The use of Mosquito Nets and The Habit of Going Out at Night as Risk Factors for Filariasis in Kodi Balaghar sub-district, Southwest Sumba district, East Nusa Tenggara, Indonesia; Case Control Study

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ABSTRACT: *There is not much information about the risk factors for filariasis transmission in Southwest Sumba Regency, East Nusa Tenggara. To obtain this information, we conducted an epidemiological study of the incidence of filariasis infection in Kahale Village and Radda Malando Village, Balaghar District. The factors investigated were gender, age, occupation, occupancy density, knowledge, use of mosquito nets, nighttime habits, use of mosquito repellent, habit of hanging clothes in the room, physical condition of the house, proximity to mosquito breeding habitats and close to people with filariasis. This type of research is analytic observational where the sample was taken using case control as many as 64 people. The research instrument used a questionnaire and check list. Data analysis used the SPSS program statistical test with Backward Logistic Regression Test. The results of the bivariate test showed that the variables that had a relationship with the incidence of filariasis were the use of mosquito nets, the habit of going out at night, the habit of hanging clothes in the room with a p value <0.05. The prediction model for the incidence of filariasis with the ability to predict is 88.8% with the following equation: Y = -10,609 + 5,148 use of bed nets + 3,318 night out habits. The study showed that two variables were risk factors for filariasis, namely the habit of using a mosquito net (OR 172.18) and the habit of going out at night (OR 27.596). We conclude that the behavior of using bed nets and the habit of going out at night plays an important role in increasing filariasis infection so that it is important to change aspects of community behavior to reduce the incidence of filariasis infection.*

Keywords: Filariasis; Mosquito Nets; Night Out; Case Control

1. INTRODUCTION

Lymphatic filariasis is an infectious disease that still causes health problems in the community(1)(1)'(2). Patients with filariasis who are not treated, even though they do not cause death, are very detrimental because they will experience pain, physical disability, poverty and even cause psychosocial problems in the community where the patient lives(3)(4). Disability due to filariasis experienced by sufferers also causes dependence on other people so that economically it will be very detrimental to the sufferer's family and lead to poverty(5)(4).

The World Health Organization (World Health Organization) in 2000 declared "The global goal of elimination of lymphatic filariasis as a public health problem by the year 2020". The Indonesian government responded to this global agreement by declaring the start of the elimination of filariasis since 2002 in Musi Banyuasin Regency and establishing filariasis elimination as one of the priority programs for eradicating infectious diseases in Indonesia(6)'(7)'(8).

Filariasis cases in the world are currently estimated to have reached more than 120 million people with 40 million of whom have suffered from chronic filariasis which causes disability. It is estimated that 856 million people in 52 countries are at risk for filariasis infection. As many as 25 million men have had an impact on their genitals (scrotal hydrocele) and more than 15 million have lymphodema(9)(9). Lymphatic filariasis does not cause death directly but a significant increase in disease prevalence causes poverty and can hinder the achievement of the *Millennium Development Goals*(10)(11)(10)(11).

Based on the 2019 Ministry of Health's report, the number of filariasis cases in Indonesia until 2018 was 10,681 cases spread across 34 provinces. This figure decreased compared to the previous year 2017 (12,677 cases), this was due to the fact that several cases were reported to have died and there was a change in diagnosis after confirmation of chronic clinical cases reported in the previous year. The five provinces with the highest chronic filariasis cases in 2018 were Papua (3,615 cases), East Nusa Tenggara (1,542 cases), West Java (781 cases), West Papua (622 cases), and Aceh (578 cases)(10)(12)(10)(12).

NTT is the second largest contributor to filariasis cases after Papua (10)'(13). This case is spread in almost all cities / districts in NTT, including 4 districts on the island of Sumba. The number of cases reported was 311 cases from 3 districts, namely Central Sumba, Southwest Sumba and West Sumba(14)'(15) (NTT Health Office, 2018).

Southwest Sumba Regency is one of the filariasis endemic areas in NTT Province with 90 chronic cases in 2011 while the microfilaria rate Mf rate> 1% based on the results of a survey of finger blood supply (SDJ) by the Ministry of Health conducted in Buru Kaghu Village and Mata Kapore Village in 2009(1). The SDJ survey results became the basis for the implementation of mass treatment for the first time in Southwest Sumba Regency in 2011 (P2M Dinkes Kab SBD, 2011)(16)(16). 2013 was the second period for the implementation of mass filariasis treatment in Southwest Sumba Regency but it was the first period of mass filariasis treatment in Kodi Balaghar District(16)'(17). Kodi Balaghar is a new sub-district resulting from the division of Kodi Bangedo District in 2012 (BPS Kabupaten Sumba Barat Daya, 2013). Yunarko, 2016 reports that Kodi Balaghar District has an mf-rate of 4.2% based on the results of SDJ taking in 2012 with a sample size of 500 people(17)(17).

