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RESEARCH ARTICLE

Factors Affecting the Incidence of Filariasis in Welamosa Village Ende District East Nusa Tenggara

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Abstract

Filariasis is a chronic communicable disease caused by filarial worms, which consists of three species: *Wucherria bancrofti*, *Brugaria malayi*, and *Brugaria timori*. This disease is transmitted through mosquito bites, infects lymph tissue (lymph) and causes swelling of the legs, breasts, arms and genital organs. Welamosa village, Ende district, located in East Nusa Tenggara (NTT) province is reported as one of the highest cases of 40 cases in 2015. This research aims to analyze the influence of social factor of demography and socio-cultural environment factor to elephantiasis incident in Welamosa village, Ende district. The study was conducted in July–September 2016 in Welamosa village and Wolowaru sub-district, Ende district. The type of research was observational analytic with case-control with 49 people as sampling. The research instrument used questionnaire and check list. The data analysis used statistical test of SPSS program with backward regression logistic test. The results showed five variables as risk factors of elephantiasis occurrence, age (OR=42.518), education (OR=38.248), occupation (OR=8.404), outdoor activity at night (OR=5.097) and sex (OR=0.193). In conclusion, social demographic factors (age, gender, occupation, and education) and environmental and social-cultural factors of attitude (outdoor activities at night) are risk factors for filariasis incidence in Welamosa village, Ende district.

Keywords: Filariasis, Ende district, Welamosa

Faktor yang Memengaruhi Kejadian Penyakit Filariasis di Desa Welamosa Kabupaten Ende Nusa Tenggara Timur

Abstrak

Filariasis adalah penyakit menular menahun yang disebabkan oleh parasit berupa cacing filaria yang terdiri atas tiga spesies, yaitu *Wucherria bancrofti*, *Brugaria malayi*, dan *Brugaria timori*. Penyakit ini menginfeksi jaringan limfe (getah bening) dan menular melalui gigitan nyamuk, serta menyebabkan pembengkakan kaki, tungkai, payudara, lengan, dan organ genital. Desa Welamosa, Kabupaten Ende terletak di Provinsi Nusa Tenggara Timur (NTT) dilaporkan sebagai salah satu kecamatan dengan kasus filariasis tertinggi, yakni 40 kasus pada tahun 2015. Tujuan penelitian adalah menganalisis pengaruh faktor sosial demografi dan faktor lingkungan sosial budaya terhadap kejadian filariasis di Desa Welamosa, Kabupaten Ende. Penelitian dilaksanakan pada bulan Juli–September 2016 di Desa Welamosa dan Kecamatan Wolowaru, Kabupaten Ende. Jenis penelitian merupakan analitik observasional dan pengambilan sampel menggunakan *case control* sebanyak 49 orang. Instrumen penelitian menggunakan kuesioner dan ceklis. Analisis data menggunakan uji statistik program SPSS dengan *backward regression logistic test*. Hasil penelitian menunjukkan lima variabel yang merupakan faktor risiko kejadian filariasis, yaitu usia (OR=42,518), pendidikan (OR=38,248), pekerjaan (OR=8,404), aktivitas di luar rumah pada malam hari (OR=5,097), dan jenis kelamin (OR=0,193). Simpulan, faktor sosial demografi (usia, jenis kelamin, pekerjaan, dan pendidikan) serta faktor lingkungan sosial budaya sikap (aktivitas di luar rumah pada malam hari) merupakan faktor risiko terhadap kejadian filariasis di Desa Welamosa, Kabupaten Ende.

