

LESSON LEARNT Risk factors of neglected tropical diseases at Juai district of Balangan regency, South Kalimantan: a lymphatic filariasis

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ORIGINAL ARTICLE

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**Risk factors of neglected tropical diseases at Juai district of
Balangan regency, South Kalimantan: a lymphatic filariasis**

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ABSTRACT

BACKGROUND

65% of all lymphatic filariasis (LF) could be found in South East Asia, including Indonesia. As one of neglected tropical diseases, filariasis has a major problem on public health and 72% of districts are endemic areas. The clinical manifestation has a **11** or impact on social, economic burden and decreasing quality of life. **Aim of the study to explore and determine an influences factors based on social determinant of health among inhabitants at Juai district.**

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METHODS

This research **9** was conducted by using a standardized questionnaire. **A** two phase of an observational study, firstly a cross-sectional conducted at 3 villages among suspected screening subjects from March to May 2014. The diagnosis of infection was confirmed by **fi**er prick test, which was done from 10 PM until 2 AM. Second phase, a case-control study from **October 2014 to January 2015, were** obtained from data-based of affected patients and their neighborhoods, comprising 38 **1** subjects respectively. Statistical analysis was descriptive and analytical by **chi-square test and multivariate logistic regression.**

RESULTS

First phase found 100% of 64 subjects were positive with **1** e count varies from 3 up-to 34 microfilaria. The second phase, LF incidence was significantly associated with age (OR=5.32, 95% CI:1. **1** -14.16), occupation (OR=3.04, 95% CI:0.95-9.75), less knowledge (OR=3.75, 95% CI:1.37-10.26) and presence of water hyacinths (OR=3.32, 95% CI:1.3-8.54). Only physical environment score were significantly associated (p=0.00) and demonstrably as a protected against LF (OR=0.3, 95% CI:0.10-0.69).

CONCLUSION

The risk of filariasis incidence with good score of physical environment as a protective factor in risk population

Keywords: NTD's, Epidemiology study, Social Determinants, Lymphatic filariasis, South Kalimantan

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ABSTRAK

KAJIAN
**FAKTOR RISIKO PENYAKIT TERBAIKAN DI KECAMATAN JUAI KABUPATEN
BALANGAN KALIMANTAN SELATAN: LIMFATIK FILARIASIS**
LATAR BELAKANG

65% dari semua kasus filariasis limfatik (FL) dapat ditemukan di Asia Tenggara, termasuk di Indonesia dan masih menjadi permasalahan kesehatan masyarakat. 72% kabupaten masih daerah endemis. Manifestasi klinis berdampak besar pada beban sosial, ekonomi dan penurunan kualitas hidup. Tujuan penelitian untuk mengeksplorasi faktor risiko determinan sosial kesehatan penduduk di kecamatan Juai.

METODE

Studi dilakukan di kecamatan Juai, Balangan Kalimantan Selatan, dengan menggunakan kuesioner tervalidasi. Studi observasional dilakukan 2 tahap, pertama studi potong lintang di 3 desa pada subyek skrining dicurigai, dari bulan Maret - Mei 2014. Diagnosis infeksi dikonfirmasi menggunakan uji tusuk jari, pada jam 10 malam sampai jam 2 pagi WITA. Tahap kedua, studi kasus-kontrol pada 38 subjek/kelompok dari Oktober 2014 - Januari 2015, menggunakan database berbasis pasien terkonfirmasi positif dan tetangga di lingkungannya dengan perbandingan 1:1. Analisis statistik secara deskriptif dan analitik dengan uji chi-square dan regresi logistik multivariat.

HASIL

Tahap pertama ditemukan 100% dari 64 subyek positif terkonfirmasi, hasil bervariasi dari 3 sampai 34 mikrofilaria dalam darah. Fase kedua, kejadian FL berhubungan bermakna dengan usia (OR=5,32, 95% CI:1,99-14,16), pekerjaan (OR=3,04, 95% CI:0,95-9,75), kurang pengetahuan (OR=3,75, 95% CI:1,37-10,26) serta adanya tanaman eceng gondok (OR=3,32, 95% CI:1,3-8,54). Hanya skor lingkungan fisik secara signifikan ($p=0,00$) dan terbukti sebagai faktor proteksi terhadap risiko penyakit FL (OR=0,3, 95% CI:0,10-0,69).

