The Diversity Of Anopheles sp. In Kehiran Village Jayapura Regency, Papua

Henny Sesanti Budi Hastuty, Dwi Andika Kurniawan, Renold Markus Mofu
Jayapura Health Polytechnic of Ministry of Health
Email: hennysesanti@gmail.com

Abstract

Background. Anopheles sp is the vector that transmits disease still a public health problem. In Indonesia there are 80 species of Anopheles spp and 22 of them have been designated as malaria vectors. Some Anopheles species confirmed to transmit filariasis, namely An. funestus, An. scapularis, An. gambia, and An. barbirostris. The data from Jayapura Regency Health Office (2016) shows, there were 25,072 malaria cases being reported. The higher density of Anopheles spp in an area further increases malaria transmission. Objective. This study aimed to calculate the density and identify Anopheles sp. species in Kehiran Village, Sentani District, Jayapura Regency. Survey method was chosen for this study. Results. The results showed the number and species of Anopheles caught were: Anopheles farauti 74 (63.3%), Anopheles punctulatus 13 (32.4%), and Anopheles koliensis 5 (4.3%). Man Hour Density (MHD) from 1st location was 0.51 mosquito/person/hour, 2nd location was 0.55 mosquito/person/hour, 3rd location was 0.55 mosquito/person/hour, the average of MHD was 0.54 mosquito/person/hour. Man Biting Rate (MBR) from 1st location was 3.10 mosquito/night, 2nd location was 3.33 mosquito/night, 3rd location was 3.33, the average of MBR was 3.25 mosquito/night. Conclusion. There are three species, Anopheles farauti, Anopheles punctulatus, and Anopheles koliensis. The MHD was 0.54 mosquito/person/hour and MBR was 3.25 mosquito/night.

Keywords: Anopheles sp., Diversity, Density
BACKGROUND

Malaria is a disease transmitted by Anopheles spp, and still a health problem in Indonesia and malaria still be endemic disease in Papua, West Papua, Maluku, North Maluku and East Nusa Tenggara. According to Majawati, E.S (2015). Efforts have been made by the Indonesian Government to reduce malaria cases, including distribution of insecticide-treated bed nets, and distribution of anti-malaria drugs.

In Indonesia there are approximately 80 species of Anopheles mosquitoes, twenty five species have proven to be a vector of malaria. Whereas in Papua there are 6 species of Anopheles, namely Anopheles tessellatus, Anopheles koliensis, Anopheles farauti, Anopheles punctulatus, Anopheles kochi and Anopheles bancrofti (Kemenkes.R.I, 2015) and (Achmadi, U.F, 2015). In Eastern Indonesia, several species Anopheles proven as malaria vectors, namely: An. koliensis, An. bancrofti, An. barbirostris, An. subpictus, An. sundaicus (Fahmi.M et.al, 2014). In Hamadi, area of Jayapura City, Anopheles koliensis species proven contain sporozoite (Mofu, R.M, 2013).

According to the Indonesian Ministry of Health (2015), in Jayapura Regency there are four known species of Anopheles: An. farauti, An. coliensis, An. punctulatus, and An. subpictus. Ecological studies and identification of Anopheles spp are very useful to determine the behavior and potential transmission of malaria and filariasis, and the results of the study can be used as a basis for determining the strategies for handling diseases transmitted by Anopheles spp.

Jayapura Regency is located between 129°16’ - 144°01’47” East Longitude, 2°23.10” North Latitude, and 9°15’00” South Latitude. The topography of the area varies from the lowlands, swamps and highlands (hills) and the wet tropical climate with an average temperature (temperature) is 26-33°, the average humidity is 75-84% with high and uneven rainfall, between rainy and dry season is not clear. (Kemenkes R.I,2015)

Kehiran Village located in the Sentani District of Jayapura Regency. The topography of Jayapura Regency in the form of swamps, lakes, lowlands, highlands and still forests and the
presence of small rivers, illustrates that the area is a very potential area as a place for breeding and resting place for malaria vectors and is very vulnerable to malaria.

