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The Presence of *Aedes Aegypti* Larvae and the Occurrence of Dengue Fever (DHF) In Beti Village, South Indralaya District, Ogan Ilir Regency

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Abstract
Dengue Hemorrhagic Fever (DHF) is an infectious disease that can be fatal. There were 117 DHF cases in Ogan Ilir Regency in 2018. The presence of *Aedes aegypti* and community behavior in mosquito breeding eradication are critical for dengue vector larvae survival. The purpose of this research is to establish a link between the presence of *Aedes aegypti* larvae and the presence of DHF in Beti Village, South Indralaya District, Ogan Ilir Regency, South Sumatra Province. This was an observational cross-sectional study with 49 randomly selected resident houses. The presence of larvae in water reservoirs was used to collect data, whereas the incidence of DHF was obtained through questionnaire interviews with respondents. For statistical analysis, the chi-square test was used. According to the findings of the study, 38.8 percent of respondents have a history of DHF. The majority of the larvae were discovered in water reservoir buckets. There is a link between the type of Aedes aegypti breeding and the incidence of DHF (p-value of 0.001), *Aedes aegypti* presence and the incidence of DHF (p-value of 0.005), and PSN behavior and the incidence of DHF (p-value of 0.005). (p-value of 0.001). Beti Village residents are advised to take preventive and vector control measures to reduce their risk of contracting dengue disease. Residents must become more involved in cleaning water reservoirs in and around their homes on their own.

Introduction

Dengue Hemorrhagic Fever (DHF) is the most common vector-borne infectious disease, and efforts to control it are currently underway. The population of *Aedes* sp. mosquitoes explodes during the rainy season due to the availability of breeding sites for *Aedes* sp. mosquitoes, namely places inundated with rainwater such as used cans, old tires, scraps of bamboo, holes in trees, drinking places for birds, and so on (Sasmita et al., 2021). Mosquitoes belong to the sub-order Nematocera, family Culicidae, and are made up of several genera, one of which is the genus *Aedes*, which contains 500 species, the most important of which are *Ae. aegypti* and *Aedes albopictus* (Kleden et al., 2021).

DHF is a disease caused by the dengue virus, which belongs to the Flavivirus genus and family Flaviviridae. DHF is transmitted to humans through the bite of a dengue-infected Aedes sp mosquito (WHO, 2022). DHF is endemic in over 100 countries, the most common of which are Africa, America, the Eastern Mediterranean, Southeast Asia, and the West Pacific. DHF is a tropical and subtropical disease. Every year, data from around the world show that Asia has the highest number of DHF patients. The World Health Organization (WHO) reported that Indonesia has the highest number of dengue cases in Southeast Asia. According to the Indonesian Ministry of Health, 65,432 cases of dengue fever were reported in Indonesia in 2011, with an incident rate (IR) of 27.56/per 100,000 population and a case fatality rate (CFR) of 0.91%. Several studies have been conducted, and the incidence of dengue fever appears to be increasing year after year. Until the end of 2013, this disease had been reported to have spread in 88% of Indonesia's 497 districts/cities (Kemenkes RI, 2020).

In South Sumatra Province, there were 1360 dengue cases in 2017, and 2,396 cases in 2018 (IR = 29/100,000). According to data from the Health Office of Ogan Ilir Regency, the number of dengue cases in 2010 was 204 (IR = 28 per 100,000 population), with a one-person death rate. In 2017, there were 37 cases of DHF in Ogan Ilir Regency, and 117 cases in 2018. Meanwhile, from January to October 2018, there were 20 dengue cases in the Tebing Gerinting Health Center work area in South Indralaya. Beti Village is in the working area of Tebing Gerinting Health Center; it is one of the villages designated as endemic for DHF; each year, Beti Village residents test positive for DHF (Dinkes Kabupaten Ogan Ilir, 2018) (Dinkes Kabupaten Ogan Ilir, 2019).

