European Journal of Molecular & Clinical Medicine
ISSN 2515-8260 Volume 07, Issue 10, 2020

Environmental Factors and Vector Density Analysis of Dengue Haemorrhagic Fever in Rowosari Health Center, Semarang

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Abstract: Dengue Hemorrhagic Fever (DHF) is an infectious disease caused by the dengue virus which is transmitted by the Aedes sp Mosquito. The Incident Rate (IR) in the Rowosari Health Center area in 2018 is still high, which is 98/100,000 residents. This study purpose to analyze the correlation between the rate of larvae and several environmental factors with the incidence of dengue in the work area of Rowosari Health Center, Semarang City. The research is a descriptive study with a cross-sectional approach, carried out by the analytic survey method. The sample in this study was houses located in 5 urban villages in the Rowosari health center area chosen by purposive sampling method. The results of this study indicate that the Rowosari Health Center work area has a House Index value (17.5%), Container Index (5.7%), Breteau Index (19.5%) with density figure 2-5. The results of the Pearson correlation test showed no significant correlation between House Index (p = 0.126), Container Index (p = 0.494), Breteau Index (p = 0.094), population density (p = 0.919), temperature (p = 0.384), humidity (p = 0.229) with the incidence of DHF in the Rowosari health center work area. It is recommended that the community routinely clean containers as an effort to improve ABJ and conduct PSN regularly and thoroughly

Keywords: DHF, Aedes sp., House Index, Container Index, Breteau Index

1. INTRODUCTION

Dengue Hemorrhagic Fever is a disease caused by the dengue virus and is transmitted through the bite of the Aedes aegypti mosquito. Basically, the age group affected by this disease is <15 years old, but it can also infect adults.[1] In 2017 the morbidity rate / Incident Rate of DHF in Central Java Province is worth 21.68/100,000 population, the number has decreased when compared to the previous year, namely with IR of 43.4/100,000 residents.[2] Although in the last period there. has been a decrease in the number of cases, IR DBD in Central Java is still lower than the national target (<51/100,000 population) and target Strategic Plan (<48/100,000).[3,4]

Tembalang Subdistrict is an endemic area of DHF in Semarang City, Tembalang Subdistrict IR in 2018 which is 35.52/100,000 inhabitants. The IR has decreased significantly when compared to 2017, which amounted to 72.28 / 100,000 inhabitants. Meanwhile, the number of the free larva of the city of Semarang in 2017 was 85.6%, an increase from 2016, which was 83.73%. ABJ in Semarang City is still below the national target of 95%. Tembalang Subdistrict is an endemic area of DHF with an IR of 35.52 / 100,000 population in 2018, which experienced a significant decline from the previous year of 72.28/100,000 inhabitants.[4–6]

DHF cases in Rowosari Health Center in 2017 amounted to 101 cases. In 2018 the number of dengue cases increased to 133 cases. The number of DHF sufferers who died in 2017 amounted to 3 deaths, increasing from 2017, namely 1 death. IR in the Rowosari Community Health Center DHF in 2018 was 88.90 per 100,000 population, the figure is still far from the national target which targets IR ≤ 51/100,000 population and the target of the RPJMD in Semarang city is ≤ 20/100,000 population.[4,6,7]

Because there are various kinds of factors that play a role in the epidemiology of DHF, prevention, and control of this disease is difficult to do. The most appropriate and effective way is to control vectors, this occurs because vaccines have not been tested to prevent the dengue fever. The main element for the success of the vector eradication program in Indonesia is the control of the vector itself, in this case, the 3M Mosquito Nest Eradication (PSN) program (draining, closing and burying water reservoirs that allow the development of DHF vectors).[1,8–11]

Aedes sp vector control program aims to reduce the density of DHF vectors so that the existence of vectors is always present in low population conditions.[12] With the success of the program, the morbidity rate is expected to decrease and DHF is no longer a health problem in the community. From this description, the researcher intends to identify the relationship between larval density and population density with the incidence of dengue in the work area of Rowosari Public Health Center, Semarang City.

2. METHODS

In this study, researchers used a type of research that is descriptive analytic with the cross-sectional approach. The population is 12894 houses in 5 urban villages in the Rowosari health center. The sample in this study were several houses studied from each area. In this study, researchers took samples using a purposive sampling technique as many as 200 samples of houses spread in 5 villages. Data collection was carried out by means of surveys and field interviews in the work area of the Rowosari health center and secondary data collection from the Semarang City Health Office. Data were processed using univariate analysis to determine the correlation between larval density, population density, and incidence of dengue in the work area of Rowosari health center in Semarang.

