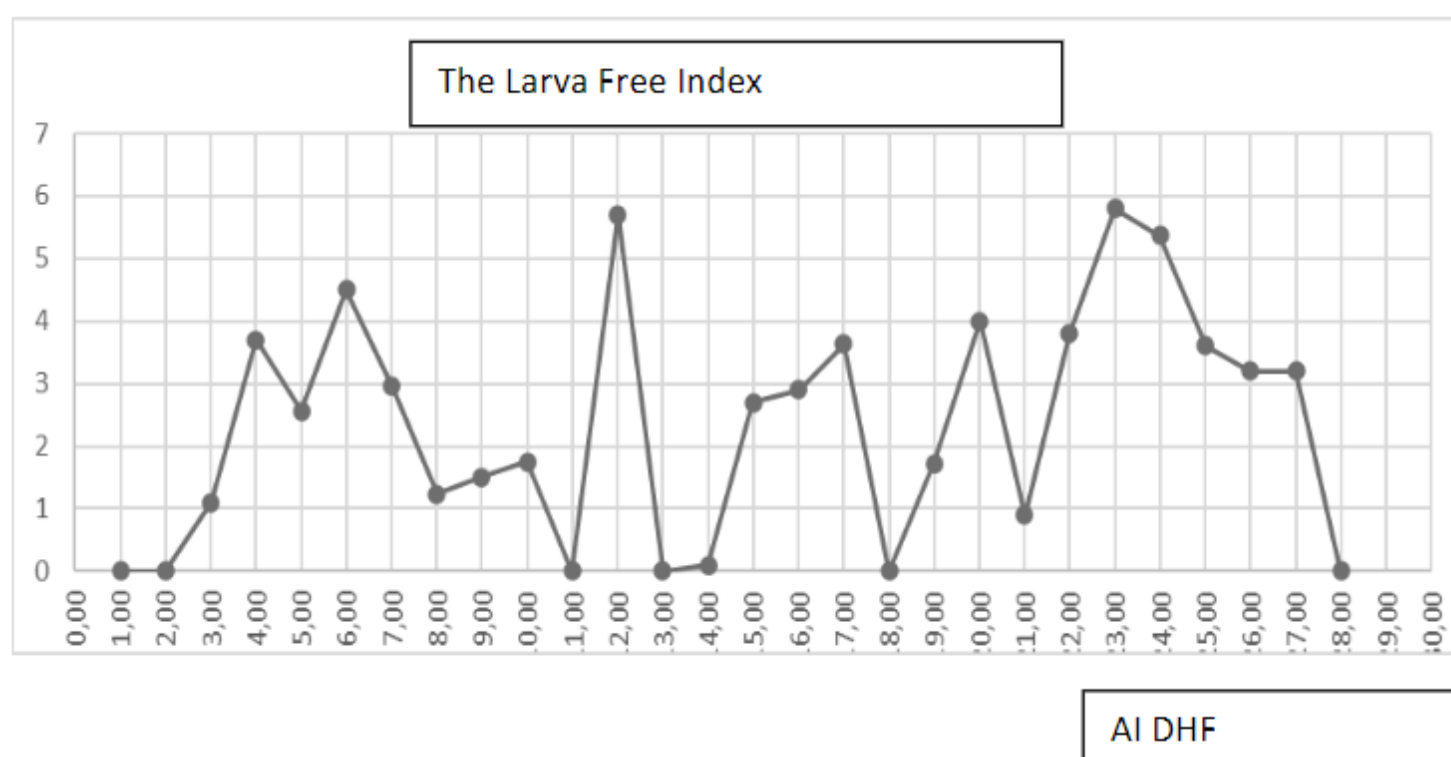
Research conducted by Fathi et al (2007) on the role of environmental and behavioral factors on the incidence of Dengue Haemorrhagic Fever in Mataram City stated that there was a significant relationship between the presence of containers and the outbreak of dengue disease (Chi-square, $p < 0.05$; $RR = 2, 96$).[14] The more people are not serious and not careful about the transmission of dengue disease, the more the risk of transmission of dengue disease will increase (Chi-square, $p < 0.05$) with $RR = 2.24$. 3M's actions have a positive role in preventing the occurrence of dengue outbreaks in Mataram City (Chi-square, $p < 0.05$) with $RR = 2.65$. Similarly, abatization measures play a role in reducing the risk of Dengue

Haemorrhagic Fever transmission (Chi-square, $p < 0.05$) with $RR = 2.51$. The high rate of dengue fever in Indonesia is due to the smooth transportation and population movement from one area to another and Indonesia's natural conditions which are in the tropics which are very suitable for the breeding of dengue vector mosquitoes.[10,11]

Periodic larva monitoring activities can produce Larva free index data that describes the extent of mosquito distribution in an area. the Larva free index is one indicator of the success of the P2 Dengue Haemorrhagic Fever program with a target of 95%.[5] Effective and efficient dengue vector control is expected to break the chain of transmission of dengue fever so that dengue fever can be controlled. Vector information is useful in vector control measures effectively and efficiently. Periodic larva monitoring activity is one type of dengue vector information that describes the density of mosquito larvae. Periodic larva monitoring produces Flick-free data which describes the extent of the spread of mosquitoes in an area. The Larva free index is one indicator of the success of the P2 Dengue Haemorrhagic Fever program with a target of 95%. In addition, the Larva free index is also used to decide the stratification/endemicity status of a region. While the Incidence Rate Dengue Haemorrhagic Fever shows a measure of the chance (probability) of a person in a population to be exposed to the disease in a certain time.[5] The greater the number of dengue vectors in a place, the greater the chance of contracting dengue fever in that place. The results of the research showed that there was a relationship between a Larva free index and Incidence Rate in Tegal City in 2020 which was indicated by a p-value of 0.043, a positive relationship with an p-value of 0.39.

This can be seen from the following image:

Figure 2. Graph of Correlation between The Larva Free Index and Incidence Rate Dengue Haemorrhagic Fever



This result is in line with Retno I's research, which states that there is a relationship between a Larva free index and AI in her research Spatial Analysis of Dengue Fever Based on Influencing Factors in Jombang Regency in 2014 – 2018.[19] But the level of relationship between a Larva free indexes and AI is moderate. Possibly due to other factors that affect AI such as population mobility and population density factors as stated by Azizah et al (2010) which states that high population mobility is one of the factors that play a role in the endemicity status of a region.[15] The population density factor is also stated as one of the factors that play a role in the endemicity of Dengue Haemorrhagic Fever.[16,17,18]

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4. Conclusion

The results of this study show that there is a significant relationship between Epidemiological Investigation activities and AI Dengue Haemorrhagic Fever by the urban village in Tegal City in 2020 with a moderate level of relationship and a positive direction (p-value: 0.033 and r: 0.411). There is also a significant relationship between a Larva free index and AI Dengue Haemorrhagic Fever by village/ward with a moderate level of relationship and a positive direction of the relationship (p-value: 0.043 and r: 0.392). However, it is necessary to re-examine qualitatively the process of implementing Epidemiological Investigation and Larva free index activities in each village/ward considering the direction of the existing relationship is positive, which means that the increase in the value of Epidemiological Investigation and Larva free index activities is followed by an increase in the value of AI even though the higher the value of Epidemiological Investigation activities, the lower the AI value. because more and more Dengue Haemorrhagic Fever cases are being followed up with the possibility of spreading Dengue Haemorrhagic Fever cases through Epidemiological Investigation activities. The bigger the Larva free index, the more places that are free/no larvae as dengue fever transmitters, so the potential for Dengue Haemorrhagic Fever (AI) in that area should be smaller.

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