

# Identification of Mosquito Larva in Water Containers in Line with the Knowledge, Attitude and Practice of Cleaning Service in Relation to Mosquito Breeding at Pascasarjana Unsri

Ahmad Ghiffari<sup>1,\*</sup>, Mukhlasinia Aprilita<sup>2</sup>, Chairil Anwar<sup>3</sup>, and Bahrin Indawan Kasim<sup>4</sup>

<sup>1</sup>Department of Parasitology, Faculty of Medicine, Universitas Muhammadiyah Palembang, Palembang, Indonesia

<sup>2</sup> Bachelor student, Faculty of Medicine, Universitas Sriwijaya, Palembang, Indonesia

<sup>3</sup>Department of Parasitology, Faculty of Medicine, Universitas Sriwijaya, Palembang, Indonesia

<sup>4</sup>Department of Public Health, Faculty of Medicine, Universitas Sriwijaya, Palembang, Indonesia  
chairil53@fk.unsri.ac.id

**Abstract.** Mosquitoes are vectors of several diseases for humans. To eradicate mosquitoes, information regarding breeding place of mosquito larva along with the knowledge and role of cleaning service are required. This study was aimed to identify water container as breeding sites for mosquitoes and as well as to discover knowledge, attitude and practice of cleaning service in relation to mosquitoes eradication at Pascasarjana Unsri. This study used a qualitative descriptive approach. The samples were all mosquito larva taken from the water containers. The Informants were taken with quota sampling and the information was obtained by in-depth interviews. Of the 108 containers, 30 (27.78%) indoor containers entirely contain clear water and meanwhile in 78 (72.22%) outdoor containers, 13 containers contain turbid water and 65 containers contain clear water. There were 431 mosquito larva found in five indoor containers (60 larva) and 26 outdoor containers (431 larva). Larva Free Rate (LFR) was 83.33%, House Index (HI) 16.67%, Container Index (CI) 28.70%, and the Breteau Index (BI) 41.67%. The species of mosquitoes found were *Aedes aegypti*, *Aedes albopictus* and *Culex*. Cleaning services have a good knowledge and attitude about mosquito breeding and practice in eradicating mosquitoes according their responsibility as cleaning service.

## 1 Introduction

Mosquito is a vector or a disease transmitter for humans [1]. The incidence of the disease that its transmitted is due to the high density of mosquito vectors, especially in tropical country such as Indonesia [2]. Indonesia is endemic territory to mosquito-borne diseases such as dengue fever, malaria and filariasis [3–5]. Female mosquitoes usually choose specific types of water to lay eggs such as clean clear water, dirty water, water brackish or other types of natural containers [6]. Mosquito eggs hatch in water and then become larva [7]. The life cycle of mosquito which ideal and effective way as vector control is at the larval stage [8].

Cleaning services play important role in controlling the mosquito density [9]. Their daily tasks such as throwing out garbage, draining water reservoir regularly, protect the water reservoirs, burying used bottles or cans, and so on, will efficiently support the program of vector borne disease eradication. There is necessity to understand the knowledge-attitude-practice of the cleaning services regarding water reservoir and to identify which water containers in offices (such as in PascasarjanaUnsri) which potentially can be inhabited by mosquitoes.

## 2 Materials and Methods

### 2.1 Study Area

This was a descriptive qualitative research. The data were collected by direct observation on water reservoirs and in-depth interviews to cleaning services at PascasarjanaUnsri. The population in this study was the unit of water reservoir and the larvae as the population variation per unit of analysis. Mosquito larvae sampling was done by full sampling technique which all mosquito larvae in the water reservoir were taken as research sample, while the respondents sampling were chosen with the sampling quota technique.