3. RESULT

A. DHF Incident

Table 1. Distribution of Frequency of DHF History in Home Samples

Status	Frequency (f)	Percentage (%)
DHF	0	0
Not DHF	200	100
Total	200	100,0

Based on Table 1, it shows that the results of research on the history of DHF obtained from the results of interviews based on the history of DHF. These results are known that from 200 houses based on the history of dengue in the owner / family, there is no positive home for DHF, in other words, the negative DHF is 100%.

B. Container Type

Containers that are found and inspected at the time of the survey based on the type of container can be seen in the following table.

Table 2. Container Type Frequency Distribution

Container Type	Frequency (f)	Percentage (%)
Bird Cages	50	7,5
Bathtub	200	30,3
Dispenser	79	11,9
Ember	109	16,5
Plastic Tub	19	2,8
Tong	40	6
Drum	20	3
Flower Vase	42	6,3
Used Cans	41	6,2
Refrigerator	59	8,9
Total	659	100,0

Based on the frequency distribution table of the container, the type of container for the breeding of vector Aedes sp. found a bath as the most container with 200 containers (30.3%), then followed by bucket containers as many as 109 pieces (16.5%), and containers with the least amount were as many as plastic and drum each 19 (2,8%) and 20 (3%) (Table 2). The results of the existence of larva and identification of Aedes sp. Species. by container type.

Table 3. Frequency Distribution Types of containers examined

Container	Larva		Total
	(-)	(+)	
Bird Cages	5	45	50
Bathtub	10	190	200

Dispenser	5	74	79
Ember	2	107	109
Plastic Tub	0	19	19
Tong	4	36	40
Drum	1	19	20
Flower Vase	4	38	42
Used Cans	7	34	41
Refrigerator	1	58	59

Based on table 3, it can be seen the types of containers examined in the study of 200 respondents, namely as many as 659 containers. The containers that were examined were at most 200 baths and 10 positive containers, 107 buckets with 2 positive containers, 74 dispensers with a positive number of 5 containers, 58 refrigerators with a positive number of 1 container, 45 birdcages with a positive number of 5 containers. 38 flower pots with a total of 4 containers, Tongs as many as 36 with a positive number of 4 containers. 34 used cans with a positive number of 7 containers, 19 drums with a positive number of 1 and 19 plastic tubs with a positive number of 0 containers (Table 3).
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C. Larva Density (House Index, Container Index, Breteau Index)

Table 4 Distribution of Frequency of Larval Density in the work area of Rowosari Health Center

Indicator	**Unit**	**Nilai**	**Category**
HI	%	17,5	High Risk
CI	%	5,7	High Risk
BI	house	19	High Risk
DF	df	2-4	Medium Density

In Table 4 shows the value of larval density in the work area of Rowosari health center categorized as high risk in the transmission of dengue in the region. HI value is 17.5%, which means that there are 17.5% of houses that have positive larvae and a high risk of dengue because the HI value is> 5%. CI value is 5.7%, which means there are 5.7% containers that are positive larvae and at high risk of dengue transmission due to CI> 5%. While the BI value is 19, which means there are 19 containers that are positive for larvae in 200 houses, the BI value is included in the high risk category because BI is> 5%. The value of Density Figure in Rowosari Village is included in the medium density category with grades 2-4.

D. Correlation of Larva Density and Environmental Factors with DHF Incidence

Table 5. Correlation of larval density and environmental factors with the incidence of DHF

No	**Variabel**	**DHF Incident**
		p-value
1	ABJ	0,126
2	*HI*	0,126

3	*CI*	0,494
4	*BI*	0,094
5	Temperature	0,384
6	Humidity	0,229
7	Population Density	0,919
8	*HI**	0,457
9	ABJ*	0,457

Information (*): City DKK data source online

Based on the table 5, the results of the Pearson correlation test show that there is no significant relationship (p value> 0.05) between ABJ, House Index, Container Index, Breteu Index, Temperature, Humidity, Population density, House Index *, ABJ * with the incidence of DHF.

4. DISCUSSION

A. Situation of DHF and Population Density in Rowosari Health Center Work Area

Based on the results of the analysis on table 5 population density in 5 sub-districts of the Rowosari Health Center working area for the period 2014-2018 did not show no significant relationship (p-value> 0.05). This shows that population density in the five sub-districts of Rowosari Health Center tends to increase from year to year during the 2014-2018 period but it can be seen that the population distribution in the 5 urban villages is not evenly distributed. Based on the analysis using the pearson correlation test, the results of the table at 5, are found that there is no significant relationship between populations.

