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The Relationship Between Mosquito Nest Eradication Practice and The Existence of Larvae *Aedes Aegypti* with Dengue Incidence in Penjaringan District, North Jakarta

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Abstract: Dengue Hemorrhagic Fever (DHF) is a public health problem in Indonesia and still often causes extraordinary events with a high mortality rate. All regions in Indonesia are at risk of contracting dengue disease, because the virus that causes and mosquitoes has spread widely in residential and public places in Indonesia. Penjaringan District North Jakarta City has 70% densely populated residential areas, so it has a risk for dengue disease transmission. The sample in this study amounted to 80 people, with a division of 40 case groups and 40 control groups. This research uses observational analytical design with case control method. The variables studied were Mosquuito Nest Eradication practice and the presence of larvae. Data on Mosquuito Nest Eradication Behavior-DHF variables were obtained through questionnaires and variable data on the presence of larvae were obtained through direct observation of the environment around the respondent's house. Based on the results of Chi Square analysis showed that the practice of Mosquuito Nest Eradication (p = 0.007) and the presence of larvae (p = 0.047) had a significant relationship. Respondents who are lacking in Mosquuito Nest Eradication practice are at 5,952 times greater risk of developing DHF compared to people who are good in Mosquuito Nest Eradication practice. There is a relationship between the practice of Mos and the existence of larvae with dengue incidence in densely populated settlements in Penjaringan District, North Jakarta. The community should pay attention to the eradication of their nest by conducting the 3M Plus program regularly.

Keywords: Dengue; Mosquito Nest Eradication; Presence of Larvae

Introduction

Dengue *Hemorrhagic Fever* (DHF) is an infectious disease caused by the fast-spreading *dengue* virus, transmitted by Aedes *aegypti* and *Aedes albopictus mosquitoes*.Dengue virus, in connection with morbidity (mortality rate) and mortality (birth rate), DHF is also called *the most mosquito transmitted disease.* (Djunaedi, 2006) DHF is mostly found in tropical and sub-tropical areas, mostly in urban and suburban areas. (Ardina, Nurhalina, Suratno, Purhayanti, & Sartika, 2018) WHO (*World Health Organization*) recorded Indonesia as the country with the highest dengue cases in Southeast Asia of the total number of cases, about 95% occurred in children under 15 years old. (Rosdiana, 2010).

The development of Dengue Hemorrhagic Fever (DHF) cases in North Jakarta City is quite high every year. DKI Jakarta is included in the 10 provinces with the highest number of cases in July 2020, which was 4,227 cases or IR DHF 40.04 per 100,000 population. (Kementrian Kesehatan Indonesia, 2020) In 2021, there were 3,092 dengue cases reported with a fairly balanced proportion between men and women (Dinas Kesehatan Provinsi DKI Jakarta, 2021), compared to 4,670 cases in 2020 and no cases of death due to dengue fever were found. Dengue cases in North Jakarta City in 2021 there were 368 cases, then cases increased in 2023 by 563 cases in January – June 2023. Dengue cases in DKI Jakarta occur in almost all sub-districts. (Widyatami & Suryawan, 2021).

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DHF can be influenced by environmental conditions, population density, population mobility, the presence of plant pots, the presence of rainwater channels, and the presence of containers, or trash cans. (Monintja, 2015) Penjaringan sub-district has the potential to be a place for dengue fever spread because in some villages there are densely populated settlements. This situation is favored by the Aedes *aegypti* naymuk because the mosquito is a domestic mosquito that lives very close to residential areas. (Yunita, Mitra, & Susmaneli, 2012) The best way to prevent dengue disease is by Mosquito Nest Eradication. The presence of larvae described by a larvae-free number greater than or equal to 95% is expected to prevent or reduce dengue transmission. (Koban, 2005) The role of the community in reducing the number of dengue vectors greatly determines the decrease in the number of dengue cases. (Rohmah, Susanti, & Haryanti, 2019).

Mosquito Nest Eradication is one of the vector control methods carried out by eradicating *A. Aegypti*. mosquito larvae through active silver The community implements 3M, namely draining water reservoirs at least once a week, closing water reservoirs tightly and burying used items that can be breeding sites for *A. Aegypti* mosquito larvae. (Direktorat Jendral Pemberantasan Penyakit Menular dan Penyehatan Lingkungan Pemukiman, 1995).

Cases in Penjaringan Sub-district have increased every year, as well as the ranking status when compared to other sub-districts. It is known that in 2021 Penjaringan District occupies the 5th position out of 6 sub-districts that have the most dengue cases in the North Jakarta area, then in 2022 Penjaringan District dropped to the lowest dengue cases compared the previous year, then in 2023 Penjaringan District to rank 4 out of 6 sub-districts with the most DHF cases.

