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Evaluation Study of Filariasis Limfatic Elimination Activities

Authors
Santoso[1*], Anif Budiyanto[1], Yahya[1], Lasbudi Pertama Ambarita[1], Nungki Hapsari Suryaningtyas[1], Gede Wempi DSP[1], Yanelza Supranelfy[1], Tanwirotun Ni'mah[1], Anorital[2], Rita Marleta[2], Amrul Hasan[3]
[1]Baturaja Health Research and Development Center
[2]Indonesian Health Research Development Agency
[3]Tanjungkarang Ministry of Health Polytechnic
*Corresponding Author
Santoso
Email: *santosobaturaja@gmail.com; santosmetro@yahoo.co.id*

Abstract
Background: *The purpose of this study is to evaluate filariasis elimination activities in areas that have been carrying out mass treatment for five years. During July-November 2017, blood fingerprints of residents aged five years and above have been taken and examination of animal reservoirs.*
Methods: *The study was conducted in 2 provinces, namely Riau Province and Bangka Belitung. 2 regions were selected for each of the two districts that had finished malondialdehyde (MDA) treatment, then from each district two villages with the highest endemic were selected, so that the total area of research was eight villages. This research is part of a study of multicenter filariasis studies in 2017 in 23 endemic filariasis districts in Indonesia.*
Result: *The results of the study found that in Kuatan Singingi and Pelalawan Districts the Mf rate was <1%, in West Bangka and Belitung Districts the Mf rate was> 1% with the Brugia malayi species. The prevalence of intestinal worms in Kuantan Singingi Regency is 13.6%; Pelalawan 2.4%; West Bangka 5.3%; and Belitung 11.5%. Animals that have positive reservoirs of B.malayi are two cats, one dog, and one long-tailed monkey. Riau Province has not become an endemic area of filariasis (MF rate <1%), while in Province Bangka Belitung, the Mf rate is > 1%.*
Conclusion: *The risk of transmission in Kuansing Regency is low while in Pelalawan District, West Bangka and Belitung are still high.*
Keyword: *Riau, Bangka Belitung, lymphatic filariasis, reservoir, evaluation.*

Introduction

The Global Program to Eliminate Lymphatic Filariasis (GPELF) was launched by the World Health Organization (WHO) in 2000. Before the launch of GPELF by WHO in 2000, lymphatic filariasis (FL) was endemic in more than 80 countries, and regions with several people risk of infection exceed 1 billion. (World Health Organization, 2016)

Until the end of 2016, of 514 regencies/cities in Indonesia, there were 236 filariasis endemic districts/cities. Of the 236 districts /that have filariasis endemic, 55 districts have administered massive medicine distribution activities for five

consecutive years (5 rounds). The remaining 181 districts/cities will implement the program until 2020 toward the population of 76 million.

In 2014 the Minister of Health of the Republic of Indonesia issued Regulation of the Minister of Health Number 94 of 2014 concerning Prevention of Filariasis. Furthermore, in 2015, the Minister of Health launched the Elimination of Elephant Feet Month with the aim that filariasis is not a public health problem in Indonesia in 2020 (Ministry of Health,2014).

Brugia malayi filariasis is included in zoonotic diseases, so it is necessary to check blood for animals that act as zoonotic animals, including dogs *(Canis familiaris),* cats *(Fellis cattus),* and monkeys *(Macaca fascicularis),* and langur *(Presbytis cristata)*

The main objective of this study was to investigate the status of this infection among Riau and Bangka Belitung people after the completion of program of elimination of lymphatic filariasis, in which ivermectin annual mass administration has been ongoing for five years through mass treatment.

Method

The study was conducted in 2 provinces, namely Riau Province and Bangka Belitung. Two regions were selected for each of the two districts that had finished doing Malondialdehyde (MDA) treatment, then from each district. Two villages with the highest endemic were selected so that the total area of research was eight villages. This research is part of a study of multicenter filariasis studies in 2017 in 23 endemic filariasis districts in Indonesia.

Results and Discussion

The results of clinical examinations of respondents before blood sampling at night showed that there were respondents who had clinical symptoms of filariasis in the form of filaria fever and lymphadenitis. Both of these symptoms are the initial symptoms of filariasis sufferers. Although the symptoms of illness filarial are confused with symptoms of disease other diseases, but with the typical symptoms of filariasis in the form of recurrent fever for three days or three times a month or more, it is cause for concern, given the number of respondents who experience these symptoms pretty much.

