

Epidemiology of filariasis malayi in Muara Padang Village, Muara Padang SubDistrict, Banyuasin District, South Sumatra, Indonesia

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ABSTRACT

Filariasis is still a public health problem in Indonesia especially in rural areas. In South Sumatra Province, 186 patients with chronic filariasis were reported in 2009 and 130 of them came from Banyuasin District. In Muara Padang SubDistrict, there were 7 patients with chronic filariasis and 1 of them lived in Muara Padang Village. A finger blood survey has never been conducted in Muara Padang Village since elimination program started in 2002. The aim of the study was to evaluate epidemiology of filariasis malayi in the Muara Padang Village. This was a descriptive study using cross sectional design. Data were collected from finger blood survey, blood tests for reservoir host (cats), stage 3 of filarial larvae (L3) in mosquito and microfilaria periodicity examination. From 520 finger blood samples collected from the inhabitants, microfilaria was not observed. However, 1 subject was found to have elephantiasis caused by filariasis malayi as indicated by swelling leg below the knee. Moreover, 1 subject showed descending lymphangitis symptoms accompanied by fever, headache and weakness even though in blood examination microfilaria was not found. Among 17 samples collected from cats, microfilaria of *Brugia malayi* was not observed. However, animal filarial i.e. *Dirofilaria repens* was observed in 11 samples collected. Among 701 mosquitoes dissection and examination, L3 was not found. Due to the fact that the microfilaria was not observed in all samples, microfilaria periodicity examination was not conducted. In conclusion, microfilaria of *B. malayi* was not observed in Muara Padang Village. However, microfilaria of *D. repens* was observed in cats.

ABSTRAK

Filariasis masih merupakan masalah kesehatan masyarakat di Indonesia. Di Propinsi Sumatra Selatan, 186 penderita filariasis kronik dilaporkan pada tahun 2009 dan 130 diantaranya berasal dari Kabupaten Banyuasin. Di Kecamatan Muara Padang, terdapat 7 penderita filariasis kronik dan 1 diantaranya tinggal di Desa Muara Padang. Survei darah jari belum pernah dilakukan di desa Muara Padang sejak program pemberantasan dimulai tahun 2002. Penelitian ini bertujuan untuk mengevaluasi epidemiologi filariasis malayi di Desa Muara Padang. Penelitian ini merupakan penelitian diskriptif dengan rancangan potong silang. Data diperoleh dari survei darah jari, pemeriksaan darah inang kucing, pemeriksaan L3 nyamuk dan pemeriksaan periodisitas mikrofilaria. Dari 520 sampel darah jari yang diperoleh dari subjek penelitian, tidak ditemukan mikrofilaria. Namun demikian, ditemukan 1 penderita elefantiasis akibat filariasis malayi yang ditandai dengan pembengkakan kaki bawah lutut. Selain itu ditemukan 1 orang dengan gejala limfangitis desendens disertai demam, sakit kepala, dan kelemahan, meskipun tidak ditemukan mikrofilaria pada pemeriksaan darah. Diantara 17 sampel yang dikoleksi dari kucing, tidak ditemukan mikrofilaria *Brugia malayi*, namun ditemukan filaria hewan yaitu *Dirofilaria repens* pada 11 sampel yang diperoleh. Dari 701 pembedahan dan pemeriksaan sampel nyamuk, tidak ditemukan L3. Karena tidak ditemukan mikrofilaria pada semua sampel yang diperiksa, pemeriksaan

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periodisitas mikrofilaria tidak dilakukan. Dapat disimpulkan, mikrofilaria *B. malayi* tidak ditemukan di Muara Padang Village namun demikian ditemukan mikrofilaria *D. repens* pada kucing.