Based on Supriyanto's research, there is a significant relationship between Mosquito Nest Eradication practices and dengue incidence in the working area of the Tlogosari Wetan Health Center in Semarang City. (Supriyanto & Suharto, 2012) community behaviors in Penjaringan District have not behaved healthily such as the lack of awareness to carry out Mosquito Nest Eradication (PSN) independently and routinely. This is reinforced by the dengue case in Penjaringan District.

Method

The type of research used in this study is observational analytics with *a case control* approach. This research will be carried out in March – June 2023 in densely populated settlements, Penjaringan District, North Jakarta. The sample selection technique in this study was carried out by *simple random sampling* with the sample size carried out in this study was 80 respondents consisting of 50 case group respondents and 50 control group respondents.

The inclusion criteria for the case group sample in this study include: residing in a densely populated settlement in Penjaringan District, respondents have family members who have suffered from DHF in the period June 2022 – June 2023, and are willing to be respondents. The inclusion criteria for the control group sample include: residing in a densely populated settlement in Penjaringan District, respondents do not have family members who have suffered from DHF, and are willing to be respondents. The exclusion criteria for the control case group sample include: respondents do not live in densely populated settlements in Penjaringan sub-district, and are not willing to follow the research flow.

Data collection was carried out by means of interviews using questionnaires that have been tested for validity and reliability tests. The data obtained were processed and analyzed using the program SPSS ver 17.0. The relationship test between independent variables and bound variables was carried out bivariately using *the Chi Square statistical test*, this is to determine the strength of the relationship between risk factors in this case Mosquito Nest Eradication practice and the presence of larvae with the incidence of DHF used *Odds Ratio* (OR)

Result and Discussion

Based on the results of the research conducted that the respondents included in this study are as follows (Table 1). Table 1 shows the characteristics of respondents based on age, sex, education, occupation, and income in families in densely populated settlements in Penjaringan District, North Jakarta. Most respondents were aged 20-40 years, both the case group was 22 people (55%) and the control group was 24 people (60%). The majority of respondents were women in the case group as many as 22 people (55%) and the control group as many as 23 people (57.5%). Respondents with the last secondary school education were more than at any other level of education, in the case group as many as 19 people (47.5%) and the control group as many as 18 people (45%). Based on employment, most of them worked as laborers as many as 17 people (42.5%) in the case group and 18 people (45%) in the control group. Most respondents had monthly income of < 4,901,798, in the case group of 32 people (80%) and 40 people (100%) in the control group.

Table 1. Characteristic of Respondents

Characteristics of Respondents	Frequency			
	Case	%	Control	%
Age				
< 20 years	14	35	14	35
– 40 years	22	55	24	60
> 40 years	4	10	2	5
Gender				
Man	18	45	17	42.5
Woman	22	55	23	57.5
Education				
SD SMP	2	5	5	12.5
SMA	19	47.5	18	45
S1	15	37.5	16	40
	4	10	1	2.5
Work				
Housewives	9	22.5	10	25
Fisherman	3	7.5	7	17.5
Laborer	17	42.5	18	45
Private Employees	6	15	3	7.5
State Officer	2	5	0	0
Merchant	3	7.5	2	5
Income				
< 4.901.798	32	80	40	100
> 4.901.798	8	20	0	0

Table 2. Distribution of Mosquito Nest Eradication Practice in Penjaringan District, North Jakarta City

Mosquito Nest Eradication Practice	Case								Control							
	Never		Sometimes		Often		Always		Never		Sometimes		Often		Always	
	f	%	f	%	f	%	f	%	f	%	f	%	f	%	f	%
Draining landfill once a week	0	0	23	57.5	17	18.5	0	0	0	0	6	15	20	50	14	35
Close tightly all landfill in the house	10	25	12	30	18	45	0	0	0	0	5	12.5	17	42.5	18	45
Close tightly all landfills outside the home	9	22.5	15	37.5	16	40	0	0	0	0	12	30	15	37.5	13	32.5
Recycling/disposing of used items	18	45	2	5	20	50	0	0	32	80	4	20	4	20	0	0
Using wire gauze on home ventilation	3	7.7	16	41	20	51.3	0	0	27	67.5	10	25	3	7.5	0	0
Hanging clothes	3	7.7	16	41	20	51.3	0	0	15	37.5	16	40	9	22.5	0	0
Sprinkling Abate	4	10	14	35	20	50	2	5	0	0	10	25	13	32.5	17	42.5
Using insect repellent	1	2.5	19	47.5	15	37.5	5	12.5	13	32.5	4	10	20	50	3	7.5
Regularly monitor larvae	5	12.5	16	40	16	40	3	7.5	0	0	3	7.5	19	47.5	18	45