**RESEARCH METHODS**

The study was conducted in June 2018. Design of this study was survey research with a cross sectional approach. Surveys of adult mosquitoes are carried out with reference to WHO standards (1975), and WHO (2003). Mosquitoes collection is carried out at 06.00 p.m-06.00 a.m. To find out the species of the caught mosquito, was identified using the identification key O’Connor and Soepanto (1999). The survey data are then analyzed descriptively. The collection of mosquitoes was carried out in Kehiran Village, Jayapura Regency, while the identification of samples was carried out at the Entomology Laboratory. The object in this study was *Anopheles spp*. The collected mosquitoes were identified and calculated by the population density of stabbing human blood per person per hour (*MHD* = Man Hour Density), and the number of mosquitoes that stabbing human blood per person per night (*MBR* = Man Bitting Rate), calculated by the WHO based equation as the following:

\[
MHD = \frac{\text{Number of Anopheles mosquito collected}}{\text{Number of collectors} \times \text{time of collection (hour)}}
\]

\[
MBR = \frac{\text{Number of Anopheles mosquito collected}}{\text{Number of collectors} \times \text{time of collection (night)}}
\]
RESULTS

Location of Mosquitoes Collection

The location of mosquitoes catching in Kehiran Village as follows:

Mosquito Species Collection

The collection in Kehiran Village gets 117 *Anopheles spp* mosquitoes, which consisted of 74 *Anopheles farauti* (63.3%), 38 *Anopheles punctulatus* (32.4%), and 5 *Anopheles koliensis* (4.3%).
Figure 2. Distribution of *Anopheles spp* mosquitoes collected in Kehiran Village

The distribution of *Anopheles spp* caught according to the location is as follows

![Bar chart showing distribution of Anopheles spp by location](image)

**Figure 3. Distribution of Anopheles spp Based on Location of Collection**

At the figure 2, shows the distribution of *Anopheles spp* is almost evenly distributed throughout the Kehiran Village area. The highest *Anopheles spp* species collected was *Anopheles farauti*, while the least was *Anopheles coliensis*.

**Mosquito density per person per hour (Man Hour Density)**

Results of the analysis of the density of mosquitoes that were collected stabbing human blood were found 0.53 mosquito/person/hour.
Table 1 Man Hour Density (MHD) Mosquito Density Distribution According to Location of Anopheles spp Collection in Kehiran Village

<table>
<thead>
<tr>
<th>No</th>
<th>Location</th>
<th>MHD</th>
<th>MHD Average</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>1&lt;sup&gt;st&lt;/sup&gt;</td>
<td>0,51</td>
<td>0,53 mosquito/person/hour</td>
</tr>
<tr>
<td>2</td>
<td>2&lt;sup&gt;nd&lt;/sup&gt;</td>
<td>0,55</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>3&lt;sup&gt;rd&lt;/sup&gt;</td>
<td>0,55</td>
<td></td>
</tr>
</tbody>
</table>

Mosquito density per person per night (Man Biting Rate)

The results of the analysis of the density of mosquitoes collected per person per night are as follows.

Table 2 Mosquito Distribution of Man Biting Rate (MBR) Based on Location of Anopheles spp Collection in Kehiran Village

<table>
<thead>
<tr>
<th>No</th>
<th>Location</th>
<th>MBR</th>
<th>MBR Average</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>1&lt;sup&gt;st&lt;/sup&gt;</td>
<td>3,10</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>2&lt;sup&gt;nd&lt;/sup&gt;</td>
<td>3,33</td>
<td>3,25 mosquitoes/night</td>
</tr>
<tr>
<td>3</td>
<td>3&lt;sup&gt;rd&lt;/sup&gt;</td>
<td>3,33</td>
<td></td>
</tr>
</tbody>
</table>

The data shows that mosquito/person/night density in Kampung Kehiran is 3.25 per night, it means that in one night there are 3.25 mosquitoes that bite or suck blood in Kehiran Village.

DISCUSSION

Based on the results of a survey in Kehiran Village conducted in RT 01 (1<sup>st</sup> location), RT 02 2<sup>nd</sup> location), and RT 03...
(3rd location), the density of *Anopheles spp* with Man Hour Density (MHD) in Kehiran Village was obtained, RT 01 = 0.51, RT 02 = 0.55 and RT 03 = 0.55 with an average of 0.53 mosquito/person/hour. The density of *Anopheles spp* mosquitoes with Man Biting Rate (MBR) in Kehiran Village is RT 01 = 3.1, RT 02 = 3.33 and RT 03 = 3.33 with an average of 3.25 mosquitoes/night, the species are *Anopheles farauti, Anopheles punctulatus* and *Anopheles coliensis*. Former research conducted by Sandy, et.al (2016), found in Bikar Village, MHD in the house was 0.39 mosquito/person/hour, MHD outside the house was 0.33 mosquito/person/hour. Same study in Kwor village, Tambraw district, MHD in the house was 0.14, and MHD outside the house was 0.08 mosquito/person/hour (Sandy, et. Al, 2016). This is shows that the density of *Anopheles spp* mosquito in Kehiran Village is higher than in Kampung Bikar and Kampung Kwor Tambrauw.