The success of eradicating filariasis is influenced by community participation. The magnitude of community participation is influenced by knowledge, attitudes and actions towards filariasis(1)(1)'(2)'(18)'(9). The risk factors for filariasis include physical environmental factors, mosquito breeding grounds, biological and social environmental factors. Behavioral factors, such as the habit of going out at night, wearing a mosquito net while sleeping, using gauze at home, etc(2)(4)(19).

Several previous studies have suggested that gender, occupation, age, education, occupation, and social environmental risk factors influence the spread of filariasis(20)'(21)'(22)'(23)'(24)' The purpose of this study was to determine the factors that influence the incidence of filariasis in Kodi Balaghar District. The factors analyzed were socio-demographic factors, namely age, gender, and occupation, socio-cultural environmental factors such as knowledge, attitudes and actions to prevent filariasis. Jointly analyze the effect of independent variables on the incidence of filariasis and determine the dominant variables that affect the incidence of filariasis.

2. RESEARCH METHODS

This study is an observational analytic study using a case control design. The population in this study were all cases of filariasis, both acute and chronic found in Kodi Balaghar district, Kahale Village and Radda Malando Village. The case sample was 10 cases of filariasis patients registered at the Panenggo Ede health care and the control sample was 54 healthy people who are not registered as filariasis sufferers. Data collection was carried out from October to November 2020. The sampling technique for cases was total sampling using all patients recorded in the public health center register and for control samples using a case sample ratio of 1: 5 depending on the number of residents available and willing to be interviewed. This research has received research ethics permit from the Health Research Ethics Commission for Health Polytechnic of the Ministry of Health in Kupang with registration number LB.02.03 / I / 0075/2020, dated 20 October 2020. All signed the informed consern as a sign of willingness to take part in the research by filling out a questionnaire.

3. RESULT

This study involved 64 respondents with 10 case samples and 54 control samples who met the specified criteria. The distribution of socio-demographic characteristics (age, sex, occupation) is shown in Table 1 below.

The proportion of female sex was balanced in the control group (88.9%) and the case group (70%). The age of respondents ≤ 50 years of age in controls was 74%, while in cases 30%. 100% farmer occupation was found in both the control group and the case group. However, it differs from the occupancy density, namely 81.5% in the control group and 100% in the case group.

The relationship between risk factors and the incidence of filariasis in this study can be explained using bivariate analysis. This analysis aims to determine the relationship and risk level of each independent variable with the incidence of filariasis (the dependent variable). The existence of a significant relationship between risk factors and the incidence of filariasis

is indicated by a p value <0.05; the odds ratio (OR)> 1 and 95% CI did not include value 1. The results of the analysis of the relationship between risk factors and the incidence of filariasis (bivariate analysis) are presented in Table 2.

The results of the bivariate analysis showed that of the 12 variables analyzed, there were 3 variables that were proven to be risk factors for filariasis, namely having a p value <0.05 and the CI did not include a value of 1. There were 9 variables that were proven not to be a risk factor for the occurrence of filariasis, namely having p value> 0.05. While the results of the multivariate analysis showed that of the 3 variables analyzed together, the independent variables which had a p value <0.25 in the bivariate analysis and the independent variables which were biologically significant to the dependent variable were used as candidates in the logistic regression test, namely 3. variables which include: use of mosquito nets, habit of going out at night, and habit of hanging clothes. Then the independent variables are included in the multivariate analysis.

Table 2 shows the level of knowledge and actions of respondents in the control group and the case group that was mostly good. The percentage of attitudes in the control group and the case group was good when compared to adequate / poor attitudes with a p value> 0.05 (0.859). In the use of mosquito nets, 92.6% of respondents in the control group used a mosquito net and 90% of the case group did not use a mosquito net with a value of p <0.05 (0.000). The percentage of night out habits, 63% of respondents in the control group did not have a habit of going out at night and 90% of the case group used to go out at night with a p value <0.05 (0.006). In the use of mosquito repellent, 94.4% of respondents in the control group did not use mosquito repellent and 100% of the control group also did not use mosquito repellent with p value> 0.05 (1,000). The habit of hanging clothes was found 70% in the case group and 92.6% of the control group did not hang clothes with a p value <0.05 (0.000). The physical environment at risk was found to be 98.1% in the control group and 90% in the case group with a p value> 0.05 (0.711). Environmental conditions close to mosquito breeding habitat were found to be 57.4% in the control group and 80% in the case group with a p value> 0.05 (0.321). In the control group it was found 77.8% in the control group and 70% in the case group with a p value> 0.05 (0.899). Environmental conditions close to the breeding of mosquito habitat were found in 57.4% in the control group and 80% in the case group with a p value> 0.05 (0.321). In the control group it was found 77.8% in the control group and 70% in the case group with a p value> 0.05 (0.899). Environmental conditions close to the breeding of mosquito habitat were found in 57.4% in the control group and 80% in the case group with a p value> 0.05 (0.321). In the control group it was found 77.8% in the control group and 70% in the case group with a p value> 0.05 (0.899).