Table 1 Clinical symptoms of filariasis as a result of clinical examination in 4 districts

Clinical Symptoms	District				Total
	Kuantan Singingi	Pelalawan	Bangka Barat	Belitung	
	n (%)	n (%)	n (%)	n (%)	n (%)
Fever	37 (5.9)	0 (0.0)	10 (1.6)	11 (1.8)	57 (2.32)
Elefantiasis	0 (0.0)	0 (0.0)	1 (0.2)	6 (1.0)	7 (0.28)
FilariaRetrograde Limphangitis	0 (0.0)	0 (0.0)	10 (1.6)	10 (1.6)	20 (0.80)
Lymphadenitis	2 (0.3)	0 (0.0)	1 (0.2)	10 (1.6)	13 (0.52)
Early Lymphodema	0 (0.0)	0 (0.0)	1 (0.2)	5 (0.8)	6 (0, 24)
Filaria Abscess	0 (0.0)	0 (0.0)	1 (0.2)	2 (0.3)	3 (0.12)
Elefantiasis	0 (0.0)	0 (0.0)	1 (0.2)	3 (0.5)	4 (0.16)
Hydrocele	0 (0.0)	0 (0.0)	1 (0.2)	0 (0.0)	1 (0.02)
There are no clinical symptoms	593 (93.8)	621 (100)	601 (96.0)	611 (98.2)	, 00)

Based on the results of finger blood tests, only one respondent was positive for microfilaria from 36 respondents who had a recurrent fever. Other respondents may not experience symptoms of filarial fever, but fever due to other diseases. Another possibility respondents were suffering from filariasis, but due to the density of microfilariae, the low that is not found of microfilariae during the examination in the blood. Another thing that might also occur due to the nature of microfilariae *B.malayi* which is sub-periodic nocturnal with peak density at certain hours, so this is related to the time of blood collection. The results of studies in several regions *B.malayi* sub-periodic nocturnal showed different peaks of density microfilariae (10–13).

Table 2 Distribution of results of microscopic examination based on districts and villages

District / Village	Results		Total
	Positive Mf	Negative Mf	
	n (%)	n (%)	(n)
Kuantan Singingi			
Desa Pulau Panjang Cerenti	1 (0.3)	321 (99.7)	322 (100)
Sukadamai Village	0 (0.0)	310 (100)	310 (100)
Total	***1 (0.2)***	***631 (99.8)***	***632 (100)***
Pelalawan			
Village Ukui 1	0 (0,0)	310 (100)	310 (100)
Sialang Humpback Village	0 (0.0)	311 (100)	311 (100)
Total	***0 (0.0)***	***621 (100)***	***621 (100)***
West Bangka			
Desa Gantang Air	0 (0,0)	312 (100)	312 (100)
Tanjung Niur Village	4 (1.3)	310 (98.7)	314 (100)
Total	***4 (0.6)***	***622 (99.4)***	***626 (100)***
Belitung			
Village Cerucuk	4 (1.3)	308 (98.7)	312 (100)
Kembiri Village	4 (1.3)	306 (98,7)	310 (100)
Total	***8 (1.3)***	***614 (98.7)***	***622 (100)***
TOTAL	**13 (0.5)**	**2,488 (99.5)**	**2,501 (100)**

The results of finger blood survey found that in the Riau Province area found *Mf rate* <1% while in Bangka Belitung Province showed prevalence was still high due to *Mf rate* > 1%. The finger blood survey results showed differences between the two villages studied, where Tanjung Niur Village found four residents who were positive for microfilariae or 1.27% while the Water Gantang Village, all of the residents examined were negative. The results of the initial endemic city mapping (baseline survey) before treatment in Tanjung Niur Village were 1.6% while those in Air Gantang Village were 1.89%. The density of microfilariae (per 60 µl) was found to range from 1-28 microfilariae. The prevalence of microfilariae and its density is the best indicator of the epidemiological aspects, management, and control of filariasis itself (Bookarie,2009).

The density of microfilariae per person ranges from 1-43 heads per 60µL. The highest microfilaria density was found in the 60-year-old male population in the Bangka Regency region (Table 3).

