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House Environment Factors Related To The Presence Of Mosquito Larvae

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ABSTRACT

Background: Dengue hemorrhagic fever (DHF) is a viral infection transmitted by mosquitoes and is one of the health problems in community. DHF is currently still a health problem in Indonesia because the incidence of DHF cannot be reduced. The DHF morbidity in Indonesia in 2015 reached 50.75 per 100,000 populations, and the Incidence Rate (IR) in 2016 reached 78.85 per 100,000 populations, exceeding the national IR target (49 per 100,000 populations). The presence of mosquito larvae is an indicator of mosquitoes in an area. As a matter of fact, there are many factors that affect the presence of mosquito larvae.

Objective: To determine the house environment factors related with the presence of mosquito larvae

Method: Observational analytic with cross-sectional design. The sampling used cases and controls of 285 houses. The sample filled out the informed consent agreement, then the researchers gave the questionnaire, and made observations, next the researchers filled out the checklist according to the observation. The data were analyzed in bivariate technique with chi-square test, followed by multivariate test using logistic regression test.

Results: The results of the multivariate test showed 7 factors that influenced the presence of larvae, consisting of the variables of PSN (Mosquito Breeding Ground Eradication) action (p = 0.012; OR = 0.022; CI = 0.001-0.435), PSN attitude (p = 0.005; OR = 1658247.9; OR: CI = 0.000-0.014), Number of people in the house (p = 0.013; OR = 0.071; CI = 1.731-113.550), Frequency of cleaning containers (p = 0.006; OR = 1139.1; CI = 0.000-0.080), Mosquito breeding sites (p = 0.006; OR = 0.006; CI = 0.424-6148.76), Fish in containers (p = 0.003; OR = 434.272; CI = 0.000-0.134), container location (p = 0.007; OR = 0.006 ; CI = 4.047- 4653.77).

Conclusion: Many factors affect the presence of mosquito larvae, both in the home environment and containers owned by residents of the house. The presence of fish in containers is the most influential factor. Breeding fish as mosquito larva predators is included as parts of 3M Plus which is quite easy to do by the community. Thus, it requires maximum effort to increase knowledge of the community about these steps.

Keywords: mosquito larvae, larvae presence factors.

INTRODUCTION

Dengue fever is a disease that is transmitted through mosquitoes and is one of the health problems in community. This disease is caused by four dengue virus serotypes and is transmitted by

two main mosquito species, *Aedes aegypti* and *Aedes albopictus* (Vannavong *et al.*, 2017). Every year, 390 million infections are globally reported. The number of annual cases reported by WHO member countries increased from 2.2 million in 2010 to 3.2 million in 2015 (Abinaya *et al.*, 2018). In 2017, from January to May, there were 17,877 cases, with 115 deaths. In the same year in 2017, there were 7,838 DHF cases in East Java, in which the number ranked the second highest case in Indonesia and had the highest number of deaths of 105 cases (Ministry of Health, 2018). Kediri City is one of the dengue endemic area in East Java Province. In 2017, there were 155 cases of DHF (Health Office of Kediri, 2017). Whereas in 2018, 215 cases were found (Health Office of Kediri, 2018). In 2019, a total of 213 DD/DHF cases were found from January to July (Health Office of Kediri, 2019). The community health care center of Ngletih is one of the community health centers in Kediri City with the highest incidence rate of all the community health centers in Kediri City, which is 105 (Health Office of Kediri, 2019).

The main control of dengue fever is to break the chain of transmission control vectors because until now, the vaccines and drugs are still not available. The presence of mosquito larvae in this area is an indicator that there are larval populations in certain areas (Nofita, Rusdji and Irawati, 2017). Mosquito productivity depends on various factors, such as the nutritional quality of the larval environment, container type, environmental conditions, and climate and season. In addition, socioeconomic factors, such as household size, income, education, water storage practices, and solid waste management, can influence the presence and abundance of the vectors (Overgaard *et al.*, 2017). Efforts to eradicate the vectors can be conducted through the Mosquito Breeding Ground Eradication (PSN) activity. The effectiveness of PSN is measured by periodic larvae observation (PJB). This PJB activity produces indicator of Larvae Free Rate (ABJ) which describes larvae density and is categorized as successful if the ABJ is 95% (Ministry of Health, 2018).

