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LARVAL DENSITY AND INCIDENCE OF DENGUE HEMORRHAGIC FEVER IN URBAN AREA OF JARKATA

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ABSTRACT

Dengue Hemorrhagic Fever (DHF) is a current health problem in Indonesia, characterized by anoutbreaks of diseaseincidence in several provinces. The elevated prevalence of DHF in DKI Jakarta is caused by high population density and mobility. This research was conducted in five villages with the following larvaeindexfor observation, encompassing House Index (HI), Container Index (CI), and Breteau Index (BI). This type of research is quantitative research that is observational, with study design Cross Sectional. A total of 200 elderly were included in the study. Data was analysed using SPSS and bivariate analysis was aimed at identifying the significance and relationship between Chi square test was used for data analysis. The results and chi square test statistical analysis showed the absence of a correlation between the existence of larvae and the incidence of DHF in Kalideres Subdistrict. In addition, the highest larvae density was observed in Tegal Alur Village with a density figure (DF) of 6.67.The density figures (DF) of Kalideres, Pegadungan, Semanan and Kamal Villages were in the medium range of 2-5, while Tegal Alur Village demonstrated a high range of 6-9.

Keywords : Dengue Hemorrhagic Fever (DHF), outbreaks of disease, *House Index (*HI), *Container Index* (CI), *Breteau Index* (BI)

Introduction

Dengue hemorrhagic fever (DHF) is an infectious disease caused by arboviral pathogens, and is known to impact on public health[1,2,3]. This virus is transmitted to humans through the bite of infected female mosquitoes, especially the Aedes aegypti species[4], and the infection is characterized by symptoms of fever with headaches, anorexia, vomiting, stomach aches, and potential death[5]. Furthermore, dengue is a problem experienced in Indonesia every year, causing outbreaks of diseasein several cities, including Jakarta, in 2019. Based on the Indonesia's health profile for 2015 - 2016, an increase was observed in the number of cases from 129,650 to 204,171[6]. In 2015, data gathered from the 6 cities in Jakarta, including Central, East, West, North, and South Jakarta, as well as the Thousand Islands, showed a significant increase in DHF cases from 11,905 to 39,487 in 2016.[7]

The condition of environmental sanitation is a major causative factor, including lighting, the

existenceof larvae, house and residential density, temperature, and rainfall[7]. In addition, the breeding place for

Aedes aegypti is usually related to the puddle and open waterways, e.g., barrels, drums, pots, buckets, flower vases, plant stems or leaves, tanks, discarded bottles, cans, old tires and others,characterized by absent cleaning practices[8]

According to[9] reported on the existence of a relationship between the incidence of dengue fever and residential density, as shown by the heightened risk of contraction in children of parents living in those conditions. According to[10] showed a significant positive correlation with the existence of larvae.

This was due to the lack of independent *jumantik* (individual larvae supervisorsorinspectors) in the Kalideres Subdistrict area, as numerous potential breedingplaces still exist for Aedes aegypti, the difficulty of implementing Eradication of Mosquito Nest in local companies and industries, the challenge of obtaining clean water, thus the community buys from Drinking Water Company and collects rainwater for daily needs, crowded housing conditions, as well as the deprivation of facilities and infrastructure DHF Operational Working Group Kalideres Subdistrict. These challenges spark interest towards the examination of dengue hemorrhagic fever (DHF) determinants in the Kalideres Subdistrict Health Center, Indonesia.

Methods

This is an observational quantitative study, with cross sectional design, and the sample used were inclusive of respondents in the Kalideres Subdistrict area, Jakarta. Furthermore, the research variables entail the existence of larvae in five villages and the incidence of dengue hemorrhagic fever (DHF).

This research was conducted in Kalideres Subdistrict, Jakarta, which consists of five villages, encompassing Tegal Alur, Kalideres, Pegadungan, Semanan, and Kamal. In addition, the larvae index employed during observations include House Index (HI), Container Index (CI), and Breteau Index (BI). Also, stratified random sampling was used to obtain samples, and 20 were selected from each village, making a total of 100 respondents.

