

The Dynamics of Malaria Transmission in Tablolong Village

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Abstract

Three factors which are always interplay in malaria infection process are agent (plasmodium), wet nurse (humans and mosquitoes), and the environment. The process of malaria transmission is also influenced by the existence of *Anopheles sp* breeding sites. This research aimed to know the dynamics of malaria transmission in Tablolong village, West Kupang Subdistrict on April-May 2014. The type of this research was a survey, while research design was cross sectional. The population was *Anopheles sp* in Tablolong village, West Kupang subdistrict, Kupang District, *Anopheles sp* breeding sites and all malaria sufferers from March until April 2014. The sample was all *Anopheles sp* caught, the entire *Anopheles sp* breeding sites and all malaria sufferers recorded in the malaria register from March until April 2014. The number of mosquitoes that bite people both inside and outside home in an hour was calculated by using the formula of mosquitoes density wherein the amount of *Anopheles sp* caught divided the number of hours then multiplied by the number of mosquito collectors. Observations and measurements were committed from 6 pm until 12 pm indicated that *Anopheles sp* was found most outside of the house with a density of 1.91 biting tail/hour/person in the research site. Results of the study showed that most cases of malaria sufferers were in 100 metres which is near to *Anopheles sp* breeding sites. It could be concluded that the most malaria sufferers' location stood about 200 meters from *Anopheles sp* breeding sites.

Keywords: The bite density, mosquitoes, distance of malaria sufferers' location.

I. INTRODUCTION

Malaria is an infectious disease caused by the Plasmodium parasite living and breeding in human blood cells. The disease is naturally infected through mosquito bites of *Anopheles sp* female. Malaria is one of the diseases becoming a threat even often makes an extraordinary occurrence recently. It occurs due to vigilance system of society is weak and the planning early eradication of malaria is not committed appropriately and continually (Health Department, 2008).

The WHO (The World Mal. Report 2008) outlines that various attempts having been made. Until 2014, malaria still becomes a major problem in 107 countries in the world, and suffers more than 2 million residents. If it is estimated in a year, malaria attacks at least 350-500 million people each year. 90% sufferers are in the tropical country and Africa wherein the death rate is about 1 million people each year, mainly aged children. Malaria attacks in rural areas where the health facilities are inadequate and the majority of its victims are from the poor or weak economy (Health Department, 2003).

It is estimated that 50% of the population of Indonesia lives in malaria endemic areas. Areas with high clinical malaria cases were reported from eastern Indonesia such Papua Province, Maluku, North Maluku, Sulawesi, and Nusa Tenggara Timur (NTT). According to WHO, more than 30 million cases of malaria occur in Indonesia each year, with 30,000 deaths. National health survey in 2010 found the mortality rate due to malaria is 8-11 per 100,000 inhabitants. The national malaria data in 2013 showed that there were 2,116,066 clinical malaria cases, while 2014 became 1,774,845 clinical malaria cases. The number of positive malaria sufferers (positive microscopy examination results there are germs of malaria) in 2013 found about 350 thousand cases and in 2014 about 311 thousand cases (Indonesia Health profile, 2013).

Nationally, the province of NTT is the province with the highest number of malaria infection. The Health Department data (2014) showed that NTT has 150 per 1,000 people of malaria sufferers per year. According to the provincial Health Department of NTT, in 2010 there were 711,480 cases of clinical malaria, in 2011 there were 672,156 cases of clinical malaria, then 2012 there were 618,364 cases of clinical malaria, in 2013 there were 557,723 cases of clinical malaria and in 2014, 130,148 clinical malaria cases found. In 2012 Annual Malaria Incidence (AMI) is 167%, 2013 AMI is 145%, 2014 AMI is 119% (Health Office profile of NTT in 2013), Annual Parasite Incidence (API) 26.14%, in 2012 there were 52,662 clinical malaria cases, in 2013 there were 49,239 clinical malaria cases and in 2014 there were 40,347 cases of clinical malaria while AMI in 2012 Kupang regency was 161.60%, 2013 AMI was 151.10%, Batakte Health Center of West Kupang, AMI was 84.26% in 2011, in 2012 AMI is 94.31%, in 2013 AMI was 37.37% and in 2014 AMI was 32.61% and in particular area of research in 2012, AMI of Tablolong village is 135.57% (Kupang Health Office profile, 2013).

