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The Effect of Long Lasting Insecticidal Nets Installation in Reducing Anopheles Sp Mosquito

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ABSTRACT

Background: *This study offers another approach, namely the installation of long-term insecticide-treated bed nets in cattle sheds to accelerate the decline in the number of mosquitoes instead of using conventional spraying .*

Method: *This type of research was used pre-experiment with one group pre, and post-test design with analysis before and after the paired t-test was used.*

Result*: The results of the Anopheles mosquito suspected of being a vector are An. maculatus and An. Balabacensis. There was a decrease in mosquitoes caught overall 96.7% and 100% in cattle house. The statistical tests generated P = 0.000 meaning that there are differences in the number of mosquitoes caught between before and after two months installation of insecticide-treated bed nets.*

Conclusion: *The malaria control policy was changed to the installation of insecticide-treated bed nets added to the longevity of livestock.*

Keywords: *Anopheles Mosquitoes, livestock cages, Long Lasting Insecticidal Nets (LLIN's)*

I. INTRODUCTION

The WHO report for 2015-2017 has shown that there has been no significant progress in decreasing malaria cases. However, it is estimated that there are still 219 million cases of malaria with a *case fatality rate of* 0.19% or 435,000 deaths in the malaria-risk area [(1)]. Transmission of malaria occurs because of the mosquito vector from *Anopheles spp*. Type so the control is carried out in two ways, namely in the form of treatment as early as possible and suppress the density of mosquitoes *Anopheles spp* that the risk of transmission can be minimized[(2)] .

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Efforts to reduce the density of *Anopheles spp* were carried out chemically in the form of spraying houses and using insecticide-treated bed nets (LLI'Nt) on the bed. This program has been going on for decades in Indonesia since 1950 [(3)]. The results actually indicate the opposite effect, mosquitoes prefer to bite outside the home 82%, and prefers the blood of animals *(zoophilia)* because of the smell and the CO_2 is high.

The results of this study form the basis for changing the method of controlling malaria vectors in homes into outdoors, namely in cattle houses by installing Long Lasting Insecticidal Nets which is mosquito nets containing insecticides and recommended by WHO for malaria control in endemic areas.

II. METHOD

This type of research was used pre-experiment with one group pre and post-test design. This design assessed the density of *Anopheles spp*. conditions before and after the treatment. The density measurements were carried out one day before the installation of mosquito nets and two months after installation in each house and cage where the mosquito net was placed.

Site selection criteria includes: 1) the location of the last six months has not been sprayed and installed the mosquito nets; 2) the owner of the cage is willing to cooperate; 3) extraordinary cases of Malaria have occurred in the past five years; 4) the results of the spot survey are assumed to contain malaria vectors; 5) location determination is based on the latest malaria case index within a 400 m radius. Catching mosquitoes at each catching point was carried out by six catchers namely three inside and three outside of the house for 60 minutes. The details of activates were 40 minutes of permanent capture both inside and outside the house, 10 minutes moving, 10 minutes catching on the walls of houses and livestock houses. Every hour the mosquito obtained was identified by species. Data analysis used pair t-test to determine the effect of installing insecticide-treated bed nets on mosquito density.

III. RESULT

This study discusses the effect of the installation of WHO-recommended insecticide bed nets (LLIN's) to reduce the number of mosquitoes as a vector of transmission of malaria. The primary indicator used is the number of *Anopheles spp* mosquitoes caught from three arrestees for 12 hours of arrest (all night) from 6:00 p.m. to 6:00 p.m. *Anopheles spp*, later was identified as specified species and time of the activity with the following results:

Table 1. Results of Catching Anopheles spp. Mosquitoes.

Type of anopheles mosquitoes	the number caught	Category arrest time			
		≤ 24.00		>24.00	
		Before	After	Before	After

An. maculatus	16	8	0	8	0
An. Vagus	2	0	1	1	0
An. minimus	137	73	1	63	0
An.kochi	1	0	0	1	0
An. tesselatus	1	0	1	0	0
An.balabacensis	2	0	0	0	2

Table 1 displays that the number of mosquitoes caught before LLIN's installation was 30.8 times greater than two months after installation, and Anopheles mosquitoes were predominantly *An. minimus*. The number of mosquitoes caught based on fishing locations can be seen in Table 2 below:

