Insights in Public Health Journal

https://doi.org/10.20884/1.iphj.2021.2.1.4969

Original Article

Revealing Dengue Risk Factors in Cilacap Regency, Central Java

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ABSTRACT

Dengue virus (DENV) infection is still an important health problem in Indonesia, it is important to identify the specific risk factors in an area. The aims of this study is to analyze the risk factors for DENV infection from various variables such as mobility, preventive behavior, house conditions, occupancy density and the presence of mosquito larvae. This is a case control design, involves 64 cases and 64 control in Cilacap Regency, Central Java. Variables this study were mobility, practice of dengue prevention, ventilation area, occupancy density and presence of mosquito larvae. Data collection was carried out by questionnaire, observation and epidemiology investigation form. Results of this study showed that the existence of *Aedes sp* larvae and dengue prevention practice as significant factors contributed to the DENV infection in the research area. This research highlighted the importance of dengue prevention and control and human practice as a common denominator to minimize the risk of contracting dengue.

Key words : risk factors, dengue, *Aedes sp*

INTRODUCTION

In many countries, including Indonesia, mosquito-borne diseases such as dengue virus (DENV) infection continue to be a concern. Tropical environmental conditions which conducive to mosquito breeding, high population mobility and lack of public awareness of routine dengue prevention efforts are at the root of this issue [1-3]. In Indonesia, Java Island contributed the highest average number of dengue fever cases each year , and the incidence rates tend to follow a cyclic trend, peaking every 6–8 years. [4]. Cilacap Regency is one of the areas that is experiencing continuous dengue problems. Based on data from the Cilacap District Health Office Profile in 2019, the Incidence Rate (IR) of DENV infection in Cilacap Regency is 28.51 per 100,000 population [5].

The spread of this disease is influenced by various interrelated factors, this causes obstacles in controlling this disease. Previous studies have mentioned factors such as mobility, preventive behavior, knowledge, housing conditions, occupancy density and the presence of mosquito larvae associated with dengue infection. The study by Zhang et al (2020) suggest that human mobility, rather than land use or climate variables, is a better predictor of local outbreak clusters [6]. The density of larvae and mosquitoes that transmit DENV, *Aedes sp*, in an certain area is also an important risk factor that has been mentioned in several previous studies. Although mosquito density is not always related to the incidence of dengue disease, since even at low densities, dengue transmission can still occur [7].

Information about the risk factors for DENV infection in an area is very important in order to formulate a disease

control policy program appropriately. Several things make the risk factors for each region different, for example environmental conditions, community habits and culture. In 2019, Cilacap regency reached almost 474 cases of DENV cases. Most cases were found in the work area of the Cilacap Tengah II Community Health Center and the Cilacap Selatan I Community Health Center. This area is an urban area with a high population density. Housing with dense occupancy makes it easier for mosquitoes to transmit dengue, given the habit of mosquitoes that multibites characteristic. The mosquito breeding site eradication program in Cilacap Regency has been implemented for a long time, but the results of the larva free rate have not reached the target as expected, still below 95% [5].

The continuing occurrence of DENV cases in Cilacap Regency encourages this research to be carried out. The purpose of this study is to analyze the risk factors for DENV infection from various variables such as mobility, preventive behavior, house conditions, occupancy density and the presence of mosquito larvae. Information from this research is expected to provide important input for efforts to prevent and control DENV infection in Cilacap Regency

METHODS

This research is a case-control design, located in Cilacap Tengah II and Cilacap Tengah I Community Health Center, Cilacap Regency. The location selection was based on the high number of DENV infection cases. Variables of this research were mobility, practice of dengue prevention, ventilation area, occupancy density and presence of mosquito larvae. The characteristics of the respondents were recorded such as age, gender, education level, and occupation.

Population of case was all dengue fever patients found in the working area of the Cilacap Selatan I and the Cilacap Tengah II Community Health Center based on the Cilacap District Health Office data in 2019. The control population was all people who did not suffer from dengue who lived close to the residence of the case in the working area of the Cilacap Selatan I and the Cilacap Tengah II Community Health Center. The study used total sampling (64 cases and 64 control), with 1:1 ration and the total research sample was 128 respondents.

Cases inclusion criteria were patients diagnosed as positive for dengue and recorded at the Cilacap Selatan I and the Cilacap Tengah II Community Health Center, the condition of the patient's house has not changed and there has been no renovation for 1 last year and approved the Informed Consent research sheet. Data collection was conducted using questionnaire and observation. Data on the presence of mosquito larvae are obtained in secondary data, namely reports of epidemiological investigations conducted by the health office. Data analysis was carried out using univariate analysis carried out on each variable to determine the proportion of each case and control, whether there was a difference between the two research groups. The statistical test used is Chi square to determine the correlation between the independent variable and the dependent variable. Multivariate analysis was performed using logistic regression. The analysis results are shown in the table.

RESULTS

This study involved 64 cases and 64 controls with detailed characteristics as shown in Table 1. Based on Table 1, most of cases respondent were in 5-14 age groups (60.9%), only finished primary education and 75% of them were unemployed. Meanwhile, several frequency distributions of the variables studied, both related to behavior and environmental conditions, are shown in Table 2.