As effort to decrease the number of sufferers and deaths is committed through the malaria eradication program wherein the activities include diagnose early, quick and precise treatment, surveillance and control of vector included grown mosquito arresting and breeding site survey. this is intended to break the chain of malaria infection towards the agent, host and environment (Health Department, 2010).

West Kupang sub-district is located in Kupang Regency with 13,700 populations. Most areas in West Kupang Sub-district consist of swamp areas and forested areas. Especially in Tablolong village, there is some breeding site vector which is near to Society Housing supporting the occurrence of malaria transmission.

II. METHODS

The type of this research was a survey, while the research design was cross sectional. This research was carried out in Tablolong village, West Kupang on April 2014 until May 2014. The population in this research was all *Anopheles sp* breeding sites, the *Anopheles sp*, and all malaria sufferers who were in Tablolong village while the sample in this research was *Anopheles sp* larva breeding sites. In Tablolong village, all *Anopheles sp* are captured at night from 6 to 12 pm. The determination of sample was committed by applying accidental sampling technique, malaria sufferers in the village of Tablolong recorded in the register of malaria during March to April 2014 was 31 people. Data collection in this research was committed through interviews, observation, measurement, and examination of the document. The data collected in this research was the primary data and secondary data. Primary data was directly obtained in research activities formed observational data from breeding sites, mosquitos' data of survey result and malaria sufferers' data. While secondary data was obtained from health service Kupang District, Batakte health centers of West Kupang Subdistrict and Tablolong Village Office. The instrument used in this research was the observation sheets featured the form of arrest mosquito *Anopheles sp*. Data was analyzed descriptively in the form of tables and figures.

III. RESULTS

A. An Overview of Research Site

Tablolong village is one of the villages in the subdistrict of West Kupang, Kupang Regency East Nusa Tenggara province with a total area is 9.01 kilometres. The village of Tablolong consists of four hamlets and eight neighbourhood associations, with four region boundaries wherein to the North it borders with Tasabela village, south to Lifuleo village, and west it borders with The Timor Sea.

The distance among Tablolong village, Government center and Batakte clinics is approximately 25 Kilometres and can be reached by motorcycle or car in 60 minutes. With 986 populations, head of the family in the village of Tablolong works as fishermen, farmers and the self-employed which generally elementary school educated. The Tablolong village is a coastal area having a potential breeding site for *Anopheles sp*.

Table 1. Amounts, kinds, types, mosquitos breeding site in Tablolong village

Location	Kinds	Amounts	Types	Width	Closest distance to settlements	Anopheles larva positive
I	Breeding site	1	Permanent	700 m	0,5 m	Positive
II	Breeding site	1	Permanent	300 m	10 m	Positive
III	Breeding site	1	Permanent	250 m	100 m	Positive

The table above shows that the results of observation conducted in potential place as *Anopheles* breeding sites. There are three locations consisting of three permanent breeding sites where the width is 1.5 hectares, the dominant vegetation is found around breeding site such as mangrove trees, Moss, and seaweed. Generally, all the breeding sites got the sun shines directly and it is potential for *Anopheles sp* life.

Table 2. The distance between Malaria Sufferers and breeding site Tablong village, sub-district of Kupang West

