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Overview of Environmental Conditions and Potential Vector of Filariasis in Dempet Sub District Demak Regency

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Abstract: Dempet Sub District is one of the filariasis endemic areas in Demak Regency. Filariasis or elephantiasis can lead to permanent disability and social stigma if the community does not get the right treatment to get healing quickly. Filaria worms of the Wuchereria brancofti, Brugia malayi, and Brugia timori types that attack the lymphatic channels are microorganisms that cause filariasis. Filariasis transmission can occur through Culex spp, Anopheles spp, Mansonia spp, and Aedes spp. This study aims to determine the description of the environmental conditions and potential vectors of the incidence of filariasis in Dempet Sub District, Demak Regency. Descriptive research that uses data collection techniques with cross-sectional approach. The study was conducted on the environmental conditions of the breeding place of mosquitoes and the resting place of mosquitoes. Mosquito breeding sites include puddles, drainage canals, water reservoirs, or bathtubs. Meanwhile, resting places include bushes, hanging clothes, walls of houses, livestock pens, and mosquito nets. The results of an etymological survey of environmental conditions found 205 mosquitoes consisting of 199 Culex quinquefasciatus mosquitoes (97.03%) and 6 Aedes aegypti mosquitoes (2.92%). The results of the study concluded that the environmental conditions of the breeding grounds and mosquito resting place were potential factors for transmission of filariasis in Dempet Sub District, Demak Regency. While Culex quinquefasciatus mosquito is a potential vector of filariasis events in Dempet Sub District, Demak Regency.
Keywords: Filariasis, Potential Vector, Environmental Condition.

I. INTRODUCTION

Filariasis or elephantiasis is a disease that has high endemicity. If you do not get treatment quickly and accurately it will result in permanent disability and cause social stigma in the community. Therefore, filariasis is a priority disease to be eliminated.(1) This disease is caused by a nematode parasite consisting of three types, namely *Wuchereria bancrofti, Brugia malayi,* and *Brugia timori*, which are species of worms found in Indonesia. Brugia malayi worms are the most common worm species causing filariasis cases in Indonesia. The worm attacks the canal and lymph nodes. Transmission of the disease occurs through mosquito bites containing filaria worms. Mosquito species that can be filariasis vectors include *Culex spp, Anopheles sp, Aedes spp, Amigeres spp and Mansonia spp.*(2),(3)Filariasis or elephantiasis is still a disease that has received attention in the province of Central Java. The discovery of new cases of filariasis in the province of Central Java, Demak Regency as many as 10 cases, Semarang City there are 5 cases, Boyolali there are 4 cases, Purbalingga there are 2 cases, Pekalongan there are 2 cases, Brebes there are 2 cases and Banjarnegara, Sukoharjo, Wonogiri, Grobogan, Blora, 1 case in Batang and Tegal.(3) New cases of filariasis occur in Dempet Sub District, Demak Regency. Environmental conditions consisting of rice fields, bushes, lots of puddles during the rainy season, and the presence of water plants, are very supportive to become breeding places and the resting place of mosquitoes as potential filariasis vectors. The potential for filariasis transmission can occur through three elements: human or animal shelter containing microfilariae in the blood, mosquitoes that can carry microfilariae, and environmental conditions. (4) Each region has different environmental conditions, so that it has different mosquito species. The diversity of the vector is influenced by the distribution, bioecology, and characteristics of the breeding habitat. Habitat breeding of pre-adult stages is very necessary for mosquitoes to lay their eggs until they develop into adult stages. One that affects the density of filariasis vectors is environmental factors. An ideal environment for mosquitoes can be used as a potential place for mosquito breeding and resting, so that mosquito density will increase.(5),(6) Elimination of filariasis in Indonesia consists of two pillars of activity, namely breaking the transmission through the

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provision of mass drugs for prevention in filariasis endemic areas, and vector control are carried out by minimizing vector development habitat, reducing vector density and reducing contact between humans and vectors.[7]

II. MATERIALS AND METHODS

A. Subject

The sample in this research were all types of mosquitoes that were captured or obtained in Dempet Sub District, Demak Regency. Mosquito capture and environmental observations which include the existence of a reproduction site and a mosquito resting place are carried out in a household environment, which is within a radius of about 100 meters from the filarial case.

B. Experimental Design

The method of catching mosquitoes is the resting method where mosquitoes are resting in and around the houses. Environmental conditions are obtained by observing the environment by observing the presence of mosquito breeding place and the presence of mosquito resting places. The research location was in Dempet Sub District, Demak Regency because there were new filariasis cases in the area. Mosquitoes that are caught are identified by the type of mosquito and mosquito surgery to determine the presence of microfilariae in the mosquito's body. This type of research is descriptive with a cross sectional research design.

