Correlation of Container Characteristic, Water-Container Draining Practice, and the Ownership Status of Residence with the Presence of *Aedes Sp* Larvae in Tembalang, Semarang

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Abstract. Previous studies mostly defined Tembalang as an endemic area of dengue fever with highest incidence rate (IR) in District of Semarang. The incidence of dengue fever in Tembalang in 2016 is still high, which is 113.9 per 100.000 citizens. A number of free larvae in Tembalang is still below the target (86.26%). The presence of *Aedes sp* larvae is influenced by human and environmental factors. The aim of the study was to identify the relation between container characteristic, practices of mosquito habitat diminishing, and the ownership status of residence with the presence of *Aedes sp* larvae in Tembalang. This research was an analytic observational research with stratified random sampling. Data collection methods were observation and interview, conducted from August-October 2017. The result of this study showed that House Index (HI) was 25%, Container Index (CI) was 11.2%, Breteu Index (BI) was 26% and number of free larvae was 75%. Chi-square analysis showed number of container was related to the presence of Aedes sp larvae (p 0.000). The society needs to make efforts to improve the number of free larvae by doing practices of mosquito's habitat diminishing especially if they own more than 3 containers.

Keywords: **container index; presence of larvae ; *Aedes sp***

1 Introduction

Aedes aegypti is the major vector of urban dengue in tropical Asia. [1], [2]. The presence of *Aedes aegypti* larvae in particular area is an indicator showing that there is *Aedes aegypti* population that lives in that area. [3]. The best way to prevent the disease caused by the *Aedes aegypti* is by destroying its larvae habitat which is called as mosquito's habitat diminishing practice.[4] The Presence of *Aedes aegypti* larvae is influenced by human and the environmental factors. The environmental factors related to the presence of *Aedes aegypti* larvae are as following; the type of water container, annual rainfall, air temperature, humidity, altitude, wind pattern, natural vegetation, and climate. Meanwhile, the human factors related to the presence of *Aedes aegypti* larvae are population, mobility, house spacing, light intensity and the source reduction practice.[5] The things that make some places suitable for *Ae.aegypti* to inhabit is closely related to the water supply system and water storage system. Water storage system in an open container makes it easy for *Ae.aegypti* to breed and become an adult. [6] An area with such high supply of water and high amount of annual rainfall has a high chance to be used as a natural breeding site for *Aedes sp*. The example is on the tree holes, the axil, and the bamboo cutting. Meanwhile, in an area that has such poor water supply system, the society usually store the water for household stuffs. It also makes the area potential to be the breeding site for *Aedes sp*.[7] Tembalang is dengue hemorrhagic fever (DHF) endemic area which is always included in the top 10 of IR of DHF in the district level in Semarang. IR of DHF of Tembalang in 2016 is on the second place which is 113.9 per 100,000 citizens. Free Number of Larvae (FNL) in Tembalang is still below the target (86.26%). Tembalang is an area in which the campus of Diponegoro University (Undip) is located. The number of the students of Diponegoro University is increasing each year. These students are coming from many places, and those who come from outside Semarang usually choose to live in a boarding house during their study. Most of the boarding houses in Diponegoro University area is located in Tembalang. The behavior of each student to take care of their boarding house is different from one another in term of mosquito habitat diminishing practice.

Based on the description above, the writer wants to identify the correlation between container characteristics, the source reduction practice, and building status and the presence of *Aedes sp* larvae in Tembalang Semarang

2 Method

The method used in this research was analytic observational with cross sectional approach, conducted from August-October 2017 in Tembalang, Semarang City. The independent variable consisted of the number of containers, containers type, containers' material, containers' position, water source, the source reduction practice, the recycling practice the practice of owning mosquito-larvae-eating fish, the building status, water temperature, and the pH level of the water.

The population of this research was all residence in Tembalang, Semarang City. Samples in this study were 100 respondents by using stratified random sampling method. The data analysis is using *univariate* and *bivariate* analysis in the form of frequency distribution table and cross tab of chi-square statistical test.