### 2.2 Sampling of Mosquitoes

The water reservoir data (TPA), the number and types of larvae found were presented in the table and described in narrative form, while the respondents' knowledge-attitudes-practice were presented verbatim and presented in tabular form to draw conclusion.<sup>5</sup>

## 3 Results and Discussions

There were 108 TPAs inside and outside the room with potential for mosquito breeding, 30 (27.78%) and 78 (72.22%) indoor and outdoor respectively. 31 TPAs were found with mosquito larvae, 5 (16.13%) and 26 (83.87%) indoor and outdoor respectively. Table 1 shows location and TPA number.

**Table 1.** Location and TPA number

Location of TPA	n	%	Positive larva		Negative larva	
			n	%	n	%
Indoor	30	27.78	5	16.13	25	32.47
Outdoor	78	72.22	26	83.87	52	67.53
Total	108	100.00	31	100.00	77	100.00

Below are the Larva Free Rate (ABJ), House Index (HI), Container Index (CI), and Breteau Index (BI).

**Table 2.** Larva Index

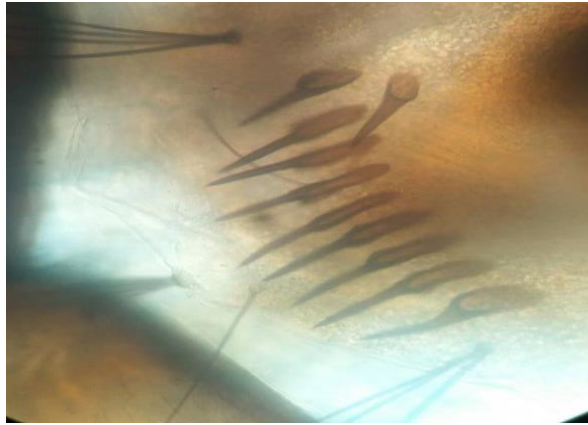
Indicator	Parameter
<i>Larva free rate (%)</i>	83.33
<i>House Index (%)</i>	16.67
<i>Container Index (%)</i>	28.70
<i>Breteau Index</i>	41.67

Sixty five natural or manmade containers were acknowledged to be filled with clear water or cloudy water. The clear water containers are: eight glasses of used mineral water, a food box, four plastic cups, three puddles of air conditioning, two buckets, 13 flower pots, a piggy bank, three used bottles, one jar cap, 18 flower vases, one vase cap, three fish ponds, one used bowl, two drum lids, and three armpit leaves. While the cloudy water containers are: six sewers, two open pipes, one can, two ground water puddles and two ponds. Table 2 lists Type of Natural and Manmade containers.

**Table 3.** List of TPA containers.

Lists TPA	n	%	Positive larva		Negative larva	
			n	%	n	%
Buckets	13	12.04	1	3.23	12	17.65
Bath tube	19	17.59	5	16.13	11	16.18
Water mineral plastic	8	7.41	3	9.68	5	7.35
Food box	1	0.93	1	3.23	0	0.00
Plastic cups	4	3.70	4	12.90	0	0.00
Sewers	6	5.55	2	6.45	0	0.00
Open pipe	2	1.85	2	6.45	0	0.00
Bread used can	1	0.93	0	0.00	1	1.47
AC puddles	3	2.78	0	0.00	1	1.47
Vase cap	13	12.03	3	9.68	10	14.70
Ground water	2	1.85	0	0.00	2	2.94
Piggy bank	1	0.93	1	3.23	0	0.00
Used bottles	3	2.78	3	9.68	0	0.00
Jar cap	1	0.93	1	3.23	0	0.00
Bread plastic	1	0.93	1	3.23	0	0.00
Flower vases	18	16.67	0	0.00	18	26.47
Park ponds	2	1.85	0	0.00	2	2.94
Fish ponds	3	2.78	0	0.00	3	4.41
Used bowls	1	0.93	1	3.23	0	0.00
Drum lids	2	1.85	2	6.45	0	0.00
Vase lid	1	0.93	1	3.23	0	0.00
Leaves armpit	3	2.78	0	0.00	3	4.41
Total	108	100.00	31	100	68	100.00

Through microscope, the characteristics of: *Aedes* larvae are short and thick siphon, a pair of siphon feathers, and comb tooth with lateral spine (no lateral for *Aedes albopictus*); in contrast with the *Culex* larvae are slim and long siphon, anal segment with closed saddle. *Culex* larvae were collected from the two sewers. Table 4 lists genus of larva collected from the containers.