Keywords : epidemiology - filariasis - finger blood survey - *Brugia malayi* - microfilariae

INTRODUCTION

Filariasis is a chronic infectious disease caused by filarial worms and transmitted by various species mosquito species such as *Mansonia sp* and *Anopheles sp*. It is zoonotic disease that can infect animals other than humans such as monkey (*Macaca fascicularis*), langur (*Presbythis cristatus*) and cats (*Felis catus*).¹

Filariasis is considered endemic in tropical and subtropical regions of Asia, Africa, Central and South America and Pasific Island nations. It is estimated that over than 120 million people in 83 countries in the world, 39 of these are in Africa, are infected and one billion people at risk for infection. In Asia, filariasis is considered as an endemic in Bangladesh, India, Indonesia, Maldives, Myanmar, Nepal, Sri Lanka, Thailand and Timor-Leste.^{3,4}

In Indonesia, filariasis is still a public health problem especially in rural areas. A survey conducted in 2000-2004 reported that over than 60 million Indonesian people are at risk for filarial infection with 6 million people were infected. Moreover, it is estimated more than 8000 people are suffering from chronic clinical filariasis.^{2,4}

South Sumatra Province is one of the filarial endemic area in Indonesia. Filariasis is almost found in all areas in this province. In 2009, 186 patients with chronic filariasis were reported in South Sumatra Province and Banyuasin District was considered as the highest filarial endemic area in this province. During 1983-2000, 126 chronic filariasis and 337 microfilariae positive cases were reported in Banyuasin District. In 2009, the chronic filariasis increased to be 130 cases spread in 52 villages in 15 subdistricts. In Muara Padang

SubDistrict, one of subdistrict in Banyuasin District, 7 patients with chronic filariasis were reported and 1 of them lived in Muara Padang Village.^{5,6}

Filariasis is mainly found in lowland areas including urban and rural areas, coastal areas, inland wetlands, rice paddies and forest. Epidemiology of filariasis involves many complex factors i.e. filarial worms as agents of the disease, human as host, adult mosquitoes as vectors, physical environmental factors and biological and social factors such as socio-economic factors and behavior of the local population.^{2,3} This study was conducted to evaluate epidemiology of filariasis malayi in the Muara Padang Village, Muara Padang SubDistric, Banyuasin District, South Sumatra Province.

MATERIALS AND METHODS

This was a descriptive study using a cross sectional design.⁷ The study was conducted by a blood survey for the prevalence of the microfilaria of the inhabitants and the reservoir host (cats) in Muara Padang Village. Moreover, stage-3 of filarial larvae (L3) survey in mosquitoes was also conducted in the village.

For blood survey on inhabitants, finger blood was collected according the microfilaria periodicity at 08.00 PM and then examined for microfilaria microscopically after Giemsa stained. For the blood samples showing microfilaria positive, microfilaria periodicity examination would be conducted. Written informed consent was obtained from all inhabitants. Ethical clearance for this study was given by the Medical and Health Research Ethics Committee, Faculty of Medicine, Universitas Gadjah Mada, Yogyakarta.

For blood survey on reservoir host (cats), ear blood was collected at 08.00 PM simultaneously with finger blood survey on inhabitants and then examined for microfilaria microscopically after Giemsa stained. For the blood samples showing microfilaria positive, further examination were then conducted at Laboratory of Parasitology, Faculty of Medicine, Gadjah Mada University to identify the species of the microfilaria.

For L3 examination in mosquitoes, mosquitoes capture was conducted at 06.00 PM – 06.00 AM using light trap method. All captured mosquitoes were identified morphologically to determine its species. The mosquitoes were then cultured during 10-14 days before L3 examination. The L3 examination was conducted after mosquito dissection using methods previously described.⁸⁻¹⁰

RESULTS

Finger-Blood Survey

Number of finger blood sample collected from inhabitants in Muara Padang Village, Muara Padang SubDistrict, Banyuasin District, South Sumatra Province is shown in TABLE 1. Among 520 finger blood samples collected, microfilaria was not observed. However, 1 inhabitant was found to have elephantiasis caused by filariasis malayi as indicated by swelling leg below the knee. Moreover, 1 inhabitant showed descending lymphangitis symptoms accompanied by fever, headache and weakness which showed specific early symptoms of filariasis malayi even though in blood examination, microfilaria was not observed.