C. Statistical Analysis

This research is a type of descriptive research, where data is presented in the form of frequency distribution tables. The aim of the research was to determine the description of environmental conditions and filariasis potential vectors in Dempet Sub District, Demak Regency. The dependent variable in this research was the incidence of filariasis and the independent variables namely the presence of mosquitoes, the presence of mosquito breeding sites, and the existence of mosquito resting places.

III. RESULT AND DISCUSSION

A. The Existence Of Breeding Place And The Existence Of Resting Place

The existence of mosquito breeding places is obtained through observations around the home environment such as bathtubs, drainage channels, puddles, and rice fields. Based on observations around the home environment, there were 34.6% of mosquito breeding places or breeding places around the home environment in Dempet Sub District, Demak Regency as much as 65.4%. The research was carried out in the dry season some potential places that could become breeding places mosquitoes experienced drought. The existence of resting places is obtained through environmental observations such as bushes, hanging clothes, and livestock pens. Based on the observation results, the existence of resting place is 57.7% and here is no existence of mosquito resting place as much as 42.3%.

B. The Existence Of Mosquitoes As A Potential Vector Of Filariasis

The method used for mosquito capture which is suspected as a vector of filariasis or elephantiasis is the resting method, where the arrest is done by looking for mosquitoes that are resting on the walls of houses, mosquito nets, hanging clothes, bushes, hallways of tables, chairs and places sleep around the house. Based on the results of the identification obtained 199 species of *Culex quinquefasciatus mosquitoes and 6 tailed Aedes aegypti*. *Culex quinquefasciatus* mosquitoes have morphological characteristics that are shorter in the palpus part than proboscis and pale brown mosquito parts. *Aedes aegyti* mosquitoes have morphological characteristics, namely the following in the mesonotum section has a back-shaped line like a lyre with two curved lines and two white straight lines. In the section of the femur there is an elongated white strip.

Figure 1.1 Identification of Mosquitoes

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Mosquito surgery is done by dissecting the body parts of mosquitoes including: head, thorax or chest, and abdomen or stomach of mosquitoes. Then, the presence or absence of microfilariae was observed by looking at the movement with a microscope. Based on the results of mosquito surgery there were no mosquitoes containing microfilariae.

Figure 1.2 Mosquito Surgery

Catching mosquitoes is done where mosquitoes usually rest like mosquito nets, walls of houses, bushes, hanging clothes, and livestock pens. Then mosquitoes caught at the location will be identified. Vector identification aims to find out vector species in an area for vector control. If the control method is carried out in accordance with the target vector, it can produce a maximum vector control program.[10] The mosquitoes caught 205 mosquitoes, 199 caught *(Culex quinquefasciatus)* and *97.0% Aedes aegyti*. 6 tails *(2.92%). Culex quinquefasciatus* mosquito is the most dominant type of mosquito found in Dempet Sub District, Demak Regency. This is due to the condition of the house adjacent to the yard with trees and bushes. In addition, around the location there are water gutters, puddles, and water reservoirs that are not covered so that it becomes a potential place for breeding of *Culex quinquefasciatus* mosquitoes. The dominance figure describes the density of mosquito populations in an area. *Culex quinquefasciatus* mosquitoes are more dominant than other mosquito species. This can show the *Culex quinquefasciatus* mosquito as a potential vector for infectious filariasis in Dempet Sub District, Demak Regency.

The habit of *Culex quinquefasciatus* mosquitoes is more dominant in sucking blood and resting in the house than outside the home and is anthropophilic. This is in line with the research of Upiek Ngesti et al that *Culex quinquefasciatus* mosquitoes prefer a resting place in a house with dark or less light conditions such as hanging clothes and home furniture. In contrast to the habits of *Aedes aegypti* mosquitoes who prefer to live in clean water while *Culex quinquefasciatus* mosquitoes prefer to live in dirty water, wastewater, sewers, and rivers filled with garbage. [11] Mosquitoes can become filariasis vectors if mosquitoes have age which is long enough so that microfilariae can complete the life cycle in the mosquito's body. If the age of a mosquito is longer than the age of the parasite, then parasites can automatically develop to become infective larvae to transmit. [12]