KESIMPULAN

Risiko kejadian filariasis pada populasi berisiko dengan skor lingkungan fisik baik adalah sebagai faktor protektif.

Kata kunci: *NTDs, studi epidemiologi, determinan sosial, Lymphatic filariasis, Kalimantan Selatan*

INTRODUCTION

According to the World Health Assembly, lymphatic filariasis has become a global health problem since 1997.⁽¹⁾ In 2002, the Global Programme to Eliminate Lymphatic filariasis (GPELF) was launched in accordance with the World Health Organization (WHO) declaration of 2000, with the goal by 2020 eliminating the diseases. The WHO reported in 2014 that 73 countries were lymphatic filariasis endemic, with 1,400 million people being at risk for infection, 120 million being already infected, more than 40 million having disabilities as a result of lymphatic lymphatic filariasis developing into lymphedema, elephantiasis and hydrocele.⁽²⁻⁴⁾ Globally, 1.38 billions people are living in areas where LF is considered endemic.

Among 497 Indonesian districts/cities, 300 districts / cities (60.4%) are endemic for lymphatic filariasis.⁽⁴⁾ The endemicity level in these provinces and districts varies from 0% to

20%, with a microfilaria rate (Mf-rate) of $\geq 1\%$, indicating that the area is lymphatic filariasis endemic. The Mf-rate prevalence in Indonesia is 19%.^(1,4) Based on the health profile⁽²³⁾ Indonesia 2018, 103 districts/cities managed to reduce the microfilaria rate to less than 1%. However, the province of South Kalimantan has only managed to reduce 50% out of the total 8 districts/cities.^(4,5) But according to the MoH Diseases Prevention and Control report, approximately 40.7 million Indonesians in 118 districts and 17 provinces are still at risk of contracting LF. Indonesia launches final round of Mass Drugs Administration (MDA) Campaign to eliminate Lymphatic Filariasis, 2019.⁽⁵⁾

Due to many risk factors involved, without control measures the number of reported cases in endemic areas will probably increase, not including those from areas with unreported cases or not yet under surveillance.⁽⁵⁻⁷⁾ Thus, it is necessary to examine all aspects of an underlying that make high endemicity in Indonesia. Endemic

areas defined through finger prick test surveys and do not show the same distribution of endemicity data as a clinical case of lymphatic filariasis. This is possibly due to the quality of data in clinical case reports or finger prick surveys or limitations in data collection, other factors such as differences of environmental conditions, risk in and host factors affecting the development of clinical sign of lymphatic filariasis.

It may be concluded, the regional conditions in Indonesia are determine and influence of various risk factors presumably arising in each region. Although the *Mf-rate* in South Kalimantan is a low 2%, however lymphatic filariasis is a re-emerging disease requiring prompt measures to determine its causes. The International Task Force for Disease Eradication has identified lymphatic filariasis as one of six diseases that could be eliminated. For a national lymphatic filariasis elimination program, the essential requirement need is information on geographical distribution and risk status of filarial infection, thus facilitating planning.⁽⁸⁻⁹⁾

Based on the Minister of Health of the Republic of Indonesia regulation number 94/2014, stated the management of filariasis based on GPELF and WHO recommendation based on 2 main programs, (i) interrupting transmission of the parasite by using mass drug administration (MDA) to deliver annual treatment to all people living in endemic areas who are risk of diseases; (ii) managing morbidity and preventing disability among people who are already been affected by the diseases. The MDA or *Pemberian Obat Pencegahan Massal* (POPM) for filariasis elimination activities have become a National strategy at the endemic area, to break the chain of transmission at-risk populations including at South Kalimantan. The target of activity begins from age 2 to 70 years with a goal of target 65% of the total population and 85% of target population. The MDA programme aim was to break the chain of filariasis transmission filariasis, resulting in reduction of microfilariae in the blood periphery and reduce transmission by mosquitoes. Strategy in mass treatment of filariasis was carried out of once in a year for period of 5 consecutive years at an endemic area through blood tests with microfilariae (*Mf*) rate <1%.⁽¹⁰⁻¹³⁾