Based on data from the Health Office of Kediri City in 2019, from January to May, the ABJ program in Kediri City has not reached the target of 89.7% with the ABJ program in the Community Health Center of Ngletih is also not reaching the target. In January-July 2019, it reached 65%, while in 2017 it was 95.6% and in 2018 it was 63% (Data on Environmental Health of Community Health Center of Ngletih, 2018).

Dengue Hemorrhagic Fever is a disease caused by Dengue virus transmitted to humans through the bite of the *Aedes aegypti* and *Aedes albocpictus* mosquitoes (Department of Haelth of RI, 2017). According to WHO (2015), as a result of secondary infection by a different type of dengue virus, the patient's anamnestic antibody response will be triggered, causing lymphocyte proliferation and transformation and producing high IgG antidengue titers. Symptoms that will appear are marked by a sudden fever for 2-7 days, headache, pain in the back eyeball, nausea and hemorrhage manifestations. Life cycle of *Aedes aegypti* mosquitoes and Anophelini mosquitoes experience a perfect metamorphosis, which are: eggs, larvae, cocoons, mosquitoes. The stages of eggs, larvae, and cocoons live in water. In general, the eggs will hatch into larvae within ±2 days after the eggs are submerged

in water. The larval stage usually lasts 6-8 days, and the cocoon stage lasts around 2-4 days. The growth from eggs into adult mosquitoes requires 9-10 days (Department of Haelth, 2017). Many things affect the occurrence of dengue fever, including the amount of vegetation and conditions in the home environment. In addition, the climate can be related to the ecology of dengue itself (Sanyaolu, 2017). Mosquito productivity depends on various factors, such as the nutritional quality of the larval environment, container type, environmental conditions, and climate and season. In addition, socioeconomic factors, such as household size, income, education, water storage practices, and solid waste management, can influence the presence and abundance of the vectors (Overgaard *et al.*, 2017).

METHODS

The type of research used in this study is analytic observation with a cross sectional approach. The study was conducted in the working area of the Community Health Care Center of Ngletih, Pesantren Sub-District, Kediri City, on August 28, 2019, to September 1, 2019, which met the inclusion criteria.

The sample of research cases are all houses with positive larval observation results and all houses with negative larval observation results. The number of samples required in this study are 150 case group samples and 150 control group samples. The sampling method in this study is simple random sampling for the case group and simple random sampling for the control group. The instruments used in this study are questionnaires and check lists. Variables assessed by questionnaire include variables of knowledge about PSN, PSN attitudes and PSN actions, while variables assessed by check list include the presence of larvae, temperature, humidity, container type, container location, number of containers, fish in containers, use of abate, solid waste around the house, number of people in the house, house type including walls/roofs/floors, house ownership, use of mosquito repellent, water source, and frequency of cleaning containers. The tools used in this study are a flashlight, thermometer, and hygrometer. Regarding the flow of data collection, respondents filled out the informed consent sheets and filled out the questionnaires. While the researchers made observations and filled out the checklist about home environment.

The data were analyzed in bivariate technique using chi square test and multivariate test using logistic regression test using SPSS for windows version 23.

RESULTS

Univariate

Table 1. Data of PSN Knowledge, Attitudes, Actions and Home Environment

Variable	Category	Total	(%)
The presence of larvae	Positive	150	50.0
	Negative	150	50.0
Knowledge about PSN	High	86	28.6
	Moderate	68	22.6
	Low	146	48.6
PSN attitudes	Good	200	66.7
	Moderate	100	33.3
	Low	0	0.0
PSN actions	Good	90	30.0
	Moderate	109	36.3
	Low	101	33.6
Larva density of the CI (Containers Index)	High Risk	150	50.0
	Low Risk	150	50.0
House ownership	Private	292	97.3
	Rent	8	2.7
Number of people in the house	Less than 6	170	56.7
	More than 6	130	43.3
House conditions	Permanent	286	95.3
	Not Permanent	14	4.7
Use of mosquito repellent	Yes	71	23.7
	No	229	76.3
Water source	Well	300	100.0
	PDAM	0	0.0
	Rainwater	0	0.0
Breeding grounds	No used goods	148	49.3
	There are used goods	152	50.7
Temperature	Optimal	300	100.0
	Not Optimal	0	0.0
Humidity	Optimal	287	95.7
	Not Optimal	13	4.3

Respondents who participated in the study are 300 respondents with 150 (50.0%) respondents having positive larval houses and 150 (50.0%) respondents having negative larval houses. Based on the results of the study, knowledge about PSN with the low category obtained the most results, which are 146 (48.6%). The most results for the PSN attitudes variable are 200 (66.7%), which are in the good category. For the PSN actions variable, the most frequent category is in the moderate category, which is 109 (36.3%).