Kata kunci: Filariasis, Kabupaten Ende, Welamosa

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Introduction

Filariasis is a contagious disease caused by infections of filarial worms transmitted through the bite of various types of mosquitoes. Filariasis worms consist of 3 species: *Wucherria bancrofti*, *Brugaria malayi*, and *Brugaria timori*. All of these species can be found in Indonesia, but more than 70% of filariasis cases in Indonesia are caused by *Brugaria malayi*.[1]

In 2014, filariasis cases affect 632 million (57%) of the population living in Southeast Asia (9 endemic countries) and 410 million (37%) of the population live in Africa (35 endemic countries). While the rest (6%) suffered by residents living in the Americas (4 endemic countries), the Eastern Mediterranean (3 endemic countries) and the western Pacific (22 endemic countries). Since 2000, USD 5.6 million fund has been granted worldwide to eradicate filariasis. In an attempt to eliminate filariasis by 2020, WHO has established a global agreement (The Global Goal of Elimination of Lymphatic Filariasis as a Public Health Problem by The Year 2020).[2]

In Indonesia filariasis was firstly reported by Haga and Van Eecke in 1889. Among the three types filaria worms, *Brugaria malayi* has the most widespread effect in Indonesia. *Brugaria timori* is found only in Timor island, Flores, Rote, Alor and several small islands in East Nusa Tenggara (NTT).[1]

The five provinces with the highest filariasis chronic cases in 2016 were NTT (2,864), Aceh (2,372), West Papua (1,244), Papua (1,184), and West Java (955). With 4.7% of the average prevalence of microfilariae in 2015. In case of the transmission of filariasis in endemic areas is not handled then the number of elephantiasis disease patient will increase from 13,032 to 4,807,148 infected people.[1]

From 2002–2014 the cumulative cases of filariasis in chronic disability in NTT were 3,175 cases.[1] In 2015, there were 68 new filariasis cases occuring in Belu, Ende, Ngada, West Sumba, and Rote Ndao regencies with the highest infected areas being Rote Ndao, Central Sumba, Ngada, East Sumba, Kupang, and Ende.[3]

Ende district ranks the sixth in chronic cases in 2015, with the number of cases as many as 348 cases.[3] Most cases were found in Welamosa village, in which there were 40 cases, Detusoko 38 cases and Kota Baru with 37 cases with over 95% of over 15 years old patients.[4]

Filariasis can cause lifelong disability and social stigma in the form of exclusion, disrupted social activities, and discomfort for the patient and his family when it has caused swelling of the hands, feet, breasts and scrotum. Another impact is the economic burden of medical expenses, productive days lost due to illness, and household members who takes care for the sick.[5]

Based on the data showing the high filariasis cases in Ende district, it is necessary to do a handling so that the number of cases does not become higher. The first step to do the handling is to identify the factors that influence the incidence of filariasis.

Environmental factors are the triggers of filariasis incidence. Environmental factors at home include the physical environment of houses that do not meet the criteria of healthy homes, such as ceiling construction and wall house, lighting, and humidity, are also to trigger the incidence of filariasis.[6,7] Meanwhile, the external environmental factors in question are those associated with mosquito breeding sites as vectors of the disease. These factors include stagnant water, rice fields, swamps, aquatic plants, shrubs, and animal reservoirs.[7] The next risk factor is the habit of going out at night and the habit of not using mosquito nets while sleeping.[8,9] Moreover, knowledge of filariasis that will increase individual awareness of the risk factors to be considered.[9] Gender, occupation, and age are also risk factors for this disease.

Faridah et al.[6] in different research about *Aedes aegypti* control in Cibeusi and Cikeruh village Jatinangor sub-district, concluded that high dengue fever case is also influenced by host factor (age, sex, mobility, immunological status, and virus serotype infecting), environmental factor home density and mosquitoes, mosquito breeding and resting places, larvae free numbers, and rainfall), and behavioral factors (sleep patterns and vector control efforts).

The purpose of this study was to analyze the influence of demographic social factors such as age, sex, occupation, and education as well as to analyze the influence of socio-cultural environmental factors such as knowledge, attitude, prevention and place of misery to the occurrence of filariasis disease in Ende district.

Methods

This study was analytic observational by using case-control design. The population was all cases of both acute and chronic filariasis found

in the district with the highest case in Welamosa with 49 cases. The case samples were filariasis patients registered in the Welamosa Public Health Center and diagnosed with filariasis. The control sample was 49 healthy individuals who were not registered as filariasis sufferers at the Wolowaru Public Health Center as a community health center with low cases and had similar characteristics. The sampling technique used the total sample based on cases recorded in the public health center book. The study was conducted in July–September 2016.