Balangan and Hulu Sungai Tengah

regencies were two regencies of division in the area of regional expansion in South Kalimantan province. These two regencies became a potential an endemic area, because of the regencies were surrounded by an endemic area of LF such as Tabalong, Hulu Sungai Utara, and Hulu Sungai Tengah regencies and at that time was never had mass drug administration (MDA) before. In order to eliminate LF by the year of 2020, as a preliminary study we would like to screen the positive subjects at a new discovered endemic area and explore an influences factors based on social determinant of health among lymphatic filariasis inhabitants at Juai district of Balangan regency. We conducted at 3 villages, by using finger pricks test and a standardized questionnaire. At the year of 2017, was the second year of MDA programme in Balangan Regency, however at Juai district was not yet implemented. By recognizing the influences factors could be benefit for further planning and implementation of a comprehensive program for lymphatic filariasis prevention and improvement among individual and community inhabitant at an endemic area.

The purpose of study was to explore risk factors based on social determinants of health among inhabitants in Juai district Balangan regency.

METHODS

This study was two phase of serial an observational analytic study, phase one was conducted a screening by finger prick test among 64 of suspected subjects on March to May 2014 at 3 villages at Juai district. Phase two was a case-control study and purposive sampling, and matching 1:1 ratio for the case and control group. Seventy-six of total subjects from October 2014 to January 2015. Inclusion criteria for the cases was microfilaria-positive's subject according to the patient data-based from the phase one study and agreed to be interviewed. Subjects recruited and selected from same neighborhood with age and gender of positive filariasis patient. Positive subject was listed as a central index. The diagnosis of infection was confirmed by finger prick test, which was done from 10 PM until 2 AM, took a place at the house of local head community leader (ketua Rukun Warga), all of the subjects were asked about their characteristic. The screening

continuing for 3 days at 3 endemic villages of Juai district.

The study location at Juai district, Balangan regency with an area of 386.88 Km², the second largest district, high rainfall and forest area, additionally there is a remote indigenous community of the Dayak tribe among the villages. Balangan was a regional expansion from the North Hulu Sungai regency. Based on geographical location, Balangan regency was quite strategic due to traversed by Trans Kalimantan, as a stopover city for trips from Banjarmasin to East Kalimantan and Central Kalimantan. Team study would like to explore and determine an influences factors based on their social determinant of health by using standardized questionnaire. The instrument consists of individual characteristics

and socio-economic, preventive knowledge, physical environmental conditions and health care services access associated with a lymphatic filariasis incidence.

Statistical analysis comprised by descriptive and analytical by chi-square test with p value significance level < 0.05, continued with multivariate logistic regression analysis, using SPSS version for Windows. This study was approved by the Ethics Committee of Faculty of Medicine, Universitas Trisakti No.238/KER-FK/X/2014 and ethics clearance from Dinas Kesehatan Kabupaten Balangan (Nomor 800/600/Dinkes-Blg/2015).