**Fig. 1.** *Comb Scale* of larva *Aedes albopictus* (magnification 40x10)



**Fig. 2.** *Comb Scale* of *Aedes aegypti* larvae (magnification 40x10)

**Table 4.** Genus larva collected in TPA.

List TPA	Genus Larva
Bath tube in main building	<i>Aedes</i> ( <i>Ae. aegypti</i> and <i>Ae. albopictus</i> )

Bath tube in library	<i>Aedes (Ae. aegypti)</i>
Used food box	<i>Aedes (Ae. albopictus)</i>
Plastic cups	<i>Aedes (Ae. albopictus)</i>
Sewers	<i>Culex</i>
Opened pipe	<i>Aedes (Ae. aegypti and Ae. albopictus)</i>
Used water plastics	<i>Aedes (Ae. albopictus)</i>
Buckets	<i>Aedes (Ae. albopictus)</i>
Vase cap	<i>Aedes (Ae. albopictus)</i>
Piggy bank	<i>Aedes (Ae. albopictus)</i>
Used bottles	<i>Aedes (Ae. albopictus)</i>
Jar lid	<i>Aedes (Ae. aegypti)</i>
Bread used plastics	<i>Aedes (Ae. albopictus)</i>
Used bowls	<i>Aedes (Ae. aegypti and Ae. albopictus)</i>
Drum lids	<i>Aedes (Ae. albopictus)</i>
Vase lids	<i>Aedes (Ae. albopictus)</i>

The results of in-depth interviews on the knowledge, attitudes and practices of cleaning services were presented in the Table 5-6-7.

**Table 5.** Knowledge of the Cleaning services regarding Mosquito borne disease

Item	Knowledge	Source
Knowledge about mosquitoes as vector of human disease	<i>"I think the dengue mosquito is striped"</i>	JF
	<i>"Yes it can. If we are bitten by the Aedes aegypti"</i>	SF
	<i>"I know that it can transmitted, if the mosquito sucked our blood"</i>	AG
Knowledge of mosquito life cycle and breeding site	<i>"Yes I know that the mosquito breed in stagnant water"</i>	JF
	<i>"It can breed, into larvae later grow to adult"</i>	SF
	<i>"It breed, where there is logged water"</i>	AG
Knowledge about the symptoms of dengue hemorrhagic fever	<i>"DHF sign is a red on the skin. What' else? High fever!"</i>	JF
	<i>"Fever, lethargic body, I have had DHF long time ago"</i>	SF
	<i>"It feels bit chilly, cold body, and then the red bumps begins"</i>	AG
Knowledge about the prevention of dengue hemorrhagic fever	<i>"It can be prevented with being clean, draining water container once a week, trashing garbage later burning, logging out the sewers"</i>	JF
	<i>"Closing water reservoirs lid, clean up the bath, dried the gutters"</i>	SF
	<i>"Drain, bury, what else I forget!"</i>	AG

**Table 6.** Attitude of the cleaning services regarding mosquito borne disease.

Item	Attitude	Source
Attitude about the	<i>"Agree, it can be prevented"</i>	JF

prevention of dengue hemorrhagic fever	<i>“Agree”</i>	SF
	<i>“Agree, it can be prevented. Maybe using Autan (repellent), keep the cleanliness, manage the water container”</i>	AG
Attitude about the importance to implement vector breeding eradication	<i>“Agree, let us trash the garbage, then drained the water logged”</i>	JF
	<i>“I agree to do, for our ourselves health”</i>	SF
	<i>“Agree”</i>	AG