The data in this study include primary data and secondary data. Secondary data were cases obtained from Ende District Health Office and public health center at the research location, while primary data were collected directly through interview, questionnaire. Moreover, the data regarding the environmental condition were obtained through direct observation by using observation sheet.

The data collection process was conducted at each of the respondents' houses, within 14 days. The respondents were given questions about filariasis, actions and attitudes toward the incidence of filariasis disease. Adding to this, the observation data includes livestock ownership, the use of mosquito nets and the use of wire netting.

The data from the interview with the respondents and environmental observation were processed by using the Microsoft Excel program for a univariate variable, while statistic test was analyzed by using SPSS program with backward logistic regression test.

The study has been registered with the Medical Research Ethics Commission of the Faculty of Medicine, Universitas Nusa Cendana, Kupang and has been granted a research ethic license with decision sheet number: 107/UN 15.16/KEPK/2016 and registration number UN16080115. All respondents in this study were asked for approval and have signed the informed consent.

Results

This study was conducted on 49 samples who meet the criteria as research subjects. The frequency distribution of social demographic characteristics is illustrated in Table 1.

Table 1 shows that in case of groups; the proportion of sex, there were more female than male respondents. Regarding age of respondents, 90% of them were mostly over 50 years. In terms of education, 86% of the respondents only completed primary school or they do not attend school. Most of the respondents were farmers (84%). The number of family members who live in the house was mostly 4 people and more (78%).

In the control group, it was found that most of the respondents were male (57%). The age

Table 1 Characteristics of Social Demographics of Case and Control Groups

Variable	Control		Case		Total	
	Numbers	%	Numbers	%	Numbers	%
Gender						
Woman	21	43	31	63	52	53
Male	28	57	18	37	46	47
Age (years)						
≤50	38	78	5	10	43	44
>50	11	22	44	90	55	56
Education						
SMP/SMA/PT	33	67	7	14	40	41
SD/no school	16	33	42	86	58	59
Work						
Non-farmers	22	45	8	16	30	31
Farmers	27	55	41	84	68	69
Family members (persons)						
1–4	26	53	11	22	37	38
>4	23	47	38	78	61	62

SMP: *sekolah menengah pertama* (junior high school), SMA: *sekolah menengah atas* (high school), PT: *perguruan tinggi* (college), SD: *sekolah dasar* (elementary school)

Table 2 Characteristics of Socio-Cultural Factors of Cases of Control Groups

Variable	Control		Case		Total	
	Numbers	%	Numbers	%	Numbers	%
Knowledge						
Good	30	61	17	35	47	48
Enough/less	19	39	32	65	51	52
Attitude						
Good	32	65	31	63	63	64
Enough/less	17	35	18	37	35	36
Action						
Good	33	67	16	33	49	50
Fair/less	16	33	33	67	49	50
Source of information						
District health	42	86	37	75	79	81
Not district health	7	14	12	25	19	19
Livestock						
None	27	55	11	22	38	39
There are	22	45	38	78	60	61
Outdoor activity						
Not exit	35	72	25	51	60	61
Exit	14	29	24	49	38	39
Mosquito nets						
Yes	36	73	27	55	63	64
No	13	27	22	45	35	36
Wire gauze						
Yes	18	37	7	14	25	26
No	31	63	42	86	73	74

of respondents was less than 50 years (78%). Regarding education, the majority of respondents had completed junior high school, senior high school and university (67%). The occupation was not very different between farmers (55%) and non-farmers (45%). The number of family members who live in the house was mostly 1–4 people or less than 4 people (53%).