In the larval density variable of the Containers Index (CI), 50% of houses had a high risk of transmission, and 50% had a low risk of transmission. Based on the results of the study obtained from 300 houses observed, they are divided into 150 houses with positive *Aedes aegypti* larvae and 150 houses with negative larvae, so the HI value is obtained, which is 50%. This means that HI > 10% which shows a high risk of DHF. In this study, the BI value of 61.3% is obtained. This means that BI > 35%, which shows a high risk of DHF. The most results for the house ownership variable is in the personal ownership of the house, which are 292 (97.3%). The most results for the number of people in the house variable is in the category of less than 6 people, which is 170 (56.7%) in this study. The results for permanent housing condition of respondents are 286 (95.3%). For the use of mosquito repellent, there are 229 respondents (76.3%) who do not use mosquito repellent. The water source at the respondents' houses are all from the well, which are 300 (100%). The mosquito breeding grounds in the respondents' houses can be seen from the absence of used goods, in which 152 (50.7%) of respondents have no used goods. The temperature in the respondents' houses is all has an optimal temperature, which are 300 (100%). For humidity, there are 287 (95.7%) respondents who have an optimal humidity.

Table 2. Data of Container Variable

Variable	Category	Total	(%)
Container Type	Small	25	8.3
	Medium	115	38.3
	Large	160	53.3
Container Location	Outdoor	66	22.0
	Indoor	234	78.0
Fish in containers	Present	158	52.7
	Not present	142	47.3
Number of containers	Many	78	26.0
	Few	222	74.0
Use of abate	Use	30	10.0
	Not use	270	90.0

Frequency of cleaning containers	Less than a week	166	55.3
	More than a week	134	44.7

For the container variable, the most of container type is in large sized containers, which are 160 (53.3%). For the container location variable, the most results is located in the house (indoor), which are 234 (78.0%). For the fish in containers variable, there are 158 (52.7%) respondents who have fish in their containers. For the number of containers in each respondent's house, there are 222 (74.0%) that are categorized as few, that have less than 5 containers. For the frequency of cleaning containers, there are 166 (55.3%) respondents who clean containers less than a week.

Bivariate

The house variable with factors of knowledge about PSN, PSN attitudes, PSN actions, larval density, number of people, house conditions, mosquito breeding grounds, and humidity meet the requirements of the Chi-Square Test because it is obtained p values for the variables of knowledge about PSN (p = 0.000), PSN attitudes (p = 0,000), PSN actions (p = 0,000), larval density (p = 0,000), number of people (p = 0,000), house conditions (p = 0.006), mosquito breeding grounds (p = 0.000), and humidity (p = 0.001). This means that the factors of knowledge about PSN, PSN attitudes, PSN actions, larval density, number of people, house conditions, mosquito breeding grounds, and humidity have an influence on the presence of mosquito larvae because the significance value is < 0.05.

The variable factors of house ownership and the use of mosquito repellent do not affect the presence of mosquito larvae because the significance value > 0.05. While the temperature and water source variables cannot be concluded because the data are homogeneous.

The container variable with the factors of container type, container location, number of containers, fish in containers, use of abate, and frequency of cleaning containers meet the requirements of the Chi-Square Test because it is obtained p values for the variables of container type (p = 0.000), container location (p = 0.000), number of containers (p = 0.001), fish in containers (p = 0.000), use of abate in containers (p = 0.021), frequency of cleaning containers (p = 0.000). This means that the factors of container type, container location, number of containers, fish in containers, use of abate, and frequency of cleaning containers have an influence on the presence of mosquito larvae because the significance value is <0.05.