Table 1. Risk factors of Characteristic and Socio-economic and LF's incidence

Variables and categories	Affected		P _{value}	OR (95% CI)
	Positive n=38 n(%)	Negative n=38 n(%)		
Age				
11 – 40 years	11 (28.9)	26 (68.4)	0.00	5.3 (1.99 – 14.16)
≥ 41 years	27 (71.1)	12 (31.6)		
Gender				
Male	24 (63.2)	18 (47.4)	0.17	1.9 (0.76 – 4.76)
Female	14 (36.8)	20 (52.6)		
Individual characteristic score				
Having >1 risk factors	11 (28.9)	6 (15.8)	0.17	2.2 (0.71 – 6.65)
Having ≤1 risk factors	27 (71.1)	32 (84.2)		
Work type				
At risk	33 (86.8)	26 (68.4)	0.05	3.0 (0.95 – 9.75)
Not at risk	5 (13.2)	12 (31.6)		
Final educational level				
≤9 years	34 (89.5)	29 (76.3)	0.13	2.6 (0.73 – 9.46)
≥9 years	4 (10.5)	9 (23.7)		
Monthly income				
< Regional minimum wage	33 (86.8)	31 (81.6)	0.53	1.5 (0.43 – 5.19)
> Regional minimum wage	5 (13.2)	7 (18.4)		
Socio-economic score				
Having ≥2 risks	35 (92.1)	30 (78.9)	0.10	3.1(0.76 -12.79)
Having <2 risks	3 (7.9)	8 (21.1)		

Table 2. Risk factor of knowledge with regard to preventive and LF's incidence

Variables and Categories	Affected		<i>P</i> value	OR (95% CI)
	Positive n = 38 (n%)	Negative n = 38 (n%)		
Do you know the terms "penyakit kaki gajah [elephantiasis]/ filariasis/ huntut"				
No	11 (28.9)	10 (26.3)	0.79	1.1 (0.42 – 3.12)
Yes	27 (71.1)	28 (73.7)		
Do you know the cause(s) of filariasis				
No	29 (76.3)	28 (73.7)	0.79	1.2 (0.407 – 3.25)
Yes	9 (23.7)	10 (26.3)		
Do you know the symptom(s)/sign(s) of filariasis				
No	36 (94.7)	32 (84.2)	0.13	3.4 (0.636 – 17.92)
Yes	2 (5.3)	6 (15.8)		
Do you know the organism that can transmit filariasis				
No	27 (71.1)	24 (63.2)	0.46	1.4 (0.547 – 3.78)
Yes	11 (28.9)	14 (36.8)		
Do you know if filariasis can or cannot be prevented				
No	17 (44.7)	17 (44.7)	1.000	1.0(0.405 – 2.47)
Yes	21 (55.3)	21 (55.3)		
Do you know that filariasis could cause permanent damage ?				
No	8 (21.1)	11 (28.9)	0.43	0.7 (0.23 – 1.87)
Yes	30 (78.9)	27 (71.1)		
Do you know that by avoiding mosquito bites you can avoid getting elephantiasis/filariasis				
No	19 (50.0)	8 (21.1)	0.00	3.8 (1.37 – 10.26)
Yes	19 (50.0)	30 (78.9)		
Do you know that by taking the medicines recommended by the government / primary health center personnel you can prevent filariasis				
No	8 (21.1)	10 (26.3)	0.58	0.8 (0.26 – 2.16)
Yes	30 (78.9)	28 (73.7)		
Do you know that taking a blood sample is a method for determining filariasis				
No	3 (7.9)	7 (18.4)	0.17	0.4 (0.90 – 1.59)
Yes	35 (92.1)	31 (81.6)		
As community member, do you feel the need for getting involved in preventing filariasis				
No	5 (13.2)	7 (18.4)	0.53	0.7 (0.19 – 2.34)
Yes	33 (86.8)	31 (81.6)		
Will you allow health care personnel take your blood for filariasis testing				
No	1 (2.6)	3 (7.9)	0.30	0.3 (0.31 – 3.18)
Yes	37 (97.4)	35 (92.1)		
Score for behavior regarding filariasis				
High	25 (65.8)	15 (39.5)	0.63	1.3 (0.49 – 3.19)
Low	13 (34.2)	23 (60.5)		

Table 3. Risk factor of physical environment and LF's incidence

Variables and Categories	Affected		Pvalue	OR (95% CI)
	Positive n=38 (n%)	Negative n=38 (n%)		
Presence of aquatic plants (water hyacinths) in the environment in neighborhood of dwelling				
Present	26 (68.4)	15 (39.5)	0.01	3.3 (1.29 – 8.54)
Absent	12 (31.6)	23 (60.5)		
Presence of wire gauze				
Absent	36 (94.7)	36 (94.7)	1.00	1.0 (0.13 – 7.49)
Present	2 (5.3)	2 (5.3)		
Physical environment score				
Good	26 (68.4)	15 (36.8)	0.00	0.3 (0.104 – 0.696)
Poor	12 (31.6)	24 (63.2)		