Based on Table 2, it can be concluded that the behavior of Mosquito Nest Eradication practices in the control group is better than the case group, this is because many respondents answered that they never closed all landfills inside the house (25%), tightly closed all landfills outside the home (22.5%), recycled/disposed of used goods (45%), and never had larvae (12.5%). The results of this study are in line with research conducted in Andalas Village which stated that the Mosquito Nest Eradication behavior of the control group was better than that of the case group (Priesley, Reza, & Rusjdi, 2018).

Closing the landfill means not providing a place to live for dengue vector mosquitoes.(Heryanti, Fajar, & Windusari, 2020) Based on observations, it was found that the landfills used by respondents at the study site were buckets, bathtubs, drums, and crocks. *A. Aegypti* mosquitoes like such shelters as breeding grounds, therefore landfills must always be closed to prevent mosquitoes from entering and breeding.

The behavior of draining landfill > 1 time / week was done less frequently by the case group than the control group. The results of this study are in line with research which states that in the control group the practice of Mosquito Nest Eradication by draining the landfill 1 time / week was carried out more by control group respondents than the case group.

Based on the observation that some respondents' homes only use buckets as good baths. Respondents who do not drain > 1 time / week are found in houses that have landfills with large types of water reservoirs made of cement. Landfill draining is one of Mosquito Nest Eradication 's practices that aims to control mosquito breeding *places*. This is reinforced by Pratiwi's research in the working area of the Kedungmundu Health Center in Semarang City, which states that there is a relationship between *breeding place* and dengue incidence with an OR value of 4,375. (Pratiwi, Suharyo, & Kun, 2014).

The Relationship of Mosquito Nest Eradication Practices with Dengue Events

Based on the results of the analysis, Mosquito Nest Eradication practice variables are divided into two categories, namely poor and good. The results of the analysis are presented in the Table 3.

Table 3. The Relationship of Mosquito Nest Eradication with Dengue Events

Mosquito Nest Eradication (n = 80)	Incidence of DHF				P value	OR
	Case		Kontrol			
	f	%	f	%		
Less	26	65	13	32.5	0,007	5.952 (1.209 – 21.154)
Good	14	35	27	67.5		
Total	40	100	40	100		

Based on Table 3, the relationship between Mosquito Nest Eradication practice variables and dengue incidence in Penjaringan District, North Jakarta City shows that responses with Mosquito Nest Eradication practices are more or less found in case groups (65%) compared to controls (32.5%) and based on the chi-square test, a value of p = 0.007 shows that there is a relationship between Mosquito Nest Eradication practices and dengue incidence in Penjaringan District, North Jakarta City. The risk outcome is OR= 5.952 95% CI (1.209 – 21.154), which can mean that people who are lacking in Mosquito Nest Eradication practice have a 5.952 times greater risk of DHF than people who are good in Mosquito Nest Eradication practice.

The results of this study are in line with research conducted by Mangindaan in Watudambo Village, Kauditan District, which showed that there was a relationship between Mosquito Nest Eradication behavior and dengue incidence (p = 0.009). (Mangindaan, Pingkan, Kaunang, & Sekeon, 2018) Based on observations obtained that the practice of PSN in densely populated settlements of Penjaringan District, most of the case and control respondents had a fairly good understanding of DHF and were often given socialization or counseling about DHF by cadres or health workers. However, although some respondents had knowledge of good DHF, measures such as good Mosquito Nest Eradication practices were not implemented correctly. This is because the better the Mosquito Nest Eradication action carried out, the less potential for dengue fever, for example, there are still many respondents who still hang their clothes, do not routinely drain the landfill, and there are still many unused drums outside the house.

The existence of larvae

Environmental factors greatly affect the incidence of dengue fever because mosquitoes often lay eggs in the rainy season. The existence of water reservoirs will be a supporting factor for mosquito breeding, because it will be a breeding ground for mosquitoes. Survey of the presence of mosquito larvae is needed in controlling dengue transmission. The survey can be used as an indicator to estimate the risk of dengue transmission in an area.