The research instrument used to obtain the incidence of DHF involves the collection of secondary data from patients in the last month atKalideresSubdistrict. This is followed by calculating the number of larvae, using the following formula, according to [5] :

a. *House Index* (HI)

$$\textit{House Index (HI)} = \frac{\text{Number of house (+) larvae}}{\text{Number of inspected houses}} \times 100\%$$

b. *Container Index* (CI)

$$\textit{Container Index (CI)} = \frac{\text{Number of containers with larvae}}{} \times 100\%$$

Number of inspected containers

c. *Breteau Index* (BI)

Breteau Index (BI) = Number of containers with larvae x 100%

100 inspected houses

Table 1. Density figure Criteria

Density Figure	HI	CI	BI
1	1-3	1-2	1-4
2	4-7	3-5	5-9
3	8-17	6-9	10-19
4	18-28	10-14	20-34
5	29-37	15-20	35-49
6	38-49	21-27	50-74
7	50-59	28-31	75-99
8	60-76	32-40	100-199
9	> 77	> 40	> 200

Source:[5]

Description:

DF (*Density Figure*) = 1 Low density

DF (*Density Figure*) = 2-5 Medium density

DF (*Density Figure*) = 6-9 Highdensity

Univariate analysis was conducted with the aim of distinguishing the frequency distribution of variables, while bivariate analysis was aimed at identifying the significance and relationship between the independent and dependent. Furthermore, Chi square test was used for data analysis, while the House Index (HI), Container Index (CI), and Breteau Index (BI) were calculated and tabulated for descriptive statistics.

Results

Observations were made directly in the five villages, encompassing Tegal Alur, Kalideres, Pegadungan, Semanan, and Kamal, using the larvae inspection observation form.

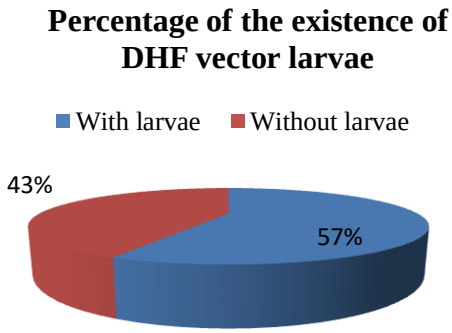

Figure 1. Percentage of the existence of DHF vector larvae in Kalideres Subdistrict, Jakarta, Indonesia

Figure 1 shows the number of houses with and without larvae as 57 (57.0%), and 43 (43.0%), respectively, out of 100 in total.

Table 2. The Relationship between the existence of larvae and the incidence of DHF in Kalideres Subdistrict, Jakarta, Indonesia

The existence of larvae	DHF Incidence				*P Value*
	DHF (+)		DHF (-)		
	n	%	n	%	
With larvae	7	63,6	50	56,2	0,753
Withoutlarvae	4	36,4	39	43,8	

Table 2 demonstrates the highest proportion of DHF groups with and without the larvae category in 7 (63.6%) and 4 houses (36.4), respectively. However, the highest proportion of non-DHF groups with and without the larvae category was 50 (56.2%) and 39 (43.8%) houses, respectively. The statistical results using chi square test provided a p-value of 0.753 (p> 0.05), indicating the absence of a relationship between the existence of larvae and the incidence of DHF in Kalideres Subdistrict.

Table 3. Frequency distribution of larvae based on house index (HI), container index (CI) and Breteau index (BI) in KalideresSubdistrict, Jakarta, Indonesia

Village	DHF Incidence		The existence of larvae		Number of house		Number of container		HI (%)	DF	CI (%)	DF	BI(%)	DF	Average DF
	n	+	n	+	n	+	n	+							
Tegal Alur	20	4	20	14	20	14	100	35	20,0	4	35,0	8	175,0	8	6,67
Kalideres	20	1	20	13	20	13	167	18	5,0	2	10,77	4	90,0	7	4,33
Pegadungan	20	2	20	18	20	18	179	32	10,0	3	18,18	5	160,0	8	5,33
Semanan	20	3	20	11	20	11	178	13	15,0	3	7,30	3	65,0	6	4
Kamal	20	1	20	2	20	2	196	6	5,0	2	3,06	2	30,0	4	2,67