No	Sufferers' name	Hamlets	Age/Sex		Diagnose		Distance Between House Breeding Site
			Men	Women	Clinical	RDT	
Hamlet I							
1	HK	I		16	V	-	± 250 M
2	YN	I	4		V	-	± 100 M
3	FB	I	27		V	-	± 100 M
4	YM	I	15		V	-	± 100 M
5	VN	I		52	V	-	± 100 M
6	SAC	I		4	V	-	± 100 M
7	RM	I	13		V	-	± 100 M
8	Y	I		15	V	-	± 100 M
9	AK	I		13	V	-	± 100 M
10	LM	I	37		V	-	± 100 M
11	MH	I	37		V	-	± 100 M
12	SAC	I	63		V	-	± 50 M
13	LM	I	17		V	-	± 70 M
14	NK	I	50		V	-	± 100 M
Hamlet II							
1	HK	II		30	V	-	± 250 M
2	EP	II	60		V	-	± 250 M
3	RD	II		6	V	-	± 250 M
4	FN	II	13		V	-	± 250 M
Hamlet III							
1	ML	III	49		V	-	± 100 M
2	IR	III		4	V	-	± 100 M
3	SP	III		23	V	-	± 100 M
4	YN	III	45		V	-	± 90 M
5	NH	III		15	V	-	± 80 M
6	NH	III		40	V	-	± 100 M
7	YY	III	4		V	-	± 80 M
8	YY	III	4		V	-	± 80 M
Hamlet IV							
1	RL	IV	6		V	-	± 2KM
2	VW	IV	27		V	-	± 2KM
3	YD	IV		40	V	-	± 2KM
4	AL	IV		70	V	-	± 2KM

The distance of house of malaria sufferers in Tablong village, West Kupang subdistrict with mosquito breeding site at most about 100 metres counted 16 houses, about 250 metres counted 6 houses, down to 100 metres counted 5 houses, and distance 2 km counted 4 houses, while case of malaria sufferers which was diagnosed clinically in Tablong village, found 31 malaria cases consisted of 17 cases of males and females for 14 cases where from 31 malaria cases, malaria sufferers distance in Tablong Village as of 31 April 2014 was at most approximately 200 m from *Anopheles sp* mosquito breeds or close to the mosquito breeding sites for 21 malaria sufferers, in 200 to 400 metres distance there were 6 malaria sufferers and distance up to 400 m found 4 malaria sufferers.

The results of observation of bite behavior showed that *Anopheles sp.* attacked was not only inside the house but also outside. Observations were made at night from 6 to 12 pm. This activity was conducted in Tablong Village in 4 houses with people bait method, both inside and outside the house.

Table 3. The vector behavior (*Anopheles sp* mosquito biting activity) in Tablolong village, West Kupang subdistrict

Catching Places	Collectors	Time Amounts of Mosquitoes Caught											
		6 to 7.40 pm	MHD	7 to 7.40 pm	MHD	8 to 8.40 pm	MHD	9 to 9.40 pm	MHD	10 to 10.40 pm	MHD	11 to 11.40 pm	MHD
UOD	1	2	0.16	4	0.33	6	0.5	8	0.66	2	0.16	9	0.75
	2	1	0.08	3	0.25	7	0.58	5	0.41	2	0.16	0	0
Total		3	0.24	7	0.58	13	1.08	13	1.07	4	0.32	9	0.75
UOL	1	0	0	3	0.25	3	0.25	9	0.75	3	0.25	5	0.41
	2	3	0.25	1	0.08	8	0.66	12	1	4	0.33	18	1.5
Total		3	0.25	4	0.3	11	0.9	21	1.8	7	0.58	23	1.91

The activity of biting *Anopheles sp* at night prefer biting outside the house to inside the house, while the highest peak of *Anopheles sp* outdoors is at 11 to 12 pm with MHD of 1.91 mosquito/hour/person.

IV. DISCUSSION

A. Amounts, Kinds, and Types of Mosquitoes Breeding Site in Tablolong Village

Amounts, kinds and types of breeding site greatly affect the density of *Anopheles sp* larva and the presence of *Anopheles sp*. Potential breeding sites in Tablolong village is 3 permanent breeding sites in hamlet I about 700 metres area, in hamlet II with wide about 300 metres and in hamlet III with wide about 500 metres. The condition is due to the rising tidal waters leave a large puddle and mixed with rain then become brackish water, therefore positive larvae *Anopheles sp* found.