The presence of breeding sites for *Ae. aegypti* is critical to the survival of dengue vector larvae. Mosquito breeding sites are the most important part of the mosquito life cycle, and there are puddles of water inside and outside the house where Ae. aegypti lives in a humid environment with high rainfall. Other factors that cause dengue fever include poor environmental sanitation, unhealthy community behavior, and daytime behavior in the home, which plays the most important role in dengue virus transmission (Getachew et al., 2015). Water reservoirs also play a significant role in Aedes aegypti density; the more containers, the more breeding sites, and the higher the density. The greater the population density, the greater the risk of infection with the dengue virus. Aedes aegypti has been found in large water reservoirs such as bathtubs and drums, according to several studies. This occurs because these containers are notoriously difficult to clean. Aedes aegypti prefers places that are not directly exposed to sunlight, as well as breeding areas that are in direct contact with the soil (Abílio et al., 2018) (Wanti et al., 2019).

Larvae distribution of *Ae. aegepty* has not been scientifically revealed, even though observations of *Ae. aegepty* is very important, it is useful for knowing the endemic areas of DHF, as well as knowing the main habitat of *Ae. aegepty*. If further studies are carried out, solutions can be found to overcome or break the breeding cycle of the *Ae. aegypti*.

Materials and Methods

The research method used was observational with a cross-sectional design. The population is residents of Beti Village, South Indralaya District, Ogan Ilir Regency, South Sumatra. Sampling in a simple way random sampling namely as many as 49 residents' houses. Interviews were used to collect primary data, and larval surveys were used to collect data on the presence of larvae in various mosquito breeding places in each resident's home. Every location that can hold water is checked for larvae and the type of container is recorded. Mosquito larvae were collected from 49 homes in Beti Village, South Indralaya District, Ogan Ilir Regency, South Sumatra. 70% alcohol is used as the reagent. Closed bottles/containers, a dipper, a Pasteur pipette, an object-glass, a deck glass, and a microscope are used. The larvae are identified by scooping them out of the water reservoir (container) with a scoop/dipper, placing them in a bottle, and labeling them to be brought to the laboratory for identification. The larvae were removed from the bottle using a Pasteur pipette and then immersed in 70% alcohol prior to identification. Mosquito larvae were placed on a glass object and covered with a glass deck before being observed under a microscope with a 10 x magnification objective lens. A parasitology atlas book was used to identify mosquito larvae by species. It is sufficient to take one larva from each water reservoir containing larvae and then identify it under a microscope. Univariate and bivariate data were analyzed using a chi-square test with a 95% confidence level (=0.05). Ethical approval was obtained from the Ethical Committee of the Faculty of Medicine, Universitas Muhammadiyah Palembang with Number 075/EC/KBHKI/FK-UMP/XI/2021.

Results and Discussions

Respondent Characteristics

Respondent characteristics include age, last education, occupation, DHF history, and type of *Ae. aegypti*, as well as the presence of *Ae. aegypti* in different types of water reservoirs and the implementation of mosquito nest eradication.

Table 1. Characteristics of Respondents

Characteristics	Frequency (n)	Percentage (%)
Age		
17-25 years (Late Adolescence)	3	6.1%

26-35 years old (Early Adult)	5	10.2%
36-45 years (Late Adulthood)	22	44.9 %
46-55 years old (Early Elderly)	14	28.6%
56-65 years (Late Elderly)	5	10.2%
Last education		
SD	11	22.4%
Junior High School	7	14.3%
Senior High School	25	51.0%
S1	5	10.2%
S2	1	2.0%
Profession		
civil servant	4	8%
Private	2	4%
Honorary	1	2%
Farmer	2	4%
Teacher	2	4%
Trader	3	6%
IRT	34	7%
DHF history		
Once	19	38.8%
Never	30	61.2%
Types of Breeding Sites		
Bathtub	41	45.6%
Barrel	20	22.2%
Bucket	87	96.7%
Drum	7	7.8%
Dispenser Storage	6	6.7%
Used Cans	2	2.2%
Used Bottles	0	0%
Banana Leaf	5	5.6%
Presence of Larva on Type Water reservoirs		
Bathtub	36	73.5%
Barrel	20	42.9%
Bucket	43	87.8%
Drum	13	26.5%
Dispenser Storage	11	22.4%
Mosquito Nest Eradication Behavior		
Well	14	28.6%
Bad	30	71.4%

According to the table above, the majority of respondents in Beti Village are 36-45 years old, with as many as 22 respondents (44.9%). The age group of 36-45 years is considered late adulthood; at this age, there is also a decline in function, as well as a decrease in physical strength and memory. This will influence a person's attitudes and behavior regarding health issues (Pliatsikas et al., 2019).