Table 3. Bivariate Data Analysis of PSN Knowledge, Attitudes, Actions and Home Environment on the presence of larvae

Independent Variable	Cate-gory	Positive Larvae	(%)	Negative Larvae	(%)	P value	Significance
Knowledge about PSN	High	0	0.0	86	28.7	0.000 (*Chi-Square)*	√
	Moderate	4	1.3	64	21.3		
	Low	146	48.7	0	0.0		
PSN attitudes	Good	1	0.3	51	17.0	0.000 (*Chi-Square)*	√
	Moderate	149	49.7	99	33.0		
	Low	0	0	0	0		
PSN actions	Low	92	30.7	9	3.0	0.000 (*Chi-Square)*	√
	Moderate	46	15.3	63	21.0		
	Good	12	4.0	78	26.0		
Larval density of CI (Containers Index)	High Risk	150	50.0	0	0.0	0.000 (*Chi-Square*)	√
	Low Risk	0	0.0	150	50.0		
House ownership	Private	144	48.0	148	49.3	0.282 (*Chi-Square)*	*X*
	Rent	6	2.0	2	7.0		
Number of people in the house	Less than 6	44	14.7	126	42.0	0.000 (*Chi-Square)*	√
	More than 6	106	35.3	24	8.0		
House conditions	Permanent	148	49.3	138	46.0	0.006 (*Chi-Square)*	√
	Not permaent	12	7.0	12	4.0		
Use of mosquito repellent	Yes	41	13.7	30	10.0	0.174 (*Chi-Square)*	*X*
	No	109	36.3	120	40.0		
Water source	Well	150	50.0	150	50.0	-	-
	PDAM	0	0.0	0.0	0.0		
	Rainwater	0	0.0	0.0	0.0		
Mosquito breeding grounds	There are used goods	50	16.7	98	32.7	0.000 (*Chi-Square)*	√
	No used	100	33.3	52	17.3		

	goods						
Temperature	Optimal	150	50.0	150	50.0	-	-
	Not optimal	0	0.0	0.0	0.0		
Humidity	Optimal	150	50.0	137	45.7	0.001 *(Chi-Square)*	√
	Not Optimal	0	0.0	13	4.3		

Table 4. Bivariate Data Analysis of the Container Variable on the presence of larvae

Independent Variable	Category	Positive Larvae	(%)	Negative larvae	(%)	P value	Significance
Container Type	Small	7	2.3	18	6.0	0.000 (Chi-Square)	√
	Medium	35	11.7	80	26.7		
	Large	108	36.0	52	17.3		
Container Location	Outdoor	18	6.0	48	16.0	0.000 (Chi-Square)	√
	Indoor	132	44.0	102	34.0		
Fish in containers	Present	44	14.7	114	38.0	0.000 (Chi-Square)	√
	Not Present	106	35.3	36	12.0		
Number of containers	Many	52	17.3	26	8.7	0.001 (Chi-Square)	√
	Few	98	32.7	124	41.3		
Use of abate	Use	9	3.0	21	7.0	0.021 (Chi-Square)	√
	Not use	141	47.0	129	43.0		
Frequency of cleaning containers	Less than a week	131	43.7	35	11.7	0.000 (Chi-Square)	√
	More than a week	19	6.3	115	38.3		

Multivariate

Table 5. Results of Multivariate Logistic Regression Test

Variable	B	S.E.	Wald	Df	Sig.	Exp (B)	95% C.I.for EXP(B)	
							Lower	Upper
PSN actions (Good)	-3.835	1.532	6.268	1	.012	.022	.001	.435
PSN attitudes (Good)	-14.321	5.125	7.810	1	.005	.000	.000	.014
Number of people in the house (> 6 people)	2.640	1.067	6.120	1	.013	14.019	1.731	113.550
Container Location (Indoor)	5.085	1.881	7.307	1	.007	161.612	4.047	4653.775
Mosquito breeding grounds (There are used goods)	5.084	1.857	7.496	1	.006	161.461	04.4240	6148.765
Fish in containers (Present)	-6.074	2.075	8.566	1	.003	.002	.000	.134
Frequency of cleaning containers (Less than a week)	-7.038	2.299	9.370	1	.002	.001	.000	.080
Constant	4.333							

There are seven variables that have a significance value of p <0.05, including : Variable of PSN actions (Good), the value of sig = 0.012, which shows that the hypothesis is accepted that there is an influence of PSN actions (Good) on the presence of larvae. The OR of PSN actions (good) is <1, which is 0.022, which means that good PSN actions in a house will inhibit mosquito larvae.