RESULT**A. Phase One**

The prevalence of LF at the area study was 100%, all of 64 suspect subjects were positive microfilaria, and the result count varies from 3 up-to 34 microfilaria. All subjects were local inhabitants who engaged and usually work at the rubber plantation site from 6 AM to 12 AM. Since the present times, Balangan area has been known as a rubber plantation and production, thus why most of villages were surrounding by and near rubber plantations, most of them were worked as a rubber farmer or labour at the plantation.

B. Phase Two**1. Risk factors of individual characteristics and socio-economic compare two groups**

Individual characteristics (IC) was not significantly associated with lymphatic filariasis incidence, except for age ($p=0.00$) (Table 1). The age group of ≥ 41 years had a 5.3-fold greater risk for lymphatic filariasis, however gender was not significantly associated with the incidence, and comparison between 2 groups of IC risk score has not associated either.

Socio-economic (SE) score compare among two groups was not significantly differences, however type of occupation was associated ($p=0.05$) and had a 3.0-fold risk for affected group.

2. Risk factor of knowledge on preventive compare two groups

Knowledge factors (KF) score was not associated with lymphatic filariasis incidence (presented Table 2), since there were no

Table 4. Risk factors of health care services and LF's incidence

Variables and Categories	Affected		Pvalue	OR (95% CI)
	Positive n=38 (n%)	Negative n=38 (n%)		
Did you get information on filariasis from health personnel in the last 6 months				
No	11 (28.9)	13 (34.2)	0.62	0.78 (0.29 – 2.06)
Yes	27 (71.1)	25 (65.8)		
Utilization of health personnel/health care facilities for treatment				
No	12 (31.6)	11 (28.9)	0.80	1.13 (0.42 – 3.02)
Yes	26 (68.4)	27 (71.1)		
Score for health care services				
Low	18 (47.4)	19 (50)	0.82	0.90 (0.37 – 2.21)
High	20 (52.6)	19 (50)		

significantly differences between subjects with and without lymphatic filariasis. A significant association was found only for knowledge of prevention, i.e. about avoiding mosquito bites could prevent suffering from LF disease ($p=0.00$), with a 3.75-fold greater risk become filariasis in subjects without known a prevention action. However, both groups did not know about cause, symptom and vector of transmission became LF disease.

3. Risk factor of Physical Environment and Lymphatic filariasis incidence

The physical environmental (PE) score was significantly associated with lymphatic filariasis incidence ($p=0.00$). Affected subjects with good level of physical environment scores were demonstrably protected against LF (OR<1, Table 3)

The presence of aquatic plants (water hyacinths) in the environment surrounding residential dwellings was significantly associated with LF incidence ($p=0.01$). These aquatic plants were found at the Lake Baru Baharu, which is approximately one kilometer from the location of the nearest local village. The lake was located in the middle / surrounding by the rubber plantation.

4. Risk factor of Health Services Access and Lymphatic filariasis incidence

Based on 2 groups, the health services (HS) score was not associated with lymphatic filariasis incidence, with no significant differences between subjects with and without filariasis.

Based on multivariate regression analysis to search the most influences factor of social determinant of four variables (age, occupation, avoiding mosquito bites prevent LF, and presence of water hyacinths) were significantly associated with LF's incidence ($p<0.05$). Those were subsequently subjected to multivariate logistic regression analysis (Table 5). Three variables

were directly influenced factor for LF's incidence at Juai district, i.e. age, occupation, and presence of water hyacinths, the equation became $y = 1.897 x^1 + 1.558 x^2 + 1.558 x^3 - 3.065$

The quality of the equation obtained based on the discrimination parameters by considering AUC (Area Under Curve) was 79.1%, signifying the above equation was a moderate quality (70% - 80%).