TABLE 1. Number of finger blood samples based on age group and sex difference from inhabitants in the Muara Padang Village, Muara Padang SubDistrict, Banyuasin District, South Sumatra Province

Age (year)	Total sample examined		Microfilaria of <i>B. malayi</i>
	Male (%)	Female (%)	
2-10	46 (18.55)	38 (13.97)	Negative
11-20	71 (28.63)	58 (21.32)	Negative
21-30	44 (17.74)	38 (13.97)	Negative
31-40	25 (10.08)	41 (15.07)	Negative
41-50	28 (11.29)	46 (16.91)	Negative
51-60	22 (8.87)	27 (9.93)	Negative
>60	12 (4.84)	24 (8.82)	Negative
Total	248 (100)	272(100)	

Reservoir Host

Blood sample from reservoir host i.e cats was also collected in Muara Padang Village. From 17 samples collected, 11 samples were found micro-filaria positive. Further examination was then conducted at Laboratory of Parasitology, Faculty of Medicine, Gadjah Mada University to identify the species of the microfilaria. From 11 microfilaria positive samples, microfilaria of *B. malayi* was not observed. However, animal filarial i.e. *D. repens* was observed in the samples as characterized with blunt head, posterior tip and empty spaces resembling microfilaria of *Wuchereria bancrofti* tail but it has 2 nuclei in its head.⁸⁻¹⁰

Mosquitoes as Vectors of Filariasis Malayi

A total of 701 mosquitoes were collected from the Muara Padang Village, Muara Padang SubDistrict, Banyuasin District, South Sumatra Province. Fourteen species belonging to 3 families were identified and listed in TABLE 2. The most common species identified in Muara Padang Village were *Ma. dives/bonneae* (268 or 38.23%) followed by *Cx. tritaeni-orhyncus* (138 or 19.69%) and *Cx. quinqui-fasciatus* (127 or 18.12%). Among 701 mosquito-toes dissection and examination, L3 was not found.

TABLE 2. Number of mosquito samples collected from Muara Padang Village, Muara Padang SubDistrict, Banyuasin District, South Sumatra Province

No.	Mosquito species	Number of mosquitoes dissection (tail) / %
1	<i>Ae. albopictus</i>	1(0.14)
2	<i>Ae. aegypti</i>	3(0.43)
3	<i>Cx. tritaeniorhyncus</i>	138(19.69)
4	<i>Cx. quinquefasciatus</i>	127(18.12)
5	<i>Cx. fuscocephalus</i>	37(5.28)
6	<i>Cx. gellidus</i>	20(2.85)
7	<i>Cx. sitiens</i>	13(1.85)
8	<i>Cx. hutchinsoni</i>	50(7.13)
9	<i>Cx. sinensis</i>	1(0.14)
10	<i>Cx. solitarius</i>	1(0.14)
11	<i>Ma. dives/bonneae</i>	268(38.23)
12	<i>Ma. uniformis</i>	33(4.71)
13	<i>Ma.indiana</i>	8(1.14)
14	<i>Ma. annulata</i>	1(0.14)
Total		701(100)

DISCUSSION

One person suffered descending lymphangitis symptoms accompanied by intermittent fever, headache and weakness which showed specific early symptoms of filariasis malayi. However, in the blood examination, microfilariae was not observed. Several factors contributed to the blood microfilaria examination. Collection of the proper blood volume from a patient is absolutely necessary. In this study, just 20 µL of blood volume was collected from the capillary blood of the patient. This blood volume sample was not enough to yield positive result for microfilaria examination if its microfilaria rate of the patient was low.

Soeyoko¹² reported that in certain cases filariasis can not be diagnosed by finger blood examination. The finger blood examination can not be applied in all suspected cases of microfilariae infection such as filariasis during prepatent stage, filariasis with low microfilaria

rate in the blood, occult filariasis and filariasis with mix filarial infections. Another microfilaria examination that is more sensitive to confirm the blood microfilaria such as serological examination is recommended in this case.¹²

Another factor that influences the blood microfilaria examination or infection is immunological status of the patient. In endemic areas of filariasis like Muara Padang Village, endogenous people are more resistant to filarial infection than migrant people due to elevated adaptive immune response. Sex is also play a role in filarial infection. Epidemiological studies reported that the incidence of filariasis was higher in men than in women.¹³ Men have more opportunities to get a filarial infection because they have more frequent contact with filarial vectors in the workplace. In addition, the symptoms of filariasis in men are more severe than in women because they have a heavier work physically.^{2,5} Sumarni and Soeyoko¹⁴ reported that men have a higher risk to filarial infection than women although it was not statistically significant.