Variable of PSN attitudes (Good), the value of sig = 0. 005, which shows that the hypothesis is accepted that there is an influence of PSN attitudes (Good) on the presence of larvae. The OR of PSN attitudes (Good) is <1, which is 0.000, which means that good PSN attitudes in a house will inhibit mosquito larvae.

Variable of number of people in the house (> 6 people), the value of sig = 0.013, which shows that the hypothesis is accepted that there is an influence of the number of people in the house (> 6 people) on the presence of larvae. The OR of the number of people in the house (> 6 people) is >1, which is 14.019, which means that the number of people in a house with more than 6 people in a house will increase the presence of mosquito larvae.

Variable of container location (Indoor), the value of sig = 0.007, which shows that the hypothesis is accepted that there is an influence of the container location (Indoor) on the presence of larvae. The OR of the container location (Indoor) is >1, which is 161.612, which means that the container location in the indoor in a house will increase the presence of mosquito larvae.

Variable of mosquito breeding grounds (there are used goods), the value of sig = 0. 006, which shows that the hypothesis is accepted that there is an influence of mosquito breeding grounds (there are used goods) on the presence of larvae. The OR of mosquito breeding grounds (there are used goods) is >1, which is 161.461, which means that if there are mosquito breeding grounds in the form of used goods in a house, it will increase the presence of mosquito larvae.

Variable of fish in containers (there are fish), the value of sig = 0.002, which shows that the hypothesis is accepted that there is an influence of fish in containers (there are fish) on the presence of larvae. The OR of fish in containers (there are fish) is <1, which is 0.002, which means that if there are fish in containers in a house, it will inhibit the presence of mosquito larvae.

Variable of frequency of cleaning containers (less than a week), the value of sig = 0.002, which shows that the hypothesis is accepted that there is an influence of the frequency of cleaning containers (less than a week) on the presence of larvae. The OR of frequency of cleaning containers (less than a week) is <1, which is 0.001, which means that the frequency of cleaning containers in a house that is done in less than a week will inhibit the presence of mosquito larvae.

RESULTS AND DISCUSSION

Based on the results of data analysis, it is obtained a P value of 0.000, which means that this study shows the results that there is a relationship between knowledge about PSN and the presence of mosquito larvae in the working area of community health center of Ngletih, Kediri City. The results of this study are in accordance with Ryan's study (2019), which shows that there is a relationship between respondents' knowledge and the presence of *Aedes aegypti larvae* in the Galápagos Islands, Ecuador, with a p value of 0.02 (Ryan *et al.*, 2019). In line with Soldan's study (2015), high knowledge about PSN can reduce the growth of mosquitoes, larvae, and pupae (Paz-Soldán *et al.*,

2015). Lack of knowledge will have an impact on dengue prevention practices because actions based on knowledge are more effective than those without knowledge (Siregar *et al.*, 2015). Increased knowledge and application of preventive steps before the rainy season will reduce the burden of health care from the diseases transmitted by mosquitoes (Sharma, Gupta and Khandelwal, 2017). However, a study by Bestari (2018) explains that there is no relationship between the level of knowledge about PSN on the presence of *Aedes Aegypti* larvae with a p value = 0.464 (p > 0.05) (Bestari *et al.*, 2018)

The results of this study show that the variable of PSN attitudes has a P value of 0.000. This shows that there is a relationship between PSN attitudes with the presence of mosquito larvae. It is in accordance with a study conducted by Elsinga (2017) in Curaçao which shows a p value of 0.001 which means that there is a relationship between attitude and the eradication of mosquito larvae (Elsinga *et al.*, 2017). It is in line with a study by Listyorini (2016) that good respondent attitudes about eradicating mosquito breeding grounds have a one-time possibility of good behavior in eradicating mosquito breeding grounds (Listyorini, 2016). Respondents who have a good attitude regarding dengue fever and PSN will tend to take dengue prevention actions optimally (Siregar *et al.*, 2015).

The results of this study obtained a p value of 0.000 which indicate that there is a relationship between PSN actions and the presence of larvae. This is in accordance with a study conducted by Rasjid (2016) in Makassar, which obtains a p value = 0.001, meaning that there is a relationship between PSN actions and the presence of mosquito larvae (Rasjid, 2016). Thus, if the community carry out regular and sustainable eradication of mosquito breeding grounds, they can prevent mosquito growth.