IV. CONCLUSION

The environment has an important role in the transmission process, in this case the environment can support the survival of reservoirs and vectors of filariasis disease. [8] Based on observations of environmental conditions at the study site there are still mosquito breeding sites and mosquito resting places such as bathtubs, ditches, puddles, livestock pens, hanging clothes and bushes that can potentially be bitten by mosquitoes which can become a vector of filariasis disease. The presence of shrubs can block sunlight to the surface of the soil so that the environment becomes shady and humid, these conditions are favored by mosquitoes as a place to rest mosquitoes.[9] The location of livestock pens that are not far from their homes can affect the distribution of filariasis. The condition of the house with a hole and no gauze on the house ventilation can potentially contact between the community and mosquitoes so that the greater the potential for mosquito bites. Based on the results of mosquito surgery, microfilariae are not found in the body of mosquitoes, it can be influenced by several factors, including the ability of mosquitoes to suck limited blood so that the chances of microfilariae larvae being sucked small, microfilariae density in the human body is low so microfilariae transmission to the mosquito does not occur.[13] According to Sumarni and Soeyoko's research, microfilariae density in human blood is needed around 1-3 mf mm3 so that transmission can occur optimally.[14] The behavior of microfilariae moving actively to the peripheral blood must be in accordance with mosquito biting behavior. Microfilariae must also be able to move actively from visceral blood to peripheral blood in time so that it can infect mosquitoes. If mosquitoes suck blood before microfilariae larvae appear in the peripheral blood, microfilaria transmission does not occur from the human body to mosquitoes. [13] So, it can be concluded that environmental conditions as breeding grounds and resting places for mosquitoes are factors that can potentially be the transmission of filariasis in Dempet Sub District, Demak Regency. Potential vector of filariasis events in Dempet Sub District, Demak Regency, Culex quinquefasciatus

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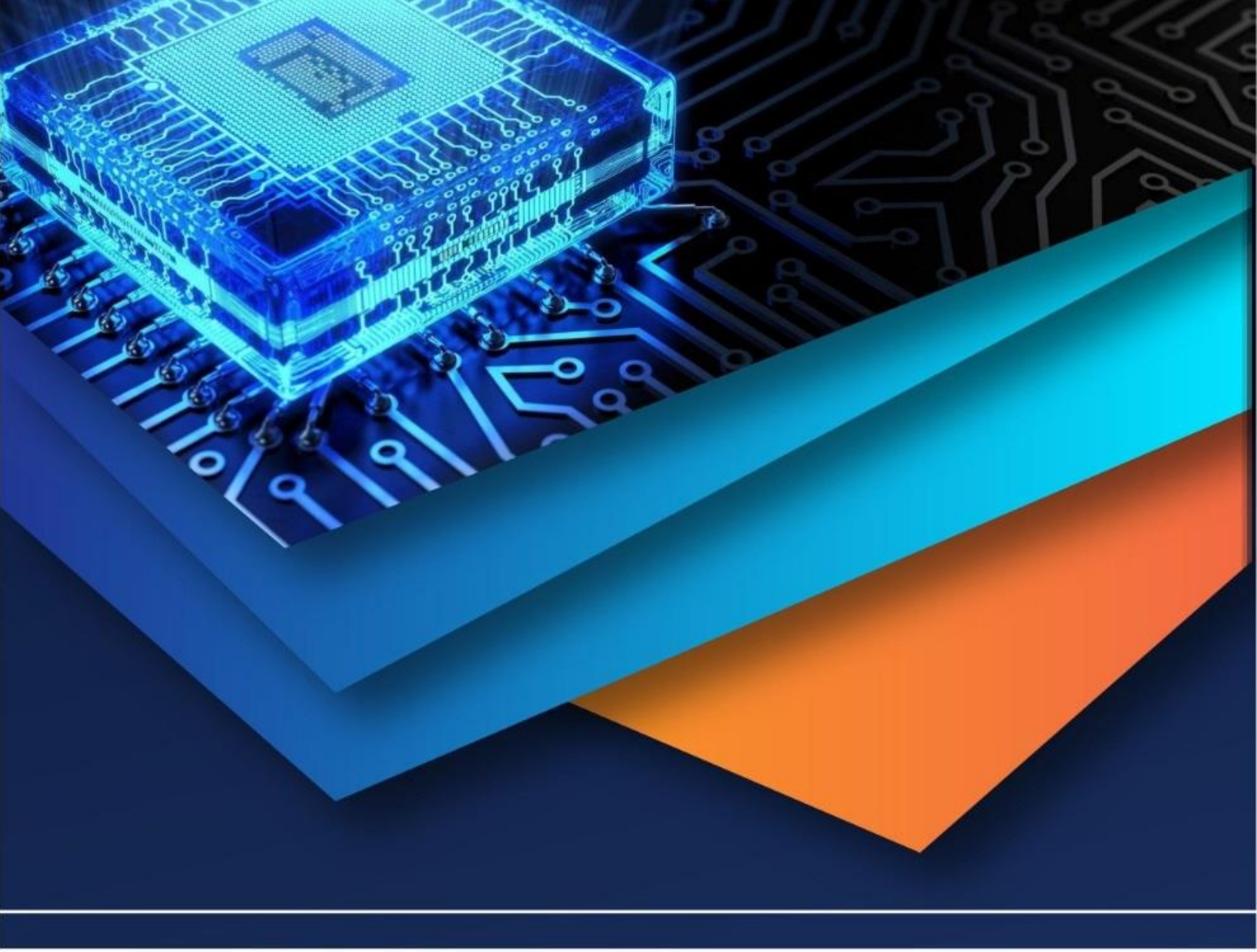

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