The frequency distribution of socio-cultural factors is described in Table 2. Table 2 shows that among the case group, most respondents had sufficient/less knowledge about filariasis (65%). The attitude of respondents was mostly good (63%). Respondent's action is mostly enough/less (67%). The majority of information about filariasis came from health worker (75%). Based on ownership of livestock and livestock farm, it can be seen that the majority had livestock barn (78%). Furthermore, 51% of the respondents had outdoor activities at night. 55% of the respondents

Table 3 Results of Multivariate Analysis Variable Research on Case and Control of Filariasis Events in Ende District

Variables in the Equation	B	S.E.	Wald	Df	Sig.	Exp (B)	95% CI
Gender	−1.646	0.790	4.339	1	0.037	0.193	0.041–0.907
Job	2.129	0.855	6.198	1	0.013	8.404	1.573–44.905
Age	3.750	0.854	19.271	1	0.000	42.518	7.970–226.819
Education	3.644	0.907	16.146	1	0.000	38.248	6.466–226.239
Outdoor activity	1.841	0.841	3.754	1	0.053	5.097	0.981–26.480
Constant	−5.650	1.328	18.112	1	0.000	0.004	

used mosquito nets during night sleep but most of them did not use netting wire (86%).

In the control group can be seen that most respondents had good knowledge (61%). The respondents' attitude was mostly good (65%) and the action of the majority of respondents is good as well (67%). Based on sources of information about filariasis, most of the respondents got information from health workers (86%). Most of the respondents do not have livestock and livestock enclosure (55%). Most of the respondents did not have outdoor activity at night (71%). Most respondents used mosquito net (73%) but did not have wire screen for the window (63%).

Based on the results of analysis by using backward logistic regression test, there were five variables influencing filariasis incidents in Ende district namely gender, occupation of the respondent, age, education and outdoor activity.

As illustrated in Table 3, the prediction model of filariasis occurrence with the prediction ability of 89% and the remaining 11% is influenced by factors outside the model, with the following equation: Y = 5.650 – 1.646 sex + 2.129 work +3.750 age +3.644 education +1.841 outdoor activities at night.

Male respondents were 0.193 times more prone to filariasis than women. Respondents working as farmers were at greater risk of filariasis than those who did not work as farmers (8.404 times). Respondents aged over 50 years had the greatest risk of filarial infection by 42.5 times compared with those who were 50 years. Respondents with low education (elementary/uneducated) had 38 times higher risk of filariasis infection than those with higher education. Respondents who had outdoor activity at night had 5.097 times more vulnerable to be infected by filariasis than those who stay at home.

Discussion

The number of women in the case group is slightly higher than that of men, whereas in the control group the number of male respondents is higher. Based on logistic regression test, sex influenced filariasis incidence with OR 0.193 value, which means that women have a higher risk to be infected by filariasis compared with men. The study found that 63% of women in the case group had filariasis. This result is similar to Garjito et al.[7] research in 2013, that women also have a risk of contracting filariasis while helping their husbands working in the field. Regarding night outdoor activity, filarial mosquitoes do not only bite outside but also bite inside the house.[7]

The results of this study is in accordance with Riftiana and Soeyoko[8] research in 2010 conducted in Pekalongan Regency with obtained value OR=1.680 and p=0.310. This means that men are expected to have higher risk of filariasis infection by 1.607 times greater, but this was not statistically significant. Sex variables is not significantly related to filariasis incidence in Pekalongan regency because both men and women have the same risk to be infected by filaria.

Similarly, Afra et al.[9] also concluded that male respondents are at higher risk with 19% filariasis incidence, whereas among respondents with no risk (women) there was as many as 81% who experienced filariasis. Based on the results of the chi-square test, p=0.482, which means that there is no significant relationship between sex and filariasis incidence. Filariasis events can occur to both men and women.

The results of this study differ from those of Santoso et al.[10] that men have a greater risk of contact with filariasis transmitting mosquitoes due to their outdoor activities during the night. Although men in some endemic locations have more frequent frequency bites when working outdoors, women also have the risk of contact with mosquitoes inside the house.

There is no research claiming that genetically men are more susceptible to contracting filariasis than women. Transmission of filariasis occurs when there are 3 elements namely a source of transmission, the presence of vectors, and humans who are susceptible to filariasis.