Based on the results of house ownership, it is obtained a p value of 0.512 (<0.05), which means that there is no relationship between house ownership with the presense of larvae. This is because there are other factors that are more influential on the presence of mosquito larvae such as PSN actions. This study is in line with Alma et al. (2014), who conducted a study on the relationship of house ownership with the presence of larvae with significance results of p value of 0.455, which means no relationship is obtained (Alma, 2014)

Based on the results of data analysis on the number of people living in the house, it is obtained a p value of 0.000 (<0.05), which means that there is a relationship. The results is supported by Lagu's study (2017) which finds a relationship between the number of people in the house with the presence of mosquito larvae with a significance of p value of 0.000 (Lagu, Damayati and Muhammad Wardiman, 2017). The results are in line with a study conducted by Walker et al. (2018) with a p value of 0.04 which means that there is a significant relationship between the number of people in the house and the presence of larvae. That study explained that the more people in the house, the more the number of containers needed, so the more likely there are mosquito larvae (Walker *et al.*, 2018).

Based on the results of the analysis of the house conditions, it is obtained a p value of 0.006 (<0.05), which means that there is a relationship between the house conditions with the presence of larvae. It is in line with a study by Abinaya (2018) that the house conditions affect the presence of larvae. The house conditions referred to in this study are permanent and semi-permanent. (Abinaya *et al.*, 2018).

For the use of mosquito repellent, the p value is 0.135 (<0.05), which means that there is no relationship. It is in accordance with the results of Widawati's (2017) study, the Chi-square analysis results show a p value = 0.375 which means that there is no relationship between the use of mosquito repellent and the presence of larvae. This is because the insecticide does not affect mosquito larvae, but it only affects adult mosquitoes (Widawati and Kusumastuti, 2017).

In this study, it is found that the houses in 300 samples observed are all have a water source from the well so that data analysis cannot be done because the values obtained are constant. According to a study conducted by Ningsih (2016), in Padang City, West Sumatera, it states that the source of well water is more dominant regarding the growth of larvae than the source of water from the PDAM (Ningsih and Zakaria, 2016).

The results of the analysis of mosquito breeding grounds obtain a p value of 0.000 (<0.05) which means that there is a relationship between breeding grounds and the presence of larvae. A study has proven that the disposal of solid waste such as cans, bucket bottles, or the sort that are spread around the house has the potential to become a breeding ground for mosquito larvae (Okoye and Nwachukwu, 2014). In addition, according to a study by On (2017), it mentions that the unused tire is a breeding ground for mosquitoes (On *et al.*, 2017). In a study conducted by Dom et al. (2016), female *Aedes aegypti* like laying eggs in solid waste or containers that can hold water such as cans and old tires because it is related to the quality of the water in the container (Dom *et al.*, 2016).

In this study, it is found that the temperature of the house in 300 samples observed is all have an optimal temperature of 15^0C-35^0C so that data analysis cannot be carried out. Temperature is the main regulator in the growth of mosquitoes. Temperature is the main regulator in the growth of mosquitoes with optimal temperatures in mosquitoes of 15^0C-35^0C (Xiang *et al.*, 2017).

For the result of the humidity factor, the p value is 0.000 (<0.05) which means that there is a relationship between humidity and the presence of larvae. This is in accordance with a study conducted by Heriyani (2019) who conducted a study at SD Banjarbaru Utara, which shows that there is a significant relationship between humidity with the presence of *Aedes Aegypti* larvae (Heriyani, 2019). A study conducted by Jemal (2018) and Xiang (2017) in China states that there is a relationship between humidity and the presence of larvae, in which optimum humidity affects oviposition (egg laying), egg hatching, flight activity, feeding behavior, and age of *Aedes aegypti* mosquitoes, optimal humidity according to the study is 78.9% (Xiang *et al.*, 2017; Jemal and Al-Thukair, 2018). According

to a study by Reinhold (2018), optimal humidity is above 60% while according to a study by Kreppel et al. (2016), it should be 84–94% (Kreppel *et al.*, 2016; Reinhold, Lazzari and Lahondère, 2018).