Microfilaria of *B. malayi* was not observed in blood samples collected from cats. However, in further examination animal filarial i.e. *D. repens* was identified in the blood samples. Santoso *et al.*¹⁵ reported that microfilaria was also not observed in cat blood samples in Sungai Rengit Village, Talang Kelapa SubDistrict, Banyuasin District. Conversely, in a study conducted by Sudjadi¹⁶ in East Kalimantan, microfilaria of *B. malayi* was observed in 11 cat blood samples among the 645 cat blood samples collected and examined. Moreover, microfilaria of *D. repens* was also identified.

Cat was not the main reservoir in the filariasis malayi transmission in the Muara Padang Village. Cats in the village were mostly wild cats which do not interact frequently with inhabitants. Three animals i.e. *Macaca*

fascicularis, *Felis catus*, and *Presbytis cristatus* are well known as reservoir hosts of filariasis especially sub-periodic and non-periodic nocturna types of filariasis malayi. Among these reservoir host, *M. fascicularis* is still found in Muara Padang Village.

The L3 was not identified among mosquitoes samples collected from the Muara Padang Village. Studies conducted in other villages in Banyuasin District found similar results. In Sungai Rengit Village, Talang Kelapa SubDistrict and Sibubus Village, Banyuasin SubDistrict, the L3 was not also identified.^{15,17} The L3 of filariasis malayi only develops in *Anopheles* or *Mansonia* mosquitoes. *Anopheles* mosquitoes were not found whereas *Mansonia* mosquitoes were the most commonly species identified in this village. However, the *Mansonia* mosquitoes can not be a vector of filariasis in this village due to the absence of L3 in the mosquito body.

The absence of L3 in the mosquitoes in the Muara Padang Village was supported by the finding from the finger blood survey which showed that microfilaria was not observed in all collected finger blood samples in this study even from the one elephantiasis and one filariasis suspected patient. Optimal transmission of microfilaria from human host to mosquito vector if the human blood microfilaria density is approximately 1-3 Mf/ μ L blood.¹⁸ The low density of human blood microfilaria causes the microfilaria to not develop in mosquito body. Conversely, the high density of human blood microfilaria causes the mosquito to die. Not all the human blood microfilariae transferred into the mosquito will survive and develop to be larvae. Approximately 40% of the microfilariae will die in the mosquito body.

Filarial transmission effectively occurs if it is supported by the availability of human or animal reservoir host with the high density blood microfilaria, effective filarial vector, high

susceptibility of human host and ecological factors i.e. physical, biological, economical and culture factors supporting the filarial transmission. However, the filarial transmission can be reduced through man-made interventions i.e. reduction of mosquito larval habitats, use of natural predators, application of larvicides and a dulticides of biological and chemical origins.¹⁹

The inhabitants of Muara Padang Village tried to keep their environment clean and free of mosquitoes by cleaning mosquito breeding places. Moreover, deforestation in Banyuasin District also caused mosquitoes breeding places to be disturbed. Large areas of forest in Banyuasin District were lost as native forest was cleared by pulp companies and being replaced by plantations. The forest was also often burned by farmers and plantation owners. Agricultural development and transmigration programs moved large people into forest areas, further increasing deforestation rates. These activities caused mosquito breeding places to be disturbed and limited filarial transmission in Muara Padang Village.

CONCLUSION

The prevalence of filariasis malayi was zero in Muara Padang Village as shown by microfilaria of *B. malayi* negative in finger blood survey. Moreover, the L3 was not observed from in mosquitoes vector collected from the village. However, animal microfilaria of *D. repens* was observed on cat blood survey, although the microfilaria of *B. malayi* was not observed either.

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