Table 2. Number of Mosquitoes Caught Based on Location

Types of Mosquitoes .	The number of mosquitoes caught	Location			
		Home		Cage	
		Before	After	Before.	After
An. maculatus	16	1	0	15	0
An. vagus	2	0	1	1	0
An. minimus	137	40	1	96	0
Kochi	1	0	0	1	0
chalange	1	0	1	0	0
balabasensis	2	0	2	0	0
Total	159	41	5	113	0

Table 2 shows that the number of mosquitoes caught in the cage was 2.75 times more at home than at the time before, while after installation in the cage no mosquitoes were found in the house. Statistical analysis

was used to draw general conclusions about the effect of installing mosquito nets with the number of mosquitoes caught, and the results are as follows:

Table 3. Results of Statistical Analysis of Number of Caught Mosquitoes

Condition	Number of mosquitoes	Calculated t	P	Conclusion
Before	154	4.017	0.000	Ho = rejected, there were differences in mosquitoes caught between before and after installation.
After	5			

The results of the statistical analysis in Table 3 show that there are differences in the number of mosquitoes caught for 12 hours before the installation of insecticide-treated bed nets and two months thereafter, with a decrease in the number of *Anopheles spp mosquitoes*. amounting to 96.7%

IV. DISCUSSION

Malaria is a disease that can be prevented and treated, and this disease is transmitted through the media of Anopheles mosquitoes called vectors [(4)]. The results of the study are several things discussed further to explain, namely the types of mosquitoes caught, the location of fishing, mosquito activity, and the number of mosquitoes caught.

Mosquitoes *Anopheles* caught of *An minimus* type on Java Island has never been reported as a vector, except in East Nusa Tenggara and North Sulawesi, the dominance of mosquitoes shows a bionomic breeding condition that is adjacent to a pool of water in a dry river, in a grove of trees on the banks of a river. The potential vectors are *An. maculatus* and *An. balabacensis*. *An. maculatus* has been declared to be a vector in hilly areas and community forests in Central Java. The mosquito is active from 20:00 to 04:00 [(5)].

An. balabacensis is a vector found in almost all countries of Asia Pacific, in Sabah Malaysia, Cambodia, in Indonesia, especially in Central Java the hilly area is the dominant vector. This *Anopheles* has a high vectorial capacity between 1.44-19.7, this means that in one night this mosquito can infect 1-20 people. This mosquito also has blood-searching activities almost the same as *An. Maculatus* [(6)].

Mosquitoes have a weakness in mobility (flying) on the lower wing (*fringe*), which is fine hairs that maneuver when flying. If the fringe is wet with water, then the mosquito maneuver is disrupted and cannot fly

far. On the other hand, the air condition after 24.00 hours experiences precipitation which is full of water vapor, so that if the humidity is measured close to 100%, even though both of them come from the forest and the edge of the forest, it takes a lot of energy to get to human settlements. This shows how strong the two *Anopheles* mosquitoes are making them vectors in reasonably large areas [7].

The results of the study as shown in Table 3 indicate two essential things; the number of mosquitoes caught in cage is is 2.84 times more than at home, and after the installation intervention, the mosquito net was not found at all in the cage. *Anopheles spp.* is zoophilic meaning this type of mosquito is like animals than human blood more [8]. Mosquitoes are attracted to food sources (human or animal) due to CO stimulation and metabolic activities that produce heat and odor, and food detection activities carried out by antennas and palpus [9].

The results of the descriptive analysis as seen in Tables 2 and 3 showed a decrease in the overall number of mosquitoes 96.7%, both at home and in cages, but mosquitoes were not found at all at home. The results of statistical analysis significantly decreased the number of mosquitoes caught between before and after the installation of long-term insecticide-treated bed nets. This significant decrease in the number of mosquitoes is due to the use of mosquito nets in the process of making a combination of 2% permethrin combined with polyethylene fibers which have knockdown effect toward mosquitoes [10]. The indicator set by WHO the effect of a mosquito knockdown is 95%, but is seen in a 100% cattle in this research indicates the effectiveness of the mosquito net is quite good, because it has only been installed for two months, while the results of field testing are still useful for 3 years up to 20 times, when compared to the spraying program in the house the first year still had the ability of 89.7%.[11]. This method can be used as another alternative to fight mosquito which is already susceptible to cypermethrin used in vector control programs in dengue hemorrhagic fever [12] .

V. CONCLUSION

There was a decrease in the number of *Anopheles spp mosquitoes*, caught 96.7% and 100% in the cage, as well as the results of statistical tests there are differences in the number of mosquitoes between before and after the installation of old insecticide-treated bed nets within two months. Suggestions proposed are the necessity to change in vector demolishment by installing the mosquito nets in cages.

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