Description: n : Sample Total, HI: House Index, DF : Density Figure, CI: Container Index, BI: Breteau Index

Table 3 demonstrates Tegal Alur as the village with the highest larvae density, with a density figure (DF) of 6.67,followed byPegadungan, at 5.33, Kalideres at 4.33, Semanan at 4, and Kamal at 2.67.These were collectivelyclassified in the categoryof medium larvae density.The highest proportion of HI is in Tegal Alur sub-district, the highest DF is in Pegadungan sub-district and the highest proportion of CI is in Pegadungan sub-district.

Discussion

There is an upsurge in the prevalence of dengue hemorrhagic fever at endemic areas of numerous countries, especially those in the tropics.[11] Furthermore, larvae are known to exist in bathtubs, due to poor drainage habits,which ought to be conducted at least once a week. Also, secondhand goods placed outside the home tend to serve as breeding places for mosquitoes. The process of handling DHF is a shared responsibility for both the government and the community, where the suppression of case incidence is crucial. Therefore, it is necessary for the community to engage in eradicate mosquito nests programs, adopting 3M plus methods in a sustainable manner.

This program involves[1] Drain, characterized by the cleaning of water reservoirs, including bathtubs, water buckets, drinking jars, refrigerators and others,[22] Closing, requires sealing water reservoirs tightly, including drums, jugs, water tank, and others; and[3]Re-using and recycling used goods that are potential breeding grounds for dengue fever mosquitoes.

The density of Aedes sp. larvae was measured using the House Index (HI), Container Index (CI), and Breteaux Index (BI). These values are collectively regarded as safe at CI ≤ 10%, HI <5% and BI <50%. The results demonstrated the highest value for (HI), which describes the spread of mosquitoes in the area, in Tegal Alur (20%) and Semanan (15%), while the lowest was in Kalideres and Kamal at 5%, of which both exceeded the safe limit for transmission. Conversely, CI designates the number of containers hoarding mosquito larvae in an area, and a higher value indicates the presence of more larvae. The results show the most significant risk of transmission at Tegal Alur (35%) and Pegadungan (18.18%). Generally, the CI value in East Jakarta is higher than the WHO standard (≤10%), therefore demonstrating the presence of numerous containers, which serve as breeding places. According to[12]dentified bathtubs and containers used for water storage as the most dominant places for larvae development, which is in accordance with the study.[13,14]

Breteaux Index (BI) refers to the number of positive water reservoirs per 100 houses examined. This serves as the best measure to estimate vector density, due to the combination of both houses and container variables. Meanwhile, Tegal Alur (175%) and Pegadungan (160%) had the highest scores, which are greater than the WHO standards (> 50%) on average. However, the Village of Kamal has a closer BI value of 30%. In addition, transmission prevention is a very crucial approach towards the control of DHF, as the CI and BI figures portray Kamal Village as safe, although efforts to control the vector are still needed.

The larvae density in Tegal Alur is higher than the values recorded in other villages. Based on observations, the most common places where larvae were identified, include containers of refrigerators / dispensers, bathroom tubs and jars. Furthermore, the most significant location in Pegadungan and Semanan villages were bath tubs and jars, while Kalideres and Kamal villages had the lowestlarvae density, with the most common spot being jars, refrigerators / dispensers, bathtubs and flower pots. This is consistent with the research of[15,16]which stipulated water access and

storage as the major risk factors promoting the existence of Ae. aegypti larvae.