Table 3 Number of Microfilariae of Supply in Blood Positive Respondents Microfilariae

Name / Sex	Age	District	Number of Parasites	Species
N (female)	62	Kuansing	4	*B.malayi*
A (male)	49	West Bangka	28	*B.malayi*
A (male)	60	Bangka Barat	5	*B.malayi*
J (male)	29	Bangka Barat	1	*B.malayi*
Y (male)	34	Bangka Barat	9	*B.malayi*
AY (Male)	34	Belitung	2	*B.malayi*
S (Female)	36	Belitung	4	*B.malayi*
DE (Male)	14	Belitung	32	*B.malayi*
H (Male)	81	Belitung	13	*B.malayi*
S (Female)	58	Belitung	30	*B.malayi*
M (Female)	53	Belitung	30	*B.malayi*
S (male)	60	Belitung	43	*B.malayi*
S (Female)	60	Belitung	22	*B.malayi*

Table 4 Distribution of the results of blood tests of animals by districts and villages

district	animal type Reservoir	Number Specimen	results		
			Bm Positive	PositiveMr.	Positive In
Kuantan Singingi	Cat	84	0	0	1
	Dog	17	0	0	5
	Long-tailed monkey	2	0	0	0
Total (a)		***103***	***0***	***0***	***6***
Pelalawan	Cat	87	2	1	0
	Dog	4	1	0	0
	Long-tailed monkey	9	0	0	0
Number (b)		***100***	***3***	***1***	***0***
Bangka Barat	Cats	97	0	0	3
	Dogs	3	0	0	0
	Long tail monkeys	1	0	0	0
Number (c)		***101***	***0***	***0***	***3***
Belitung	Cats	84	0	0	0
	Dogs	3	0	0	0
	Long tail monkeys	30	1	0	2
Amounts (d)		***117***	***1***	***0***	***2***
Amount (a + b + c + d)		**421**	**4**	**1**	**11**

Filaria worm species found in reservoir animals are *B.malayi, B.pahangi*, and *Dirofilaria.* Worms *B.malayiwere* found in cats, dogs and long-tailed monkeys (Table 4).

Filariasis *B.malayi* in Province Riau and Bangka Belitung is one of the zoonotic diseases, namely diseases that can be transmitted from animal reservoirs to humans and vice versa. Based on this, an examination of reservoir animals in the study area was carried out, including long-tailed cats, dogs, and monkeys (Kline,2013).

The results of the examination of animal reservoirs in Kuatan Singinngi District did not find any DNA of worms *B.malayi*. The results of the investigation only found Dirofilaria worms in the blood of cats and dogs. According to Kronofeld (2014), Dirofilaria is worms that live in the body of an animal, but there are no reports of worms infecting humans. Although there is no positive reservoir animal found, it still needs to be aware of the possibility that there are still other reservoir animals that are positive but not captured at the time of the study. This is because the number of reservoir animals that are most examined is cats, while the long-tailed monkeys that were captured and analyzed were only two. Opportunities for long-tailed monkeys to be infected with microfilariae *B.malayi is* quite high if the monkey lives around filariasis-endemic areas *B.malayi.* This is also related to the existence of vectors *B.malayi* dominant *(Mansonia* spp) which has a habitat in the swamps. While based on the results of previous studies the type of animal reservoir for *B.malayi* that is most commonly found in cats (*Fellis catus*)

The results of the microscopic examination of house cat blood (*Felis catus*) in Pelalawan District received three positive cats *B.malayi.* The PCR results also got the same species, namely *B.malayi* in the blood of the three cats. This shows that the potential for filariasis transmission in Pelalawan District still exists even though the SDJ results do not find a positive population.

The results of microscopic examination of reservoir animals in West Bangka Regency showed six animals (3 cats and three dogs) positive for *Dirofilariasis sp*, and all of these animals came from Tanjung Niur Village (Pelaik Hamlet). According to Damle (2014), environmental conditions in which animals were positively stated were Dirofilariasis. Because Tanjung Niur Village is surrounded by oil palm plantations belonging to private companies and community-owned gardens. From observations in

the field research, wild animals are often found, namely long-tailed macaques that have the potential to be animal reservoirs. In Indonesia, vectors of Dirofilaria especially Dirofilaria include A*edes aegypti, Aedes albopictus, Armigeres subalbatus* and *Culex quinquefasciatus*. (Erickson,2014)

Blood collection was carried out in 117 reservoir animals consisting of 84 cats, 30 long-tailed monkeys, and three dogs. The long-tailed monkeys that are sampled are wild animals while dogs and cats are residents' pets, but there is 1 wild cat. Based on the results of microscopic examination of blood reservoirs found five animals infected by filarial worms from the genus *Dirofilaria,* namely three long-tailed monkeys (*Macaca fascicularis)* and two dogs *(Canis familiaris)*. In this study, the identification of parasites from the genus *Dirofilaria* only reached the genus level, not to species. The results of the examination using the PCR method found four samples with known species *Brugia malayi* and 1 sample with species *B. malayi.* Previous studies conducted in Bengkulu also found filaria worms in reservoir animals, namely *Dirofilaria magnilarvatum,* but not in long-tailed monkeys but rather langur *(Presbytis cristata).* The results of blood collection in cats in Muara Padang Village, Banyuasin District, found 11 samples from 17 samples containing microfilariae, namely *Dirofilaria repens* (Simon,2012).