DISCUSSION

Various infectious diseases have potential to increase due to the effects of ecosystem condition and changes. From health perspective, the physical environment will have an impact on increasing frequency of diseases caused by vectors, such as mosquito bites for filariasis diseases. The incidence of filariasis, known has an interrelated relationship between the host, agent, and environment, the environment contributes to reproduction of filariasis vectors. The three factors mentioned above affect the distribution of filariasis cases in a certain area. Vector of filariasis is highly dependent on climate and local environmental conditions, especially temperature and rainfall. Rising temperature of the air that causes breeding mosquitoes are getting faster. Especially at a humid, geography area and tropical weather like in Indonesia. The diseases spread and could found at almost all over of Indonesia.

In our study, the host among 2 groups were no substantial differences in characteristic and socio-economic score. Most an affected group were at productive aged and dependently working as a rubber farmer for both male and female at rubber plantation, which surrounding their neighborhood. In contrast to several studies stated that the incidence of filariasis in males was higher compare to females due to risk of work type. In our study, risk of work type was significantly associated and 3-fold greater risk as compared

Table 5. Results of multivariate analysis of LF's incidence

Variable	B	Std. Error	Beta	Sig.
Age	1.897	0.571	6.664	0.001
Occupation	1.558	0.724	4.752	0.031
Environment: Presence of water hyacinths	1.558	0.580	4.750	0.007
Constant	-3.065			

with non-affected subjects, was also confirmed by study of Amelia (p=0.03, OR 4.4) and Salim (p=0.004, OR 4.3).¹⁸ Conteh et al. also mentioned that indirect cost to people affected by neglected tropical diseases and their economic influence on a household, due to result of worker productivity. We have known that NTDs are closely related to local vectors and intermediate host distributions that are particularly associated with geographic areas, particularly in the tropic climate,¹² in South Kalimantan. Ikhwan et al. stated that endemic location for *Brugia malayi* is areas with forest and swamps along river flow, or water body that full with water plants. Upadhyayula et al.'s reported found this to be true for subjects living near irrigated agricultural areas and involved in farming. Since these areas facilitated breeding of mosquitos' and as one-source of area for lymphatic filariasis transmission. Swamp could become very potential of breeding places for vector filariasis. This reasons why subjects with at-risk of work type in those location, increased exposed to mosquitos' bites.

Based on field observations and interviews, the rubber farmers usually work from around 05.00 up to 10.00 AM of local time. It was correlated with the nocturnal feeding activity of several mosquito species that are active from sunset to sunrise. The majority of these have two peaks of feeding activity, one before midnight and another before sunrise.⁽¹⁷⁾ Mosquitoes as vectors of filariasis were exophilic and exophagic, making it easier for mosquitoes to bites humans. These results are consistent with the types of mosquito species found at the plantation area and local residents' settlements.⁽¹⁹⁾ The possibility of vector transmission at the plantation area was *Mansonia* or *Anopheles* or due to migration of the inhabitants from the surrounding endemic area to these two districts. The rubber plantation site has played a major role as inbreeding site of the vector, with the middle area of rubber plantation was the Lake Baru Baharu site.

Even the knowledge factor score was not significantly differences compare 2 groups, but majority of the affected subjects did not know about the causes, symptom and vector transmission, opposite with un-affected subjects. The study by Salim et al. was found a significant association between knowledge of LF transmission and

incidence (p=0.01 OR 4.5) and study of Ikhwan et al. (p=0.04 OR 6.1) mentioned that greater risk for LF in subjects who did not know which organism was transmit lymphatic filariasis. In addition, at our site of study the desire of the residents to recover was very great. Their obedient with the information provided by health workers, continued socialization was carried out during the first and second phase of the study. The team conducts counseling and education of sign and symptoms of disease, continued with socialization the MDA programmed for through 5-years. The low level of knowledge about symptoms frequently retards the treatment of subjects, and in general subjects attending health services while in chronic stage, which may lead to permanent disabilities. Similarly finding with Amelia (p=0.01 OR 10.7) study found between the level of knowledge and lymphatic filariasis incidence in Kelurahan Kertoharjo, Pekalongan city. A good level of knowledge to prevent transmission of diseases could supports the achievement of expected national elimination target.