Density and the incidence of DHF (p-value = 0.919). These results are not in line with the theory which suggests that population density is one of the risk factors that influence the incidence of DHF. The frequency of mosquitoes biting humans is also influenced by the presence or density of humans themselves so that the densely populated houses will make it easier for Aedes aegypti mosquitoes to bite humans with higher frequencies than homes that are less densely packed.[13,14]

B. Larvae density in the work area of Rowosari Health Center

Based on table 4 Figures for larva free in 5 sub-districts of Rowosari Public Health Center working area in 2018, namely: 82.5%, this figure has not yet reached the national target, namely ABJ above 95%, this means that 5 villages in Rowosari Health Center still have high larvae densities with HI 17.5%. The results of the larval density survey that has been carried out can be seen in Table 4. It is known that larval density in 5 urban areas of Rowosari Health Center has HI value = 17.5%, CI = 5.7%, and BI = 19%. If it is associated with the vector density figure of WHO (density figure), then the density of larvae in 5 urban villages in the Rowosari health center has a density figure value between 2-4, which means that there is a risk of moderate transmission of dengue fever. And if it is related to the entomological larvae index and risk interpretation, it can be concluded that the density of larvae in 5 urban villages in the Rowosari health center area is a high risk category because the HI, CI and BI values are >5%.[14–16]

C. Correlation of Larva Density with DHF Events in Rowosari Health Center Work Area
Correlation test results stated that there was no significant relationship between vector density and the incidence of DHF in Rowosari Health Center working area was not entirely appropriate. Based on data on the incidence of DHF in 2016-2018 in Rowosari Health Center working area, from year to year the incidence of DHF was always successfully suppressed, for example in 2016 there were 300 cases then dropped to 66 cases in 2017 and 33 cases in 2018. The decline in the incidence of dengue is certainly the result of efforts made by both health workers and the community to jointly carry out vector eradication in this case PSN activities.
Based on the entomology index determined by WHO, vector density is one of the risk factors for transmission of dengue virus that causes Dengue Hemorrhagic Fever disease, the higher the vector density in an area, the greater the risk of transmission compared to the low vector density. Ascertained vector density in this case the House Index, Container Index, and Breteu Index affect the incidence of DHF. This is in line with the theory which suggests that the higher the House Index the higher the risk of dengue incidence in an area.[13,14]
The condition of the results of the correlation test analysis that does not show that there is a meaningful relationship is still uncertain the level of accuracy, errors can occur because it is influenced by the amount of data for each variable that is limited and does not meet the minimum number of samples when conducting the correlation test. Based on table 5, if the variables analyzed per year will be obtained results of the House Index (HI), Container Index (CI), Breteu Index (BI), and population density does not have a significant relationship with the incidence of DHF. This is because the number of samples (5 kelurahan) does not meet the minimum sample size requirement.

5. CONCLUSSION

Based on the results and discussion of research, the conclusions from this study are:
1. The House Index value, the Container index, the Breteu Index in the 5 urban areas of Rowosari Community Health Center in 2018 were 17.5%, 5.7% and 19.5% respectively. This suggests that the kelurahan in the work area of the Rowosari Community Health Center is an area with a high risk category of dengue transmission.
2. The incidence of DHF (IR) in Rowosari health center work area in 2014-2018, namely: 2014 356.66 per 100,000 population, in 2015 607.17 per 100,000 population, in 2016 736.29 per 100,000 population, 2017 132.07 per 100,000 population in 2018 88.90 per 100,000 population. The urban IR in the working area of Rowosari Community Health Center in 2018 has not yet reached the target of the Strategic Plan and RPJMD of Central Java Province.
3. There is no correlation between larva-free numbers (ABJ) and the incidence of DHF in 2018 in the Rowosari Health Center work area (p-value = 0.126).

6. SUGGESTION

Optimizing DHF prevention and control programs begins by breaking the chain of transmission from all life cycles of Aides sp. Mosquitoes by streamlining the implementation

of routine and comprehensive PSN. It is also expected that there will be different research developments, so that more factors will be found related to the incidence of DHF.

ACKNOWLEDGMENT

We would like to express our thanks to the Faculty of Public Health UNDIP for permission to conduct research, as well as Semarang City Health Office.

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