Among the genera *Dirofilaria, D. immitis* and *D. repens* are the most common species compared to other types such as *D.tenuis, D. ursi, D. subdermata, and D. striata.D. immitis* is a group parasite of nematode filarialthat are harmful to dogs, cats, and other mammals. These worms generally settle in the heart, especially the right ventricle and host pulmonary artery. (22) Unlike *D. repens* which usually occupies subcutaneous tissue (Taylor,2010).

The presence of *D. immitis* in the heart can block the pulmonary arteries which cause some symptoms such as coughing, fatigue when activities, fainting, coughing up blood, and severe loss of body weight. The main problem in establishing diagnoses of Dirofilaria is the occult infection or infection without the presence of microfilariae in peripheral blood. The number of cryptic diseases reaches 10-67% in naturally infected dogs, which is very difficult to diagnose by a microscopic blood examination, while examination and identification of adult worms can be carried out on dead animals (Azari,2009).

According to Otranto (2011), the prevalence of *D. immitis* in the world the highest was found in Canary and Madeira Islands and in Mediterranean countries, namely 22-40%, while the prevalence of *D. repens* ranged from 23-49% in southern Russia and 25-38% in some central and northern European countries. In Indonesia, the incidence of dirofilariasis shows different rates, in Lhoknga Aceh Besar sub-district, the prevalence of dirofilariasis in local dogs is 10%, in West Java (4.2%) and Central Java (2%). The prevalence of *D. immitis* in dogs is strongly related to environmental conditions and climatology, vector populations, diagnostic methods and infection situations (Nadyatara,2017).

Factors affecting transmission include the presence of various mosquito species in an area, mosquito population density and temperature. The case of dirofilariasis is also most likely related to the density of dogs as a reservoir somewhere, but the opportunity for animals to become ideal reservoirs is determined not only by the number of infected populations but also their ability to *survive, their* capacity to maintain parasitic reproduction over a period of time the old one and its adaptation to the parasite itself (De Souza,2010).

Although dirofilariasis in humans is not currently a serious threat, its potential as a zoonotic disease needs to be watched out for as the number of cases increases. The most reported dirofilariasis in humans in Europe is 4250 cases. In Asia, Sri Lanka with 135 instances and India 103 cases. In Japan, 277 cases of pulmonary dirofilariasis were reported due to *D. immitis,* 3 cases of subcutaneous dirofilariasis Most of the people

suffering from pulmonary dirofilariasis showed no symptoms while others showed signs of cough, bloody cough, chest pain, fever, and pleural effusion (fluid excess tissue between the lungs and chest cavity). Meanwhile, people infected with *D. repens* and *D. tenui*, the most obvious signs are lumps under the skin and sometimes under the conjunctival layer (Ramaiah,2014).

When viewed from the low coverage of medicine as shown in the behavioral aspects of the interview results, it shows that the population in Pelaik Hamlet (Tanjung Niur Village) is susceptible to transmission of filariasis, but when viewed from a medical history that ended in 2009, allegations that can be taken is the risk of transmission that is still quite high, mainly due to the presence of animal reservoirs that are around the hamlet region and the place of livelihood for the population. This condition is supported by information that the four respondents who are positive for filariasis have gardening and tin mining jobs and often work until evening. The goal of massive medicine distribution activities itself is to distribute anti-filarial drugs to all target individuals in the implementation unit area. More and more residents consume drugs, it will increase the chances of success in breaking the chain of transmission, whereas the lower the coverage of treatment will reduce the probability of deciding transmission so that further treatment needs to be done. The number of years of treatment required to reduce the prevalence of microfilaria less than 1% factors key is baseline microfilaria prevalence, medication adherence in massive medicine distribution activities, and vector efficiency (including the presence or absence of vector control activities). In areas with intense transmission and low treatment coverage, longer duration of treatment may be needed.

Conclusion

Kuantan Singingi and Pelalawan Districts have not become endemic areas of filariasis because the results show an *average Mf*<1%, while the West Bangka and Belitung Regencies are still endemic areas because of a *Mf* rate> 1%. Blood tests on reservoir animals found positive animals *B.malayi* (cats and dogs) in Pelalawan District, and Belitung (long-tailed monkeys).

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