As many as 25 respondents (51% of those polled) had completed high school. According to the findings of the research, the respondents in Beti Village have a standard level of education. A person's attitude and behavior pattern are determined by his level of education. The higher a person's education, the more information they receive and, as a result, the more knowledge they have (Notoatmodjo, 2014).

In this study, housewives accounted for nearly all of the respondents' occupations in Beti Village, accounting for 34 respondents (7%). To prevent dengue outbreaks, various groups, particularly families, must work together. The role of housewives in preventing DHF is to make efforts to manage the environment around the house, such as overcoming the problem of the presence of *Ae. aegypti* mosquito

larvae in water reservoirs at home by draining water reservoirs such as dispensers, refrigerators, buckets, drums, and bathtubs, and waste management (Boleu et al., 2019).

According to the table above, as many as 19 respondents (38.8%) had a history of DHF. When looking for larvae, there are many piles of plastic waste that can hold water during the rainy season, and the condition of Beti Village residents' houses is very dense and close together. The maximum flight distance of the mosquito *Ae. aegypti* is between 50 m and 50 km. The distance between Beti Village residents' houses is less than 10 m, which facilitates dengue disease transmission(Boleu et al., 2019).

Ae. aegypti mosquito larvae were discovered in containers inside the house, according to the findings. This is due to people's habit of storing water for daily needs in open houses, and until this open place attracts adult *Ae. aegypti* mosquitoes to lay their eggs. Because the community does not have time to drain water reservoirs once a week, these reservoirs have the potential to serve as a breeding ground for the *Ae. aegypti* mosquito. *Ae. aegypti* mosquitoes prefer water reservoirs that are open, dark in color, and protected from direct sunlight, whereas mosquitoes prefer breeding places outside the house that are less frequently exposed to direct sunlight(CDC, 2020).

Plastic buckets are water reservoirs where mosquito *Ae. aegypti* larvae can be found; 43 of the 123 containers inspected tested positive for larvae. *Ae. aegypti* mosquitos prefer plastic buckets because they are slippery, have a nonporous surface, and have low light reflection. The non-porous surface and low light reflection cause the water temperature to drop, making it ideal for breeding by the Aedes aegypti mosquito. Aedes aegypti mosquitos are also afraid of the sun (Photophobia). Furthermore, the microorganisms in the bucket will grow easily, and the female mosquito will easily adjust her body position when laying eggs, which are then placed on the surface of the bucket wall on a regular basis. The mosquito larvae that live in the wall feed on the microorganisms that grow on its surface. Protozoa and plankton are two types of microorganisms found in water. Protozoa play an important role in the aquatic food chain. Plankton are aquatic organisms that feed protozoa and aquatic animals (Lin et al., 2018)(Sri Maya, 2020).

According to the research findings, 35 of the 49 respondents performed the behavior of eradicating mosquito nests poorly, while the remaining 14 performed the behavior well. This demonstrates that the people of Beti Village continue to have a low level of awareness about DHF prevention. Furthermore, poor implementation of mosquito nest eradication will increase opportunities for *Ae. aegypti* to breed in the Beti village community's water reservoir.

The relationship between breeding sites, the presence of *Aedes aegypti* larvae, mosquito net eradication, and the incidence of dengue fever.

The analysis of the relationship between breeding sites and the presence of *Ae. aegypti* is shown in Table 2. Mosquito Nest Eradication with DHF Incidence in Beti Village, South Indralaya District, Ogan Ilir Regency

Table 2 shows the relationship between breeding sites, the presence of *Aedes aegypti* larvae, and the eradication of mosquito nests and DHF incidence.