Based on Table 2, mobility in the case and control group was mostly low, 87.5% for cases) and 76.6% for control. Meanwhile, most of the dengue prevention behavior was bad as many as 51 people (79.7%), while in the control group 38 people (59.4%). To analyze the relationship between the studied variables and the incidence of DENV infection, a bivariate analysis was carried out with the results shown in Table 3.

Based on the results of bivariate analysis, dengue prevention practice and the existence of mosquito larvae are associated with the incidence of DENV infection. These results were then continued using multivariate analysis to determine which variables most influenced the incidence of DENV.

The results of the analysis concluded that the most dominant variable was the presence of larvae with a p value of 0.004 <0.05 and the largest OR value = 3.392. The OR value = 3.392 means that the house component with larvae has a 3.392 times greater risk of developing DENV infection.

Table 1. Characteristics of respondents

No	Characteristic	cases (n=64)		control (n=64)	
		n	%	*n*	%
1.	Age groups (years old)				
	0-4	5	7,8	0	0
	5-14	39	60,9	0	0
	15-59	19	26,7	64	100
	≥ 60	1	1,6	0	0
2.	Gender :				
	Female	32	50,0	41	64,1
	Male	32	50,0	23	35,9
3.	Level of education :				
	Uneducated	6	9,4	0	0,0
	Primary school	42	65,6	38	59,4
	Junior-senior high school	13	20,3	23	35,9
	Higher education	3	4,7	3	4,7
4.	Occupation:				
	Unemployed	48	75,0	31	48,4
	Work	16	25,0	33	51,6

Table 2. Frequency distribution of mobility, dengue prevention practice and environmental factors

Variables	Cases		Control	
	n	%	n	%
Mobility				
High	8	12,5	15	23,4
Low	56	87,5	49	76,6
Dengue prevention practice				
Bad	51	79,7	38	59,4
Good	13	20,3	26	40,6
House ventilation				
Did not meet the standard	20	31,2	23	35,9
Meet the standard	44	68,8	41	64,1
Occupancy density				
Did not meet the standard	1	1,6	4	6,2
Meet the standard	63	98,4	60	93,8
The existence of mosquito larvae				
Yes	29	45,3	11	17,2
No	35	54,7	53	82,8

Tabel 3. Bivariate analysis

Variables	*p-value*	*OR*	*CI (95%)*
Mobility	0,167	0,467	0,182 - 1,194
Dengue prevention practice	0,021	2,684	1,222 - 5,898
House ventilation	0,449	1,434	0,679 - 3,025
Occupation density	0,362	4,20	0,456 - 38,657
The existence of larvae	0,001	3,992	1,767 - 9,017

Table 4 . Multivariate analysis

Variables	B	*Wald*	*Sig.*	OR	CI 95%
Dengue prevention practice	0,710	2,8872	0,089	2,042	0,896 - 4,655
The existence of Aedes larvae	1,223	8,119	0,004	3,392	1,471 - 7,344

DISCUSSION

Based on multivariate analysis, the factor that most influences the incidence of DHF is the presence of larvae. People who live in houses with mosquito larvae in containers have a 3 times greater risk of suffering from dengue disease than people who do not have mosquito larvae in containers at home. The presence of larvae in dengue patients was taken based on data from the epidemiology investigation form when the case group suffered from dengue while in the control group it was obtained based on filling out the routine form of larvae investigation. Based on the form recapitulation, several containers containing larvae at the research location were used tires, flower pots and bird drinking containers. The results of this study are in line with several previous studies which showed a correlation between the presence of mosquito larvae and the incidence of dengue [8-10].

Vector of DENV infection, *Aedes aegypti* as the primary vector and *Aedes albopictus* as secondary vectors, play a role in the spread of the disease. Its characteristics that like being close to human habitats, laying eggs in containers in the house, and its multiple bites make this mosquito a potential vector [11]. The high density of *Aedes sp*. mosquitoes in an area will increase the risk of dengue transmission [12]. Therefore, prevention efforts that can be done are to control the mosquito vector population to reach a minimum percentage. A program to drain and close water containers in the house so that it does not become a breeding ground for mosquitoes should be carried out regularly. Disposing of used items around the house such as used tires, used bottles is very important to avoid having a place for mosquito breeding [13].

The result of this study showed that the percentage of larvae in the house environment of dengue patients was 45.32 %, greater than the control group (17.18%). This indicates that the presence of mosquitoes is higher in the home environment of people infected with dengue. This explains logically the risk experienced by the case population, as evidenced by the presence of mosquitoes carrying the dengue virus. Female *Aedes sp*. mosquitoes bite humans in order to obtain protein for the development of eggs [14]. The results of this study also showed a correlation between dengue prevention practice and the incidence of dengue in the study location. This is logical because prevention efforts such as eradicating mosquito nests, preventing mosquito bites, using mosquito repellents will reduce the risk of experiencing dengue virus infection [15].

This research highlighted the importance of dengue prevention and control and human activity as a common denominator. The effectiveness of Aedes mosquito control strategies and the prevention of outbreaks depend heavily on social mobilization. The importance of empowerment at all levels of society so that people are informed about the importance of maintaining environmental

health, maintaining ecosystems, and preserving human life.

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