**Table 7.** Practice of the cleaning services regarding mosquito borne disease.

Item	Practice	Source
Practice about the prevention by draining the bathtub	<i>“The bathtub is cleaned once every two weeks, by each personal in each building. Should be drained, later brushed”</i>	JF
	<i>“The bathtub is cleaned every two weeks, regularly”</i>	SF
	<i>“If we observe that it was dirty, whether one week or three days that it should be clean. And when the water is getting less”</i>	AG
Practice about the prevention by closing the water container	<i>“..the trash box is closed..”</i>	JF
	<i>“Let us closed the garbage box”</i>	SF
Practice about the prevention by disposal waste cleaning	<i>“Ever been buried but not routinely, once a week or two times when he fills the garbage”</i>	SF
	<i>“Rubbish is collected, later thrown at backyard. The dry part is immediately burnt, while the wet ones is first collected until it dried”</i>	AG
Practice about the prevention about the dengue fever	<i>“All were clean, later throwed away. The trash can is closed, once in a while buried in backyard”</i>	JF
	<i>“Clean up the bathtub, also to clean up the sewers”</i>	SF
	<i>“Should be clean up every day, thrown away, trash out the garbage”</i>	AG
Practice about abate and fogging	<i>“Never, no Abate application before”</i>	JF
	<i>“I don’t know, about Abate before”</i>	SF
	<i>“Never been used the pellets before. But on Friday, there is insecticide fogging”</i>	AG

The results of in-depth interviews with the Padang Puskesmas officers are presented in Table 8.

**Table 8.** Data triangulation to community health offices officers of Padang Selasa.

Item	Attitude	Respondent
Mosquito	<i>“Once a month, we take one (home visit per) month 5 RT”</i>	IN

vector control	(neighborhood)"	
	"Fogging if only there were DHF patients, which minimum five people infected. The fogging where for the five families (surrounding the patients house): five in right and left families. When there is no DHF, no necessary for fogging. That means the mosquitoes are not from around the house, maybe from elsewhere, perhaps at school"	IN
	"There was no information early warning of dengue symptoms, we don't do. Only when the patient comes here, they complain about fever, then we explain. On other occasion, we will counsel about such fever is more than three days. The fever information explained in the Posyandu (when doing home visit)"	IN
Epidemiology investigation	If I want to know the incidence of DHF, just ask to the health office. Report are compiled in the office, once a month I also submit. Furthermore, we will recheck the patient's house again also the neighbor's condition. If there is no more case, means the vector are not around"	IN
	"There is a surveillance officer that he is going to look around, where most cases are. He will suggest which RT (neighbor), later home visiting. Then the recommendation for fogging, for one RT and five house surrounding the patients'"	IN
	In 2016, I think there were more cases. Let me see (opening book record) twenty-eight cases. Last year 2017, let me also check (searching the record book), aha more cases, forty-four"	IN

The water reservoirs (TPA) found in this study were potential for *Aedes* genus breeding[10]. Most of the sites were the clear water places[9.11]. *Aedes* mosquitoes prefer artificial/manmade containers for breeding[12–14]. Container size and the amount of water contained therein affect the number of larvae[15]. The study showed *Aedes albopictus* larvae were more outdoors compare to *Aedes aegypti* which were found indoors[12.16–18]. This is consistent with the life habits of *Aedes aegypti* which is living and resting inside the house such as home furnishings[19.20]. By contrast, *Aedes albopictus* habits were outdoors while a forest species can adapt to the environment in rural, semi urban and urban areas[21.22]. Nonetheless, *Culex* larvae are found in dirty sewer condition where lots of organic and inorganic waste can support its breeding process[23].

House Index (HI) 16.67%, Container Index (CI) 28.71% and Breteau Index (BI) 258.3, means category 3 that the area has medium density of larvae, category 5 which means the area has medium density of larvae, category 9 which means the area has high vector density respectively[24].11 Areas with an HI of more than 5% and BI more than 20% are prone and sensitive areas of DHF[25].