Variable	DHF history				Total (%)		p-value
	Once		Never				
	N	%	N	%	N	%	
Breeding Place							
There are	16	61.5	10	38.5	26	100	0.001
None	3	13	20	87	23	100	
Flickr Presence							
There are	12	63.2	7	36.8	19	100	0.005
None	7	23.3	23	76.7	30	100	
Mosquito Nest Eradication							
There are	11	42.2	8	57.8	19	100	0.001
None	3	10.3	27	89.7	30	100	

The Chi-Square test analysis revealed a significant relationship between *Ae. aegypti* breeding sites and the incidence of DHF with a significant value of 0.001 (p 0.05). This is because there are still many people in Beti Village who have not properly implemented mosquito nest eradication. Bad mosquito nest

eradication behavior puts *Ae. aegypti* mosquitos at risk of laying eggs in water reservoirs in the respondent's home.

This is consistent with Rakhmani et al., (2018) findings that there is a link between the presence of Aedes aegypti mosquito larvae and the incidence of dengue disease. Several factors influence the presence of larvae in the respondent's environment, including low education levels and a lack of knowledge about dengue prevention. which may result in an increase in the incidence of DHF and the community in the practice of 3M Plus, which is currently lacking.

The study also discovered a link between the presence of Ae. aegypti mosquito larvae and the incidence of DHF, with a significant value of 0.005 (p 0.05). Many respondents still do not understand how to use water reservoirs properly, specifically the act of closing, draining, and burying. As a result, there were a lot of Ae. aegypti mosquito larvae in this study. This is consistent with the findings of Listiono and Novianti (2018), who discovered a significant relationship between the p-value = 0.005 container location and the condition of the container lid on the presence of Ae. aegypti using the Chi-Square test.

Sari, Sarumpaet and Hiswani (2019), conducted another study in Medan Tembung District on the relationship between the presence of larvae and the incidence of dengue fever, finding that in the group of dengue cases, the larvae around her house were 2.781 times larger than the control group. According to a study conducted in Banguntapan Bantul, the presence of Ae. aegypti larvae outside the home increases the risk of DHF by 17.29 times when compared to respondents who do not have Ae. aegypti larvae outside their home (Apriyani et al., 2017).

The presence of active or live mosquito larvae can allow dengue disease transmission. Because mosquitoes lay eggs during the rainy season, environmental factors have a significant impact on the prevalence of DHF. The presence of water reservoirs or containers (tanks, bathtubs, jars, flower vases, pet drinking containers, used cans, ant traps, etc.) promotes mosquito breeding because they provide a habitat for Aedes sp. The Aedes sp mosquito that carries the dengue virus will be able to spread the virus from one person to another once it matures, causing DHF 16 cases to spread quickly (Novaranti et al., 2021).

According to the results table, there was a significant relationship between mosquito nest eradication and the incidence of DHF with a significant value of 0.001 (p 0.05). This study's findings are consistent with those of several previous studies. There was a relationship between potential breeding places in the house, the presence of resting places in the house, the practice of draining the landfill, the practice of closing the landfill, recycling used goods, and the practice of avoiding contact with Aedes, according to research conducted in the working area of the Ngawi Public Health Center, Ngawi Regency (Rahmawati and Dangiran, 2016). Another study conducted by Priesley, Reza and Rusjdi (2018), found a significant relationship between PSN 3M Plus behavior and the incidence of DHF in Andalas Village.

Eradicating mosquito nests is a healthy lifestyle practice that aims to control mosquito breeding sites and avoid contact with dengue vectors. If this behavior is carried out correctly, it has the potential to break the chain of transmission of dengue fever, resulting in a decrease in the incidence of dengue fever.

Conclusions

A bucket is the most preferred water reservoir for *Aedes aegypti* mosquitoes. In Beti Village, South Indralaya District, Ogan Ilir Regency, there is a significant relationship between breeding sites and the presence of *Aedes aegypti*, mosquito nest eradication behavior, and a history of dengue incidence.

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