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DENSITY OF *AEDES AEGYPTI* LARVAE AS INFLUENCED BY CONTAINERS

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ABSTRACT

The results of the study of the density of *Aedes aegypti* larvae from the Cochran's Q test for the presence of larvae in the school environment (p=0.000) and the CI and DF values after training and mentoring of adolescent jumantik for the school environment were at 0 WHO positive containers. Training and mentoring of Youth Jumantik on the presence of *Aedes aegypti* larvae at MAN 3 Makassar City has a significant effect on the presence of *Aedes aegypti* larvae. Therefore, it is recommended that Youth Jumantik activities be carried out by adding cadres so that the proliferation of *Aedes aegypti* larvae and the risk of dengue fever transmission in the school and home environment does not occur.

Key words: Density, occurrence, container characteristics, *Aedes aegypti,* larvae, training, mentoring, home, school, youth, Jumantik

Dengue hemorrhagic fever (DHF) is endemic in most tropical regions and certain subtropical regions. The disease poses a serious risk since it spreads swiftly throughout a region and is carried by the *Aedes aegypti* mosquito. In endemic locations, the number of dengue fever cases might approach hundreds of people infected with the virus (Suryowati, Bekti and Faradila 2018; Sivabalakrishnan et al., 2023). The viruses that cause dengue, chikungunya, and zika are spread by *A. aegypti* (Qureshi et al., 2023). The virus known as dengue fever, which is transmitted from mosquitoes to people, has become more common in recent years (WHO, 2024; Kemenkes, 2019). The management of dengue fever entails a number of measures. Insecticide use, community education, mosquito nest removal, case evaluation and treatment, surveillance, and reporting are among these and it has to be done by including multiple stakeholders and carrying out these actions in their entirety (Jantika et al., 2021). Dengue cases increased to 430.023 million cases globally in 2013 and then to 1,050 cases (285 million cases) in 2019. 2019 saw the most number of dengue cases ever recorded worldwide (Togami et al. 2023). According to the WHO, there were 2,300 fatalities and 4.5 million cases in the Americas. Asia saw a significant number of cases 321,000 in Bangladesh, 111,400 in Malaysia, 150,000 in Thailand, and 369,000 in Vietnam, (WHO 2023).In Indonesia, 143,266 cases of dengue hemorrhagic fever (DHF) were reported in 2022; of those instances, 1,237 persons lost their lives. There were 57,884 instances of dengue hemorrhagic fever and 422 cases of deaths from the illness as of the 33rd week of 2023. Out of the 13 P2PM provinces in Indonesia, Sumatra, Java as a whole, sections of Sulawesi, Bali, and Nusa Tenggara have the highest number of dengue cases (Kementrian Kesehatan, 2023). Mosquito larva density can be influenced by various factors, including water availability as a breeding ground, environmental conditions, and interactions with human factors. Controlling disease vectors, such as dengue fever, by monitoring and controlling mosquito larval density is an important step. Understanding and effectively managing mosquito larval density can help reduce the risk of disease transmission (Dharmamuthuraja et al. 2023).

The Dengue Larval Vector Density Index can be used to determine the density of dengue larval vectors. The house index (HI), breteau index (BI), container index (CI), and the degree of larval absence are the dengue vector density indices (Liziawati et al., 2023). The early stages of the *A. aegypti*, which is the primary vector of dengue hemorrhagic fever (DHF), are larvae when they are present in areas with water, like puddles, flower pots, and bathtubs. The initial stage of a mosquito's life cycle during which it can bite people and transmit the dengue virus is called a larva (Nurdin et al. 2022). According to Kumawardani's research (2020), the existence of mosquito vectors with the Jumantik frame can demonstrate how the methods, duration, and individuals involved in the formation of

Jumantik cadres differ greatly from those in Indonesia. Jumantik intervention can decrease the housing index (HI) by 40%, bretau index (BI) by 40%, container index (CI) by 20%, and enhance ABJ >75% (Kusumawardani, 2020). Based on this description, this study evaluates the density of *A. aegypti* larvae based on container characteristics at MAN 3 Makassar City.

MATERIALS AND METHODS

This study is a quasi-experiment with training intervention to determine the presence and density of mosquitoes; it was conducted twice, namely before (pretest) and after (posttest) using questionnaires and direct container observation using observation sheets at MAN 3 Makassar. The study examined all the densest containers at MAN 3 Makassar City. Sampling used a purposive random sampling method and number of container samples was 46. Larval density was measured using various indices such as the house index (HI), container index (CI), and breteau index (BI) (Anindita et al., 2023). Measurement of the presence of larvae was carried out four times, namely once before and three times after the training and mentoring of Jumantik Remaja. Before the intervention, a pretest was conducted to analyze the presence of *Aedes aegypti* at the beginning. After the training, measurements were taken again by filling out the observation sheet (posttest). Measurement of the presence of larvae was based on the condition of containers found positive for larvae both in the school environment and students' homes (i). The larval presence variable was divided into two categories: positive (if larvae were found) and negative (if no larvae were found). The level of larval presence was measured based on Container Index (CI) values using Density Figure (DF) values expressed on a scale of 1-9 according to WHO. Low density (DF-1), medium density (DF= 2-5), and high density (DF= 6-9). The results of the bivariate analysis were obtained using SPSS (Statistical Package for the Social Sciences) (Ahyar et al., 2020). The study determines the presence of mosquito larvae in each positive container examined; and to calculate larval density based on container index (CI) and density figure (DF) according to WHO (World Health Organization).