The breeding site is formed in brackish water. *Anopheles* larvae found in brackish water are *An. Sundaicus* and *An. Supictus* (Iskandar 1985). This is appropriate with Effendi et.al research, they asserted that the main vector in East Nusa Tenggara is *An. Sundaicus* and *An. Supictus* where there are many breeding sites found in the beach that full of brackish water. The dominant vegetation in the village of Tablolong is moss, water grass, and mangrove trees around the breeding grounds. According to Health Department (2010), in tidal areas with the brackish water and moss species, water grass and mangrove trees are suitable places for breeding sites of *An. Subpictus*. The breeding site especially moss which is mostly exposed sunlight directly is one food source for *An. Supictus* larva.

B. Distance between Sufferers' home and breeding sites in Tablolong Village, West Kupang Subdistrict

From 31 cases of malaria sufferers in Tablolong village, West Kupang sub-district, Kupang regency, the most sufferers were 16 people stood on 100 metres from the nearest mosquito breeding sites from the house. While distance between the house of malaria sufferers and the breeding site of *Anopheles sp* in average distance 200 metres found 31 cases of malaria sufferers. The distance of the malaria sufferers' house in Tablolong Village on 31 April 2014 was at most of the spreading distance less than 200 metres from the breeding sites or close to the mosquito breeding site was 21 people.

Residential areas in three hamlets I, II, III are concentrated in one place so that the process of transmission of malaria is very possible. According to Health Department (2010), female mosquitoes after mating will spread from breeding sites to the residential area to get blood for the egg maturation process. This is appropriate with the ideal flying distance of *Anopheles sp* from breeding sites to the residential area to get the blood for egg maturation is as far as 200 metres. The closer settlement would allow *Anopheles sp* to get blood and infect malaria to the population.

C. Vector Behavior (*Anopheles sp* Biting Activity) in Tablolong Village, West Kupang Subdistrict

The results of observations and measurements made on biting behavior, *Anopheles sp* had biting activity from the afternoon started at 6 pm. both inside and outside the home. Peak time of *Anopheles sp* biting was at 11 to 12 pm with an average density was 1.91 bites/hour/person. This was not quite different from the existing theory that the peak of *Anopheles sp* inside and outside the house occurred at 8 pm to 3 am (Sungkar 2005), indicating that *Anopheles sp* have a peak density of biting is on midnight and nightfall, where the span of time is in addition to

the existing rest (sleep), besides there are still some people doing personal activities (related to family, work and others), as well as social activities (village meetings, weddings, and cultural events).

Based on observations and measurements that have been done, it showed that *Anopheles sp* mosquitoes at research sites prefer biting outside the house with density of biting is 1.91 mosquito/hour/person. This situation is influenced by the habit of locals prefer to gather outside home. Whereas it knows that *Anopheles sp* is most spread outside. This statement is based on where *Anopheles sp* biting activity is not only bites inside the house but also bites outside the home (Garjito, 2010).

V. CONCLUSION

Based on the result of the research, it can be concluded as follows.

1. Amounts, kinds, and types of *Anopheles sp* breeding site in Tablolong village, West Kupang subdistrict, Kupang regency found 3 permanent breeding sites with the width in hamlet I is about 700 metres, hamlet II is about 300 metres and in hamlet III is about 500 metres.
2. The distance between sufferers' home and *Anopheles sp* breeding site in Tablolong village, West Kupang subdistrict, Kupang regency stands on spreading site down to 200 metres (21 houses) from *Anopheles sp* breeding site while the sufferers' cases are on the nearest place, 100 metres, found 16 houses only.
3. Vector behavior (*Anopheles sp* biting activities) in Tablolong village, West Kupang subdistrict, Kupang regency found that the mosquitoes frequently bite outside the house with density of biting is 1,91 mosquito/hour/person and the peak of biting is on 11 to 12 pm with 23 times of biting.

VI. SUGGESTION

To avoid malaria problem, it is necessary to commit a mosquito fogging periodically for mosquitoes and all perching places of *Anopheles sp*, do dissemination of killfish (*Anopheles sp* larva predator), reduce outside activity at night, and use the mosquito repellent to avoid *Anopheles sp* attack.

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