*Aedes aegypti* mosquito larva has a characteristic of having a short, thick and black siphon, open saddle and laterally spiny comb, can be distinguishes from *Aedes albopictus* which has no lateral spines[26]. The *Culex* larva has a siphon with a ratio of width and length of approximately 1: 6, has tuft on siphon > 1 pair, has acus on the base of siphon and has a closed saddle. Larvae genera of the *Aedes* Genus (*Aedes aegypti* and *Aedes albopictus*) and *Culex* genus larvae were both found in the study[23].

Cleaning services at Pascasarjana Unsri generally have good knowledge and attitude about mosquito breeding. Unfortunately, the practices on mosquito breeding are very lacking[27]. Numbers of mosquito larvae collected were still high. Furthermore no counseling nor promotion regarding vector borne disease has being performed. Chief of cleaning services

has no primary role on mosquito control, simply cleaning up the workplace without considering burying artificial used containers surrounding the office[28]

## 4 Conclusion

One hundred eight containers of TPA water reservoirs have the potential to become mosquito breeding habitat. Four hundred thirty one larva were collected, with the genus of *Culex* and *Aedes* (*Aedes aegypti* and *Aedes albopictus*).

Cleaning services have good knowledge and attitude about mosquito breeding, albeit it did not affect the high number of mosquito larvae found in the area of PascasarjanaUnsri.

## Acknowledgments

Thanks to dr. Dalilah, M.Kes and drh. Muhaimin Ramdja, M.Sc for the comments and suggestions. Kindest regards to all the staff of Parasitology Department, family, friends and all parties who have assisted in completing this research.

## References

1. Elyazar I R F, Sinka M E, Gething P W, Tarmidzi S N, Surya A, Kusriastuti R, Winarno, Baird J K, Hay S I and Bangs M J. **83** (2013)
2. Yoshikawa M J and Kusriastuti R 2013 Surge of Dengue Virus Infection and Chikungunya Fever in Bali in 2010. *Med. Health* **41** (2010)
3. Indriani C, Ahmad R A, Wiratama B S, Arguni E, Supriyati E, Sasmono R T, Kisworini F Y, Ryan P A, Neill S L O, Simmons C P, Utarini A and Anders K L (2018)
4. Hasyim H, Nursafingi A, Haque U, Montag D, Groneberg D A, Dhimal M, Kuch U and Müller R. J. **17** (2018)
5. Boesri H. Spirakel (2012)
6. Hamid P H, Prastowo J, Ghiffari A, Taubert A and Hermosilla C. **12** (2017)
7. Harbach R E and Knight K L, *Taxonomists glossary of mosquito anatomy*, (1980)
8. Donnelly B, Berrang-Ford L, Ross N A and Michel P. J. **14** (2015)
9. Susanto T, Sulistyorini L, Wuryaningsih E W and Bahtiar S. *Int. J. Nurs. Sci* **3** (2016)
10. Patz, Graczyk T K, Geller N and Vittor A Y. *Int J. Parasitol* **30** (2000)
11. Freeman M C, Chard A N, Nikolay B, Garn J V., Okoyo C, Kihara J, Njenga S M, Pullan R L, Brooker S J and Mwandawiro C S. *Parasites and Vectors* **8** (2015)
12. Hiscox A, Kaye A, Vongphayloth K, Banks I, Piffer M, Khammanithong P, Sananikhom P, Kaul S, Hill N, Lindsay S W and Brey P T. *J. Trop. Med. Hyg* **88** (2013)
13. Mardihusodo S J, Satoto T B T. *Dengue Bulletin* **35** (2011)
14. Aji R. *Int. Res. J. Public Environ. Heal* **3** (2016)
15. Wijayanti S P M, Sunaryo S, Suprihatin S, McFarlane M, Rainey S M, Dietrich I, Schnettler E, Biek R and Kohl A. *PLoS Negl. Trop. Dis* **10** (2016)
16. Leta S, Jibat T, Clercq E M De, Amenu K, Kraemer M U G and Revie C W. *Int. J. Infect. Dis* **67** (2018)
17. Lambrechts L, Scott T W and Gubler D J. *PLoS Negl. Trop. Dis* **4** (2010)
18. Tsunoda T, Cuong T C, Dong T D, Yen N T, Le N H, Phong T V and Minakawa N. *PLoS One* **9** (2014)
19. Lambrechts L, Paaijmans K P, Fansiri T, Carrington L B, Kramer L D, Thomas M B