RESULTS AND DISCUSSION

The study observed that containers serve as breeding habitat for *A. aegypti* mosquitoes such as barrels, dispensers, flower vases, flower pots, aquariums, and fish ponds (Table 1). An area's mosquito populations can be inferred from the presence of larvae and environment and people have a significant impact (Onasis et al. 2022). *Aedes aegypti* larvae seem more positively correlated with containers made of cement and soil than with plastic or ceramic materials. It's also crucial to keep containers clean and dry to stop *Aedes aegypti* larvae from reproducing (Triwahyuni et al., 2020). Before the intervention of training and mentoring of Jumantik Remaja, the most common type of container found positive for larvae was a landfill in WC buckets as many as 11 containers (23.9%) and non-landfill, namely flower pots 10 containers (21.8%). After the training, in the first observation, the most common type of container found positive for larvae was the flower pot with 3 containers (6.4%) and the WC bucket and cutting board dispenser with 1 container each (2.2%). In the third observation or the last one, 0 containers were found positive.

In the school environment it was observed that dispenser gutters, used goods, and flower pot gutters are positive for larvae at MAN 3 Makassar city. It

Table 1. Distribution of *A. Aegypti* larvae by container type before and after training and mentoring (School environment of Youth Jumantik MAN 3 Makassar city)

Container type	Number of containers	*L*arvae positive containers									
		Pre		*Post (I)*		*Post (II)*		*Post (III)*			
	n	%	n	%	n	%	n	%	n	%	
TPA	24	52,2	13	28,2	2	4,4	2	2,2	0	0	
WC bucket	20	43, 5	11	23, 9	1	2, 2	2	2,2	0	0	
Water reservoir	4	8,7	2	4, 3	1	2, 2	0	0	0	0	
Non TPA	22	47.8	15	32, 7	5	10, 8	0	0	0	0	
Flower pot	17	37.0	10	21, 8	3	6, 4	0	2,2	0	0	
Cutting board dispensers	4	8,7	4	8,7	2	4, 4	0	0	0	0	
Used goods (Chair)	1	2.2	1	2,2	0	0	0	0	0	0	
Total	46	100	28	60, 9	7	15, 2	2	2,2	0	0	

Source: Primary Data, 2024

Table 2. Analysis of larvae existence and larval density value at container index (CI) in the school environment before and after training and assistance of youth Jumantik at MAN 3 Makassar city

Pre and post test	Larve presence		p-value	Container index positive	Density figure positive
	Positive	Negative			
Pre	28	18	0,000	60,8	9
Post I	7	39		15,2	5
Post II	2	44		4,3	3
Post III	0	46		0	0

Source: Primary Data, 2024

has the potential to become a breeding ground for mosquitoes are more interested in resting and laying their eggs in containers that have plastic material and are dark in colour, and are protected from sunlight. One environmental component that appears to affect the presence of larvae in communal settlements is the presence of mosquitoes (Izhar and Syukri, 2022). Water reservoirs, standing water in containers, and bare patches of land covered in dense vegetation can all serve as breeding grounds. Certain areas, such as tree fronds or coconut shells, are also possible nesting grounds, therefore they require extra care (Mawaddah et al., 2022).

The results on % of containers that are positive are significant, before the intervention of training and mentoring of Jumantik Remaja; it was 60.9% and decreased to 39.1% after training and mentoring (Table 2). This explains that the training and mentoring of Jumantik Remaja has a significant effect in the school environment at MAN 3 Makassar City of the 46 containers examined, it can be seen that before the training was conducted, the density was in the high category obtained with a CI value of 60.8% and DF = 9 based on WHO; after the training, in the third observation, the density level was at a CI value of 0%. Lukman et al. (2020) observed that family participation is associated with significantly different post test data in the intervention area. Such difference intervention area has been known (Hakim et al. 2020). According to the findings of another study, there is a correlation (p-value = 0.031) between the colour of the container and the number of larvae present in Tembalang District elementary schools in Semarang City. Dark-colored water reservoirs were shown to have a higher concentration of larvae. This is because *Aedes aegypti* mosquitoes tend to lay their eggs in less-lit environments since they feel more secure and at ease in such environments (Fitriyatun and Putriningtyas, 2021).The results showed that 26% of homes surveyed had larvae. These results were obtained from research conducted in the Majuleng sub-district, Wajo district. The study specifically focused on the density of *Aedes aegypti* larvae in the area (Rasjid, Khaer, and Febrianti, 2023).

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AUTHOR CONTRIBUTION STATEMENT

All authors contributed equally to the conception and design of the study. All authors read and approved the final manuscript.

CONFLICT OF INTEREST

No conflict of interest.

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