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3 Results

The result of the previous research shows that there is correlation between building status and the source reduction practice. Based on the previous research, the factors related to The Presence of *Aedes aegypti* larvae are pH level of the water, water temperature, humidity, container type, and the behavior of society consisting knowledge and action to lessen and push larvae density of *Aedes aegypty*.

Table 1. Frequency distribution of the presence *of Aedes sp* larvae in Tembalang, Semarang

Breeding Place	n	Aedes larvae sp			
		Yes		**No**	
		f	%	f	%
Container	100	25	25.0	75	75.0
House	233	26	11.2	207	88.4

Based on the results of the research contained in Table 2, it was found that that a positive presence of *Aedes sp* was mostly found in in the number of containers> 3 that is 64.7%.

Table 2. The correlation between the number of containers and the presence of *Aedes sp* larvae

Number of Container	The Presence of Aedes sp				Total	
	Positive		**Negative**			
	f	%	f	%	f	%
>3	11	64.7	6	35.3	17	100.0
≤3	14	16.9	69	83.1	83	100.0
Total	25	25.0	75	75.0	100	100.0
*p_{value} = 0.000 POR = 9.036 95% CI = 2.865-28.500						

Table 3. The contributing factors related to the presence of *Aedes sp* larvae

Variables	Category	The presence of Aedes sp				P value
		Positive		**Negative**		
		f	%	f	%	
Type of container	Water container	24	10.5	204	89.5	0.009
	Non-water container	2	40.0	3	60.0	
Container's material	Cement	3	33.3	6	66.7	0.066
	Non cement	23	10.3	201	89.7	
Location of container	Indoor	26	11.3	204	88.7	0.999
	Outdoor	0	0.0	3	100.0	
Water source	Well	19	10.2	167	89.8	0.515
	Non well	7	14.9	40	85.1	
Container water temperature	Optimal	12	13.0	80	87.0	0.599
	Not optimal	14	9.9	127	90.2	
pH level of the container water	Neutral	12	11.3	94	88.7	0.999
	Acid/base	14	11.0	113	89.0	
Water container draining practice	Poor	16	28.6	40	71.4	0.485
	Good	9	20.5		79.5	
The status of owning	Yes	1	20.0	4	80,0	0,999

Variables	Category	The presence of Aedes sp				P value
		Positive		**Negative**		
		f	%	f	%	
mosquito-larvae-eating fish	No	24	25.3	71	74.7	
The status of owning residence	Renter	19	30.6	43	69.4	0.153
	Owner	6	15.8	32	84.2	

4 Discussion

As stated in the result of the research, there was a significant correlation between the number of container and the presence of *Aedes sp* larvae (*p value* = 0.000). The calculation of POR value = 9.036 (POR>1) which shows that the number of container was the factor of the presence of *Aedes sp*. Household/ building that has >3 containers has a risk of 9 time greater of had larvae positive than the building that has ≤3 container. The value of CI 95% = 2.865-28.500 (excluding one point), means that there was a correlation between the number of the container and the presence of *Aedes sp* larvae. This was caused by theory stated the more container in house means more breeding place and the raise of *Aedes sp* population. The larger of the population of *Aedes sp* results in the more population of larvae. The research result is comparable with the research conducted by Wisfer in 2014 in Makassar which showed the significant correlation between the total container and the presence of *Aedes aegypti* larvae (*p value* = 0.002) [8]. The previous study also revealed that had water storage associated with being infested with *Aedes* larvae (p value <0.001, OR 1.50 (CI 1.29-1.75))[6].

The research showed that there was no correlation between the container type and the presence of *Aedes sp* larvae with the *p value* = 0.097 (*p value*≥0.05). The result was caused both in water container and non water-container was a potential place to be a breeding spot. An area with adequate water demand and high annual rainfall has potential as a natural breeding site for *Aedes sp* mosquito [9]–[11]. Meanwhile, in an area that has such poor water supply system, the society usually store the water for household stuffs. It also makes the area potential to be the breeding site for *Aedes sp* [12]–[14].

