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Influence of Soil Transmitted Helminths Infection Towards Malaria Disease

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***Abstract*— Efforts of controlling malaria have been carried out around the world. All these efforts are aimed to break the chain of transmission of malaria disease. Fluctuations of malaria incident are influenced by many risk factors which are generally different in each region. One of the influenced risk factors towards malaria incident is a worm infection of Soil Transmitted Helminthsiasis (STH). The study that observed the malaria coinfection and STH has been done for long time by various results. Most studies state that STH infections reduce the susceptibility towards malaria infection, yet the other studies state it otherwise. This study was conducted to see the effect of STH infection as a risk factor of malaria disease, especially in malaria hypoendemic area. The study was conducted in Batubara, North Sumatra Province from March to September 2015. The samples were taken from four primary health services and twenty five villages through active case detection and passive case detection. Malaria patient is determined by microscopic examination serial in three days, if there was obtained a negative result in the first microscopic examination. The examination of thick blood smear declared negative when it was not found with plasmodium up to 500 microscopic field of view. Patients of worm infection STH are determined through the examination of direct fecal preparation with Kato-Katz method. People who participated in this study were 2173 people in which 671 people (30.9%) are people with malaria, obtained 63.6% were caused by *Plasmodium vivax*. Meanwhile, 636 people (29.2%) of the samples suffered worm infection of STH. There is a significant relationship between worm infection of STH with malaria (P> 0.05), in which patients of worm infection of STH are likely to experience malaria, even though the correlation is deeply weak (r = 0073). There is a significant relationship between worm infection of STH with malaria.**

***Keywords*— malaria, STH, risk factor**

I. INTRODUCTION

Malaria is a public health problem in Indonesia. This disease can cause death, especially in high-risk groups i.e. infants, toddlers and pregnant mothers. Control measures have been carried through the malaria eradication program include early diagnosis, rapid and precise treatment, vector control and surveillance. All such efforts aimed at breaking the chain of transmission of malaria [1].

Malaria has a very wide area coverage with a transmission rate that is different from one region to another as well as the characteristics of the different regions from one another. Therefore, every effort

malaria control requires information on the risk factors that influence malaria in the area [2].

The prevalence of malaria in Indonesia is declining. Fluctuations in malaria prevalence happens all the time and be experienced in many places in Indonesia. The fluctuation is due to the difficulty of explaining the dominant factor that causes malaria. It shows the existence of unresolved issues [1].

Research on malaria risk factors have been conducted although limited to only a few factors. Research on the relationship *soil transmitted helminthasis* (STH) with malaria also has a lot to do. But all these studies provide mixed results. Most studies suggest that STH reduce susceptibility to malaria infection, but most other studies state otherwise. This study was conducted to see the effect of STH infection as a risk factor of malaria disease, especially in malaria hypoendemic area.

II. METHODS

This study was conducted starting from March until December 2015 in Batubara district. Research subjects are resident settled in that area. Sample were taken from four primary health care and 25 villages through active case detection and passive case detection. Malaria diagnosis was confirmed by microscopic examination, which continues to be the gold standard for the detection of malaria. Serial microscopic examination was performed 3 times in patients who get a negative result in the first examination (Day1), i.e. on the second day (Day 2)

and third day (Day 3). Thick blood smear examination declared negative if it does not find plasmodium sp. up to 500 microscopic fields of view. STH diagnosis was made by stool examination (Direct fecal examination preparation, Kato-Katz method) or a history of a previous worm infection (STH) or a history of taking medicine for worm infection.

III. RESULTS

The number of eligible population sample was 2360 people. Meanwhile followed the entire process of research was 2173 people. This research got 671 people with malaria and 636 people with STH. *Plasmodium vivax* was the most common cause of malaria (Table 1).

There were significant differences in the characteristics of age, living conditions and hygiene behaviors in patients with malaria. Meanwhile, all the characteristics of the samples in STH found no significant differences (Table 2). Bivariate analysis in patients with malaria and STH got significantly different results ($p < 0.05$), the weak correlation ($r = 0.073$) (Table 3).

TABLE I
CLASSIFICATION OF SAMPLE

Sample	n	%
Malaria classification		
a. Malaria	671	30.9
b. Non Malaria	1502	69.1
Species of Malaria		
a. *Plasmodium falciparum*	91	13.6
b. *Plasmodium vivax*	427	63.6
c. *P.falciparum* + *P.vivax*	153	22.8
Soil Transmitted Helminthiasis classification		
a. Soil Transmitted Helminthiasis (STH)	636	29.2
b. Non STH	1537	70.8

TABLE II
CHARACTERISTICS OF SAMPLE

Characteristics	Malaria		Non Malaria		p	STH		Non STH		p
	n	%	N	%		n	%	n	%	
Age										
<6 years	45	2.1	72	3.3	0.001	32	1.4	85	3.9	0.091
6 - 15 years	258	11.9	713	32.8		263	12.1	708	32.6	
16 - 65 years	364	16.8	700	32.2		337	15.5	727	33.5	
> 65 years	4	0.2	17	0.7		4	0.2	17	0.8	
Sex										
Male	308	14.2	671	30.9	0.595	284	13.1	695	32.0	0.810
Female	363	16.7	831	38.2		352	16.2	842	38.7	
Living condition										
Good	415	19.1	1233	56.8	0.001	484	22.3	1164	53.6	0.367
Enough	92	4.2	115	5.3		67	3.1	140	6.4	
Less	164	7.5	154	7.1		85	3.9	233	10.7	
Hygiene behavior										
Good	263	12.1	272	12.5	0.001	160	7.4	375	17.3	0.177
Enough	397	18.3	1212	55.8		472	21.7	1137	52.3	
Less	11	0.5	18	0.8		4	0.2	25	1.1	
Detection Methods										
Active case detection	431	19.8	1034	47.6	0,034	441	20.3	1024	47.1	0.219
Passive case detection	240	11.1	468	21.5		195	9.0	513	23.6	

TABLE III
BIVARIATE ANALYSIS

	Malaria		p	r
	Positive	Negative		
STH			0.001	0.073
Positive	163	473		
Negative	508	1029		

IV. DISCUSSION

In general, STH will cause an immune response to the characteristics of increasing the production T *helper* type 2 and *immunoglobulin* E and decreased cellular immune response (T *helper* 1). The condition becomes a basic idea that the STH infection will increase the chance of malaria infection. This opinion could also explain that chronic infection STH would give a better prognosis for patients with malaria. [3], [4]

Adedoja et al (2015) and Kinung'hi et al (2014) found a significant relationship between STH and malaria in their research. STH and malaria are two parasitic diseases that can occur simultaneously in malaria-endemic area with poor environmental sanitation [7]. Multiple parasitic infections will affect the patient's immune system and have an

impact on the clinical manifestations of diseases [5], [8]. Most studies suggest that STH are protective against malaria infection [9], [10], although some are found different results [11], [12], [13].

Double infection of malaria and STH is influenced by many factors, such as parasitic species and genetic factors of the patient. Acute infection of STH will increase the Th1 system that can be protective against malaria infection. Meanwhile, the chronic infection of STH will suppress the Th1 system, thus increasing the chances of malaria infection [14].

V. CONCLUSION

The study found a significant relationship between malaria infection and STH. But this study cannot determine when the STH started happening. So it is difficult to determine the chronicity of the disease.

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