DHF vector density indices, including House Index (HI), Container Index (CI), Breteau Index (BI) and Larvae Free Number (ABJ), are entomological parameters that have direct relevance to the dynamics of disease transmission.(Sunaryo & Pramestuti, 2014) The Flick Free Rate (ABJ) is the percentage of homes where larvae are not found and is an indicator used nationally. ABJ's national target is ≥95%. The larval index is expressed by the following formula:(Intergovernmental Panel on Climate Change (IPCC), 2014)

$$HI = \frac{number\ of\ positive\ larvae\ at\ house}{\text{number of houses inspected}} \times 100\% \quad (1)$$

$$CI = \frac{\text{number of positive containers}}{\text{number of containers checked}} \times 100\% \quad (2)$$

$$BI = \frac{\text{number of positive containers}}{\text{number of house inspected}} \times 100\% \quad (3)$$

$$ABJ = \frac{\text{number of negatvie larvae at hpuse}}{\text{number of house inspected}} \times 100\% \quad (4)$$

Table 4. The result of calculating the value of HI, CI. BI. And ABJ

Component	Sum	Larvae		House Index	Container Index	Breteau Index	ABJ
		Positive	Negative				
House	80	23	57	28%	17%	57%	71%
Container	265	46	219				

Based on Table 4, from the total houses examined, it was found that fewer larvae positive houses were compared to larvae negative houses with a House Index value of 28% and ABJ of 71%, while from the total containers inspected, very few larvae positive containers were found compared to negative containers with a CI value of 17% and a BI value of 57%.

The free number of Larvae (ABJ) in densely populated settlements of Penjaringan sub-district is below the set value so that it does not meet the program criteria. One of the factors that causes ABJ in Penjaringan District has not reached targei is because in some areas there are still difficulties in distributing water from PDAMs so that some communities still rely on water purchased by literants and packed with plastic containers, and the behavior of people who still hold large amounts of water outside and inside the house.

The results of the study found several types of landfill as breeding sites for *A. aegypti* larvae, namely drums, buckets, bathtubs, and crocks. Plastic drums are the place where most larvae are found because they are rarely cleaned and rarely used, making it possible for mosquitoes to breed in the drum. The type of container found by *A. aegypti* is generally inside the house, this can be due to the habit of the community to collect water for daily needs with landfill conditions that are not in closed conditions. The results of research by Fatimah et al stated that the presence of larvae was also influenced by the presence of lids in water reservoirs.(Fatimah, S., Suharno, & Amaliyah, 2016)

The Relationship of the Existence of Larvae with the Incidence of DHF

Tabel 5. The Relationship of the Existence of Larvae with the Incidence of DHF

The existence of larvae (n = 80)	DHF Events				P value	OR
	Case		Control			
	f	%	f	%		
Exist	16	40	7	17.5	0.047	4.652 (1.100 – 14.823
None	24	60	33	82.5		
Total	40	100	40	100		

Based on Table 5, the variable relationship between the presence of larvae and the incidence of dengue fever in Penjaringan District, North Jakarta City shows that houses with larvae are more in the case group (40%) than the control (17.5%) and based on the chi-square test, the value of p = 0.047 shows that there is a relationship between Mosquito Nest Eradication practices and dengue incidence in Penjaringan District, North Jakarta City. The risk result is OR= 4,652 95%CI (1,100 – 13,823), which can be interpreted that homes with the presence of *A. Aegypti* larvae have a risk of 4,652 times greater exposure to DHF compared to people who are not found to have larvae at home.

This is in line with Ariyadi's research which states that there is a relationship between the presence of larvae and the incidence of DHF (p = 0.026) with OR = 1.802 meaning that houses with positive larvae have a risk of 1.802 dengue disease compared to houses with negative larvae.(Ariyadi, Iravati, & Hastaryo, 2012) According to Sucipto's research conducted in Semarang Regency which states that there is a significant relationship between positive water reservoirs with dengue incidence with a risk of 8.8 times greater than respondents with water reservoirs without larvae.(Sucipto, Raharjo, & Nurjazuli, 2015).

Conclusion

Based on the results of the study, it was concluded that there is a relationship between the practice of Mosquito Nest Eradication Practice (p = 0.007) and the presence of larvae (p = 0.047) with the incidence of dengue fever in densely populated residential areas in Penjaringan District, North Jakarta. people who are lacking in Mosquito Nest Eradication practice are 5,952 times more likely to develop DHF compared to people who are good in Mosquito Nest Eradication practice. The community should pay attention to the eradication of their nest by conducting the 3M Plus program regularly.

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Author Contributions
Nurdin: writing-original draft preparation, result, discussion, methodology, conclusion, analysis; Martini and Mursid Raharjo: proofreading, review, and editing

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Conflicts of Interest
The authors declare no conflict of interest.

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