In general, filariasis vector mosquitoes such as *Anopheles*, *Culex* and *Mansonia* are more likely to bite at night. This makes filariasis incidence in men is higher than in women. This is caused by the fact that generally men are more often to have contact with vectors because of their work and other outdoor activities until late at night, like as chatting with neighbors and watching TV together. Thus, men are more exposed to vectors with exophilic and exophagic nature where it will be easier for mosquitoes to bite.[11]

Based on age group it was found that among the case group, there were high occurrences of filariasis to those who are over 50 years old (90%). Then, based on logistic regression test, those who are over 50 years old are 42.518 times more risky compared to under 50 years old group. Although filarial infection can occur in all age groups, adults are more likely to be infected by filariasis

due to contact with their workplace vectors and risky behaviors such as more outdoor activities.[11]

Santoso et al.[10] stated that people who are more than 47 years old has higher potential to be infected by filariasis (28%) in comparison with the other age group. In other words, the older a person the more possible for him to have filariasis disease. This is illustrated by the percentage climbing from 5.5% (0–5 years) to 27% (31–46 years).

Afra et al.[9] states that there are a significant relation between age and filariasis incidence. It was found that 14% of the younger respondents (25–45 years) had filariasis while among the group at risk (<25 years or >45 years), 86% of them had filariasis.

In contrast, a study conducted by Riftiana and Soeyoko[8] also stated that there was no significant relationship between age and filariasis incidence. Riftiana and Soeyoko.[8] found the magnitude of risk for age variables as seen in the value of OR=1.607, meaning that people who have a productive age are estimated to have filariasis disease 1.607 times greater than people who are not productive. However, this is not statistically significant with the value of p=0.331 at α=0.05.

Despite the insignificant relation between age and filariasis occurrence, there may be other factors like internal factors (congenital) attached to the individual. Although the age of each individual is the same, different intelligence, perception, emotions, and motivation will result in different behavior. Likewise, although individuals with older ages have more experience than younger ones, it cannot be guaranteed that they have good behavior, because essentially each individual will respond differently towards though the similar object or concept. This is caused by the peculiar nature of the individual himself. Therefore, age differences do not cause differences in activity in the prevention of filariasis.[9]

Types of respondents' occupation in this study are grouped by farmers and non-farmers because the majority of the population in the case and control groups works as farmers who own rice fields and plantations. Employment as a farmer in this study is a risk factor for filariasis with OR=8.804, which means that respondents who work as farmers have a risk to be exposed to filariasis 8.804 times greater than the non-farmers. This is possible because in addition to their low education where 86% of them only finished primary school, they also work as farmers. This type of work is one of the risk factors for workers experiencing multiple bites of filariasis transmitting vectors.[5] The results of this study found that most of the filariasis patients work as farmers (84%) and a few number of non-farmers (16%). Some previous research results indicate that work at risk relates to filariasis events.

Riftiana and Soeyoko[8] categorizes work at risk in Pekalongan regency as farmers and other jobs done at night namely trader, laborer or artisan. The result of this research is OR=3.519, p=0.014 at α=0.05. In terms of biological significance, this means that the night jobs other than farmers will increase the risk of filariasis as much as 3.519 times compared to people who work during the day and this is statistically significant.

The rice field environment is suitable as a breeding ground for filariasis mosquitoes because the water is stagnant and directly related to the rice fields. Moreover, filariasis transmitting mosquitoes live at the roots of aquatic plants in the swamp. Therefore, working closely to mosquito breeding places has a great tendency to have contact with filariasis transmitting mosquitoes.[11]

Environmental conditions such as forest, rice fields, swamps that are often overgrown with water plants and sewage and trenches are one of the best habitats for breeding and resting of vector mosquitoes of certain species. There are 2 kinds of *Filariasis bancrofti*. First, the urban bancrofti filariasis with its main vector *Culex fatigans* that live in house, breeding on the dirty water around the house. Second, rural *Filariasis bancrofti* with its vector mosquito *Aedes*, *Anopheles* and *Mansoni*. *B. malayi* and *B. timori* only exist in rural areas, because the vectors cannot breed in urban areas. *B. timori* is usually located in the rice fields in accordance with the vector (*An. barbirostris*) breeding place. *B. malayi* can be found in humans and animals usually located on the beach or stream with swamps.[9]

Welamosa village, Wewaria sub-district, Ende distric is one of the villages with the geographical condition of the mountains and the rice fields. Annual rainfall is quite high, so it is an area of breeding places. This is one of the factors causing the high spread of mosquito carrying filaria worm. Almost 70% of Welamosa area consists of the plantation, rice fields and shrubs which are the mosquitoes breeding places as well as transit for the mosquitoes that can transmit filariasis disease. Unprotected environmental sanitation conditions can be a breeding ground

for mosquitoes. Puddles, ditches or sewers can also be breeding ground for mosquitoes.