Lymphatic filariasis known was caused by parasitic worms transmitted from infected persons to others by mosquito bites. The worms (microfilaria) impair the lymphatic system, resulting in periodic fevers, fluid collection in the tissues (most commonly the limbs and genitalia), and severe swelling known as elephantiasis. In addition to pain and reduced mobility, people disfigured by LF often experience crushing social stigma and chronic economic hardship that has a ripple effect across entire families and communities through lost productivity. The preventive measures consisted of improving knowledge of the community through applicative and simple delivery information activities was more useful.

A good level of physical environment (PE) score was significantly associated with LF incidence (p=0.00), and was significantly associated with presence of aquatic plants (water hyacinths, p=0.01). On field observation found that the presence of aquatic plants (water hyacinths) at the environment surrounding residential dwellings. It was different result with study by Paiting et al. who found no significant association (p=0.69), possibly because the latter study was located in Windesi sub-district, Yapen Archipelago District,

Papua Province. In Yapen Papua, the lymphatic filariasis vector was *An. Farauti*, mostly at shaded grassy fields as a favorite breeding site. Also different vectors from Salim et al study, found *Culex*, *Aedes*, *Armigeres* and *Anopheles*. Type of mosquito found as filariasis vector that prefers to live in plantation environment at Agam west Sumatera, and mostly *Wuchereria bancrofti*.

In contrast, the *Mansonia* vectors in Kalimantan need aquatic plants as breeding sites, since their larvae and pupae respire through the submerged stems and roots and the stems and leaves floating on the water surface.¹⁹ In addition, periodic removal of aquatic plants (water hyacinths) in the swamps around the houses was recommended. Even the plant has economic value if the local community could cultivate and process it, that might likewise eliminate mosquito breeding places. Based on house observation, most of the house was not has a wire gauze. That might also minimize risk inhabitant against mosquito bites, and further develop of LF diseases. Vector control on mosquitoes remains an additional strategy in the prevention of transmission. Control methods was depending on the vector mosquito species, could be of eradicating mosquito nests, environmental modification, use of bed nets (ITN), insecticide spraying programs, and the use of repellents or insect repellent.

Clinical implication of this disease could damage the lymph system, causing swelling of the hands, feet, lymph nodes, mammary glands and scrotum. Cause lifelong disability and social stigma for individuals and their families. Indirectly, it has an impact on decreasing the work productivity of sufferers and burden on their families. In the end, it causes national economic losses. Finally, community empowerment is a very important part of the process by providing information to individuals, families and communities.

None of serious limitation found during on the field, only due to geographic of research areas at a remote location and need precise planning on research logistic.

CONCLUSION

The risk of LF incidence was significantly associated with age, occupation, and the presence of water hyacinths in the neighborhood of their houses. On the other hand, a good level of physical

environment (PE) score was a protective factor against LF incidence (**OR < 1**). The investigators recommended to the Juai primary health center and Balangan District Health, to periodically monitor and evaluate treatment, especially on the MDA outcomes among affected subjects. Followed by conducting attractive and frequently health education to remind inhabitants for preventive action through their family member for break the chain of transmission. This is to ensure inhabitants have better understanding on how to take preventive action against the emergence of diseases caused by mosquito vectors. Particularly regarding knowledge of sign and symptoms, vector cycle and transmission of LF diseases, preventive action and maintaining of subject' illness. Thus, to make community enhance their awareness and taking action of empowering people to prevent of the disease and quality of life. To be able to reach the elimination stage of elephantiasis according to the national program, sustainability of multi-sectoral cooperation in the mass drug delivery programme at provinces should be as a priority.

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CONFLICT OF INTEREST

Competing interest : no relevant disclosure

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