- and Scott T W. *Proc. Natl. Acad. Sci. U. S. A* **108** (2011)
20. Wilder-Smith A, Gubler D J, Weaver S C, Monath T P, Heymann D L, Scott T W, Suwandono A, Kosasih H, Nurhayati, Kusriastuti R, Harun S, Ma'roef C, Wuryadi S, Herianto B, Yuwono D, Porter K R, Beckett C G, Blair P J, Suroso T, Holani A, Ali I, Simmonds P, Adams M J, Benk M, Breitbart M, Brister J R, Carstens E B, Davison A J, Delwart E, Gorbalenya A E, Harrach B, Hull R, King A M Q, Koonin E V., Krupovic M, Kuhn J H, Lefkowitz E J, Nibert M L, Orton R, Roossinck M J, Sabanadzovic S, Sullivan M B, Suttle C A, Tesh R B, Van Der Vlugt R A, Varsani A, Zerbini F M, Sendow I, Bahri S, Saxena S K, Tiwari S, Saxena R, Mathur a, Nair M P N, Sakkas H, Economou V, Papadopoulou C, Saiz J C, Martín-Acebes M A, Buenomari R, Salomón O D, Villamil-Jiménez L C, Heukelbach J, Alencar C H, Armstrong P K, Ortega-Carvalho T M, Mendez-Otero R, Rosado-de-Castro P H, Pimentel-Coelho P M, Rica C, Martin S, Rezende I M de, Sacchetto L, Munhoz de Mello É, Alves P A, Iani F C de M, Adelino T É R, Duarte M M, Cury A L F, Bernardes A F L, Santos T A, Pereira L S, Dutra M R T, Ramalho D B, de Thoisy B, Kroon E G, Trindade G de S, Drumond B P, Olson J G, Ksiazek T G, Suhandiman G, Triwibowo V, Musso D, Gubler D J, Monath T P, Vasconcelos P F C, Mlakar J, Korva M, et al. *PLoS Negl. Trop. Dis* **12** (2017)
  21. Muller R, Knautz T, Volker J, Kress A, Kuch U and Oehlmann J. *J. Med. Entomol.* **50**, 3 (2013)
  22. Marcondes C B and Ximenes M de F F de M. *Rev. Soc. Bras. Med. Trop* **49** (2016)
  23. Stoops C A, Gionar Y R, Shinta, Sismadi P, Rusmiarto S, Susapto D, Rachmat A, Elyazar I F and Sukowati S. *J. Vector Ecol* **33** (2008)
  24. Taviv Y, Saikhu A and Sitorus H. *Bul. Penelit. Kesehat.* **38** (2010)
  25. Bangs M J, Larasati R P, Corwin A L and Wuryadi S. *J. Trop. Med. Public Health* **37** (2006)
  26. Smith L B, Kasai S and Scott J G. *Pestic. Biochem. Physiol* **133** (2016)
  27. Yaser S A, Vatandoost H, Yavar R, Reza A M, Reza S D A and Azim P. *J. Trop. Med* **3** (2010)
  28. Hamid P H, Prastowo J, Widyasari A, Taubert A and Hermosilla C. *Parasites and Vectors* **10** (2017)