Formal education measured in this research is the education level of junior/senior high school/ university and level of uneducated/elementary school. The higher level of education will affect the level of knowledge and attitudes in preventing the incidence of certain diseases. In this study, 86% of the cases are not educated or finished primary school but only 14% of them have completed high school or university. On the contrary, 67% of the control groups have finished high school and higher education the other 33% did not attend school or finished primary school. The statistical test of logistic regression results showed that education level has OR=38.248, meaning that low educated respondents have 38.248 times higher risk to be infected by filariasis compared with the highly educated person. In this study, the level of knowledge is fair/less common in the case group compared to the control group. This has an impact on the low attitudes and actions to prevent filariasis.

Amelia[12] concluded that there is a correlation between the level of knowledge about filariasis and filariasis incidence in Kertoharjo village, Pekalongan regency. The value of OR=10.714 indicates that respondents whose level of knowledge about filariasis is low have a risk of 10.714 times higher than respondents whose level of knowledge about filariasis is high. Knowledge of filariasis disease is very important to support filariasis disease eradication. Prevention efforts were undertaken by increasing the knowledge of the community through simple and applicative extension activities such as avoiding contact with vector filariasis disease mosquitoes, including using mosquito nets, closing house ventilation with wire screen, and using mosquito repellent.[13]

The outdoor activities at night is a risk factor for the filariasis incident in Ende district with OR =5.097, meaning that people who have outdoor activity at night have a risk of 5.097 times higher than those who do stay at home all day. The habit of outdoor activity at night is related to the intensity of contact with the filariasis transmitting vector. Although sucking blood from pets, mammals, and poultry, filariasis transmitting mosquitoes prefer human blood. Female *Cx. quinuefasciatus* mosquito sucks human and animal blood throughout the night from until morning, both inside and outside the home.[11]

In this study it is found that 49% of the case group had outdoor activity outside at night compared to the control group which was only 29%. If you see patients who have a habit of going out at night with jobs at risk, then all patients who often out of the house at night have a risk for exposure to mosquito bites causing filariasis.

Garjito et al.[7] also concluded that the out-of-home habit factor was significantly related to filariasis in Pangku Tolole village, Ampibabo, Central Sulawesi. Likewise, the research from Windiastuti et al.[14] stated that respondents who have a habit of being outdoors at night have 9.034 times greater risk of filariasis compared to respondents who do not have a habit of being outdoors at night. The habit of respondents to go out at night when mosquito *Cx. quinquifasciatus* bite will increase the risk of filariasis incidence. These factors are closely related to the existing mosquito species. Based on research that has been done, the peak density of mosquitoes bite occurred at 20.00–21.00 pm. High overnight activities during the night will give greater opportunities for contact with mosquitoes, *Cx. quinquifasciatus* thus at risk of filariasis.

Based on bionomic mosquitoes related to blood-seeking activities, communities in Ende district are at risk for activities outside the home during the night so that the habit of people out of the house at night has a high tendency to have contact with filariasis transmitting mosquitoes.[7]

However, a study by Uloli et al.[15] suggested that out-of-home behavior at night was not associated with filariasis. Uloli et al used a case-control study design. When viewed from the percentage of patients and controls, most of the respondents had a habit of outdoors activity at night. That is equal to 87% and 78 % with a value of p=0.103.[15]

Conclusions

Social demographic factors (age, gender, occupation, and education) and environmental and social-cultural factors of attitude (outdoor activities at night) are risk factors for filariasis incidence in Welamosa Village, Ende District.

Conflict of Interest

The authors declare no conflict of interests.

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