According to the research, there was no correlation between the containers' material and the presence of *Aedes sp* larvae with *p value* = 0.066 (*p value*≥0.05). Because all container found on the field have a potency to be a breeding place such as cement, ceramic, and plastic. Cement leads microorganism, the food of the larvae grew more easily on the wall of the container. Ceramics and plastic on the field founded mosses or dirt thus the light reflection dimmed and made mosquito more easily to breed [15], [16].

Result of this research shows that there was no significant correlation between containers place and presence of *Aedes sp* larvae with the *p value* = >0.999 (*p* value≥0.05). Most of the containers were in houses (98.7%) and only a little amount of them that are outside the houses (1.3%). This incosistency may due to all of the larvae (100%) were found in containers in houses, so

they were affecting the statistic calculation. Contrary to expectations, this study did not find the significant correlation between containers place and the presence of *Aedes sp*. This finding was also reported by Overgaard et al [17].

While the result of chi-square examination showed no correlation between container's water sources and the presence of *Aedes sp* Larvae with *p value* = >0.999 (*p value*≥0.05). This is because in this research, the respondents have two water sources. There were Regional Water Company and well which is used according to the water sufficiency thus the container is filled by water well as well as Reginal water company. The presence of aedes sp is influenced by physical characteristics of water such as pH, temperature, and humidity. While our results revealed that the pH (*p value* = >0.999) and water temperature (*p value* = 0.599) were not contributing factors of the presence of *Aedes* larvae. This is because even the optimum temperature of mosquito growth is 25-27^0 C, but normally, the mosquitoes still can lay the eggs in around 20-30^0 C. Their growth will be stopped at the temperature of <10^0 C or above 40^0 C. This study in line with the study conducted by Arsunan et al in Makasar [18] and despite 7 being the optimal pH level for mosquitoes breeding, mosquitoes are still able to lay their eggs in water with pH level of 5.8-8.6. This might be the case as to why there were no direct correlations between the pH level of water container and the presence of *Aedes sp* larvae. This result not in line with the previous study, study conducted by Yasuoka et al and Yudhastuti et al found there was significant coreelation between pH and the presence of *Aedes sp* larvae [19], [20].

This research revealed that the correlations between the practice of water-container draining and the presence of *Aedes sp* larvae, as shown by *p value* = 0.485 (*p value*≥0.05), are absent. Contrary to expectation, this study did not find significant difference between practices water-container draining and the presence of *Aedes sp* larvae. The result of this research matches with the research conducted by Riandi et al in Tasikmalaya 2017, and it was revealed that there were no significant correlations between the practice of water-container draining and the presence of *Aedes sp* larvae as shown by *p value* = 0.099 in Cibunigeulis village [21] while other study conducted by Overgaard found that the frequency of washing container associated with *Aedes sp* investation, never-washed-container reported four times more likely to be infested than those washed every week [17]. Despite having been drained, there were still moss and dirt on the water container wall. This leads to low-light reflection which attracts mosquitoes to breed [7].

This research reveals that there were no significant correlations between owning mosquito-larvae-eating fish and the presence of *Aedes sp* larvae as shown by *p value* = >0.999 (*p value*≥0.05) because the majority of people do not own this type of fish. Surprisingly, only 5% of the respondents who own the fish. The people decided not to own this type of fish as the water will smell fishy. This study has been unable to demonstrate that fish were biological factors to control *Aedes sp* larvae in water storage. While study conducted by Ibbara et al found that there was significantly different from container indexes prior to the test as well as from control without fish (p <0.05) [22][23].

Conclusion

According to chi-square test in this research, there were no correlations between the status of owning the house/building and the presence of *Aedes sp* larvae with *p value* = 0.153 (*p value*≥0.05). This outcome was contrary to that of Ferdousi et al who found independent household was significantly related to household infestation of *Aedes sp* larvae (OR=1.57;95% CI (1.35-1.83, p <0.001) [6].

Acknowledgement

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