The results of data analysis of the container type on mosquito larvae obtains a p value of 0.000 (<0.05) which means that there is a relationship between the container type with the presence of mosquito larvae. This is in accordance with a study by Islam (2019) about the container type to the production of *Aedes aegypti* mosquito pupae, the p value of 0.0041 is obtained, which means that there is a relationship. Based on this study, it is concluded that containers with more than 50 L tend to produce cocoons more than 4.9 times. This can be caused by large-sized containers which tend to be rarely replaced so that mosquitoes can breed in that place (Islam *et al.*, 2019). Al-Ghamdi et al. (2014) also explain that large-sized containers are most significant to the presence of larvae compared to other types of containers in Jeddah City (Al-Ghamdi *et al.*, 2014).

For the container location factor, it obtains a p value of 0.000 (<0.05) which means that there is a relationship between the container location with the presence of mosquito larvae. This is supported by a study conducted by Overgaard (2017) in Colombia with a p value of 0.075 which means that there is a relationship (Overgaard *et al.*, 2017). The container inside the house has more mosquito larvae in the dry season because of the high humidity inside the house than outside the house (Lin *et al.*, 2018). The control strategies of dengue fever is by controlling the vectors, and in particular by controlling the breeding grounds of containers in and around the household (Jiménez-Alejo *et al.*, 2017).

The results of data analysis show that the p value is 0.000 (<0.05), which means that there is a relationship between the presence of fish in containers on the presence of larvae. This is also in line with a study conducted by Perez et al. (2017) that if containers containing water are more than 5 in the house, it tends to have more larvae (Morales-Pérez, Nava-Aguilera, Legorreta-Soberanis, *et al.*, 2017). Fish can also be a 'predator' against mosquito larvae in containers so that it will reduce mosquito larvae in containers (Liu *et al.*, 2019).

The results of data analysis obtain a p value of 0.210 (<0.05) which means that there is a relationship between the use of abate with the presence of larvae. This is in line with a study by Perez (2017) and Ryan (2019) which state that the use of abate containers significantly influences the presence of larvae. (Morales-Pérez, Nava-Aguilera, Balanzar-Martínez, *et al.*, 2017; Ryan *et al.*, 2019). This is supported by a study of Putra et al. (2016) because in Indonesia the insecticide used is Temephos (Abate 1%), because Temephos can control the *Aedes aegypti* mosquito larvae very effectively in Indonesia (Putra *et al.*, 2016). However, according to a study by Arostegui et al. (2017), it explains that the use of abate in the house can not reduce HI in a few years (Arosteguí *et al.*, 2017).

The results of data analysis obtain a p value of 0.000 (<0.05) which means there is a relationship between the frequency of cleaning containers with the presence of larvae. In line with Overgaard's study (2017), it explains the same thing, adding that containers that are cleaned once a month tend to

have 4 times more larvae compared to containers that are cleaned once a week (Overgaard *et al.*, 2017).

Based on the results of the study from 300 houses observed, HI values obtained are 50%, meaning that HI > 10% which shows a high risk of DHF. In this study, from the 300 houses observed, it is found a total of 847 containers and of all containers have 184 positive larvae, so that the CI value of 21.72% is obtained. This means that in this study, it is found a CI > 5% which shows a high risk of DHF. The results of data analysis obtained a P value of 0.000, which means that this study shows the results that there is a relationship between larval density and the presence of mosquito larvae in the working area of community health center of Ngletih, Kediri City. Based on our results of the study, it is found that the CI results are significant, which is not in accordance with Basso's (2017) study, which is not statistically significant (Basso *et al.*, 2017).

Based on the results of the study from the 300 houses observed, of the 300 houses found 184 containers of positive larvae, so that the BI value of 61.3% is obtained. This means that BI > 35% shows a high risk of DHF. (Nofita, Rusdji and Irawati, 2017) (Morales-Pérez, Nava-Aguilera, Balanzar-Martínez, *et al.*, 2017).

CONCLUSION

The results of the study on the factors that influence the presence of mosquito larvae in the working area of Community Health Care Center of Ngletih, Pesantren Sub-District, Kediri City assessed 18 variables. There are 14 significant factors that influence, including the knowledge of PSN, PSN attitudes, PSN actions, larval density, number of people in the house, mosquito breeding grounds, and humidity, container type, container location, number of containers, fish in containers, use of abate, and frequency of cleaning containers. While the insignificant factors that influence include the house conditions and the use of mosquito repellent. There are also two factors that cannot be analyzed, including temperature and water sources.

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