DHF eradication program is considered a more important policy over prevention. This occurs in all regions of Indonesia that perform fogging, which is conducted quickly, under special directives from the official authority without the incidence of DHF cases. However, there is a heightened tendency for the development of resistance to the Aedes mosquito on the long-run. According to the regulations, fogging is expected to be carried out only after epidemiological investigation stated positive for 3x24 hours (three times twenty-four hours).[17]

Conclusion

Based on the results and discussion, the following conclusions were made there is no relationship between the existence of larvae and the incidence of DHF in Kalideres Subdistrict (p value = 0.753 > 0.05) and the density figures (DF) of Kalideres, Pegadungan, Semanan and Kamal Villages were in the medium range of 2-5, while Tegal Alur Village demonstrated a high range of 6-9.

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Conflict of Interest

The authors declare no conflicts of interest.

Reference

1. Ellis EM, Neatherlin JC, Delorey M, Ochieng M, Mohamed AH M DO. A household serosurvey to estimate the magnitude of a dengue outbreak in Mombasa, Kenya, 2013. PLOS Negl Trop Dis. PLOS Negl Trop Dis. 2015;
2. Lutomiah J, Barrera R, Makio A, Mutisya J, Koka H, Owaka S et al. Dengue outbreak in Mombasa City, Kenya, 2013–2014. Entomol Investig PLOS Negl Trop Dis. 2016;
3. WHO. Dengue outbreak in the United Republic of Tanzania (Situation as of 30 May 2014)—Regional Office for Africa. 2015.
4. WHO. Dengue and Severe Dengue. In 2019.
5. WHO. Comprehensive guidelines for prevention and control of dengue and dengue haemorrhagic fever. WHO Regional Publication SEARO. 2011. 159–168 p.
6. Ministry of Health Indonesian. Indonesian Health Profile. Ministry of Health of the Republic of Indonesia. 2017.
7. Ministry of Health Indonesian. Increasing Factors of Dengue Hemorrhagic Fever Cases.

Ministry of Health of the Republic of Indonesia. In 2015.

8. Warsidi. Danger and Prevention Dengue. Bekasi: Mitra Utama; 2009.
9. Cahyo WN. The Influence of Knowledge Factors, Parental Income and Environmental Sanitation on the Occurrence of Dengue Fever at Age 6-15 years in Kebomas District, Gresik Regency. 2013;1.
10. Parida D dan H. The Relationship between the existence of Aedes Aegypti larvae and the implementation of 3M Plus with the incidence of dengue fever in the XVIII environment, Binjai, Medan City in 2012. 2012;
11. Kyle JL HE. Global spread and persistence of dengue. Annu Rev Microbiol. 2008;(62):71–92.
12. Wijayanti Siwi PM, Sunaryo, Suprihatin, McFarlane Melanie, Rainey Stephanie M, Dietrich Isabelle, Schnettler Esther, Biek Roman KA. Dengue in Java, Indonesia: Relevance of Mosquito Indices as Risk Predictors. PLoS Negl Trop Dis. 2016;3:10.
13. Williams CR, Johnson PH, Ball TS RS. Productivity and population density estimates of the dengue vector mosquito Aedes aegypti (Stegomyia aegypti) in Australia. Med Vet Entomol. 2013;(27):313–22.
14. Nyamah MA, Sulaiman S OB. Categorization of potential breeding sites of dengue vectors in Johor, Malaysia. Trop Biomed. 2010;27:33–40.
15. Ryan Sadie J, Lippi Catherine A, Nightingale Ryan, Hamerlinck Gabriela, Cordova Mercy J Borbor, B Cruz Marilyn, Ortega Fernando, Leon Egan Waggoner and IAMS. Socio-Ecological Factors Associated with Dengue Risk and Aedes aegypti Presence in the Galápagos Islands, Ecuador. Int J Environ Res an Public Heal. 2019;
16. Stewart Ibarra, A.M.; Ryan, S.J.; Beltrán, E.; Mejía, R.; Silva, M.; Muñoz Á. Dengue Vector Dynamics (Aedes aegypti) Influenced by Climate and Social Factors in Ecuador: Implications for Targeted Control. PLoS One. 2013;8.
17. Governor of DKI Jakarta Province. Provincial Regulation of the Special Capital Region of Jakarta Number 6 of 2007 concerning Control of Dengue Hemorrhagic Fever. 2007.