*Anopheles spp* mosquitoes caught was carried out in June 2018. The weather conditions during the study were bright with an average temperature of 28°C with a humidity of 73.8% RH. The temperature and humidity in the Kehiran Village strongly supports the breeding of the *Anopheles* mosquito. The optimal temperature for *Anopheles spp* to breed is in the temperature range of 26-30°C, (Sandy, et.al, 2016). According to Arsunan A, A. (2012), 60% humidity is the lowest limit that can be tolerated by *Anopheles spp*. The temperature will affect the length of the sporogony cycle. Higher temperature will affect to shorten the sporogony cycle, and vice versa. Besides affecting the sporogony cycle, the temperature will affect the age and growth of gametocytes. Optimal temperature for the growth of mosquitoes at 25-30°C (Friaraiyatini, et. al, 2006). The results of Mofu, R.M (2013) research showed that there was a strong positive relationship of between air humidity and vector density.

*Anopheles spp* mosquito breeding place generally at a pool of dirty water and directly contact with the soil. The Kehiran village is an area that contains sago forests and banana trees, the abundance of thick grass weeds, numbers
of plantations, there are swamp areas overgrown with water spinach, river flow and there are naturally occurring stagnant waterways, as well as artificial waterways inundated by water. The *Anopheles spp* habitat found in Kehiran Village is in line with the results of Sandy, et al (2016) study, in Bikar and Kwor Villages, Tambrauw District which found *Anopheles farauti*, *Anopheles punctulatus*, and *Anopheles coliensis* breeding sites generally enjoyed living in habitats such as waterways, ponds and inundations used vehicle tires. The results of this study also have similarities with the Hasanah. N. (2010) research, that *Anopheles spp* habitat found in Yobeh Village, Jayapura Regency is a waters overgrown by grass *Digitaria ciliaris*, reeds and water algae *Chlorophyta*. According to Shinta.S, et.al (2015), *Anopheles spp* habitat in Merauke is in unproductive ponds, rice fields, ditches, irrigation canals, swamps, wells, ponds, and farms. The houses of the people around the Kehiran Village are of two types of houses, namely semi-permanent stilt houses and non-stage houses (permanent houses). For houses not on stilts, standing water is around the house, but for some houses on stilts there are puddles or puddles under the house that have the potential to become a place for breeding mosquitoes (Noshirma.M. et al, 2012)

The diversity of *Anopheles spp* species found in an area may be different from other regions, depending on the ecosystem and its distribution area. *Anopheles* species will also differ between various geographic zones, this is related to the ability to adapt to physical conditions, chemical waters as well as food availability for the pre-adult stage. Geographical conditions will affect the weather, and the weather will affect habitat availability for breeding mosquitoes. (Noshirma.M. et.al, 2012).

The high density of *Anopheles spp* mosquitoes in Kehiran Village will impact in increasing malaria. This can be seen from malaria data in Sentani Public Health Center, the data shows from January - December 2017 there were 244 cases of malaria in Kehiran Village.

According to Arsunan, A.A (2012) and Erdinal, et. Al (2006), there are three important factors in the transmission of...
a disease: host, agent, and vector. These factors play an important role in the transmission of disease, if high density and agents are available, transmission become very fast. Host intervention is very important in controlling and spreading malaria, especially in Kehiran Village by preventing contact between humans and mosquitoes by not being outdoors at night, using trousers and long sleeves when going out at night, sleep using an insecticide-treated mosquito net, use mosquito repellents both lotion when outdoors at night or spray or burn when going to sleep, close windows and doors and install wire netting on vents, ceilings and doorways.

CONCLUSIONS AND RECOMMENDATIONS

Malaria control efforts that can be carried out in Kehiran Village are by hoarding puddles of water and unproductive ponds, or by keeping the flow of sewage water flowing smoothly, cleaning up plants around the houses of residents and requiring the use of mosquito nets in homes residents, especially houses that are not perfectly protected from mosquito attacks, and the use of mosquito repellent for residents who will carry out activities outside the house.

REFERENCES