After conducting a multivariate analysis, the results showed that of the 3 variables there were 2 independent variables that should be statistically maintained, namely: the use of bed nets and the habit of going out at night. For more details, it can be seen in table 3.

The results of the multivariate analysis above are included in the multiple logistic regression equation formula, it is found that respondents with the use of mosquito nets and the habit of going out at night have a probability of having filariasis of 5.56%.

Based on the results of the analysis using the Backward LR logistic regression method, the prediction model for the incidence of filariasis with the ability to predict is 88.8% with the equation: Y = -10,609 + 5,148 Use of mosquito nets + 3,318 Night out habits. Two variables were found to be the most influential, the biggest influence was the use of bed nets, namely those who did not use a mosquito net had a risk of being infected with filariasis by 172.18 times compared to those who did not use a mosquito net. The second risk factor is those who have a night out habit have a 27.596 times risk of infection than those who do not go out at night.

4. DISCUSSION

The habit of going out at night is related to the intensity of contact with the vector of transmitting filariasis. Although they suck blood from domestic animals, mammals and poultry, mosquitoes that transmit filariasis prefer human blood (Chandra, 2007). Mosquito Cx. Female quinuefasciatus suck human and animal blood throughout the night from late afternoon to early morning, both indoors and outdoors (Kemenkes, 2011).

The percentage of the results of the study indicated that the behavior of patients who had the habit of leaving the house at night was 90%. If it is seen that patients who have a habit of leaving the house at night with risky jobs, namely farmers, the potential for infection will be even higher. In line with Irfan's (2018) research in Ende Regency, East Nusa Tenggara which states that the habit of leaving the house at night is the dominant factor in the incidence of filariasis in Ende Regency. Community activities in Ende Regency at night have become normal activities, such as men leaving the house to work in the fields, gardens or just gathering at a coffee shop(3)(3).

Yudi (2012) in Pekalongan Regency also concluded that respondents who had the habit of being outside at night had a 3.576 times risk of getting filariasis compared to respondents who did not have the habit of being outside at night(25). Ardias, 2012 also reported that respondents who had the habit of going out at night had a 39,054 greater risk of suffering from filariasis than respondents who did not have the habit of going out at night(26)(27).

However, in Uloli's (2008) study, the behavior of leaving the house at night was not related to the incidence of filariasis. Uloli uses a case control study design(21)(21). When viewed from the percentage of sufferers and controls, most of them had the habit of going out at night, namely 87.1% and 78.5%. This means that outdoor activities at night are common in Bonebolango Regency.

Based on the description above, most of the filariasis sufferers have the habit of going out at night. We recommend that people who live in an endemic environment reduce their activities outside the home at night. If you have a special job that is required to be outside the house at night, personal protection must be increased to avoid contact with mosquitoes that transmit filariasis. The higher the contact between the mosquito as a vector for transmitting humans, the higher the incidence of disease transmission(1)(1).

The best way to avoid mosquito bites while sleeping is to use a mosquito net(20)(20). Protection from mosquito bites using a better mosquito net recommended by WHO (2015) is to use insecticide-treated bed nets.

The results of this study indicated that most of the patients who did not use a mosquito net were 90% lower than the control group, namely 7.4%. Based on interviews with sufferers, the reason for not using a mosquito net is the feeling of heat generated when sleeping using a

mosquito net. In addition, there are also those who say they do not use mosquito nets for reasons that are not practical, namely before sleeping and in the morning the mosquito nets must be tidied up again. Not having a mosquito net is the reason most sufferers cite not using a mosquito net while sleeping.

The use of bed nets to prevent filariasis is in accordance with Jontari's research (2014) which states that the use of bed nets is related to the incidence of filariasis. The percentage of Jontrari's research regarding control habits that did not use a mosquito net while sleeping was almost equal to the case group. This means that the people of Agam Regency do not usually use a mosquito net while sleeping, but they use mosquito repellent at night. The percentage of cases and controls using mosquito repellent was 79.1% and 78% (28)(28).

Based on the bionomic filariasis-transmitting mosquitoes, people must increase their protection from mosquito bites during their sleep at night. The activity of infectious mosquitoes that actively bite blood at night, increases the tendency for contact with mosquitoes that transmit filaraysis is greater.

Ramdhani (2009) explains further about the bionomic mosquito that transmits filariasis further, namely the mosquito that transmits filariasis biting in the house, namely 20.00-21.00, 22.00-23.00, and midnight 02.00-03.00. *Culex quinquefasciatus* is an *anthropophilic* species, eating and resting in human habitation. This is because mosquitoes that are half pregnant (have not yet sucked the maximum blood) and pregnant are caught in the house, especially in the first quarter of the night, namely 18.00-21.00 There is a possibility of *Cx. quinquefasciatus* completes the gonotrophic cycle in all rooms in the house(26)(27)(26)(27).

Tallan, 2016 conducted research in the same sub-district, namely Balaghar Subdistrict, Southwest Sumba and found potential habitats as a breeding ground for mosquitoes where the dominant habitats are puddles, springs, waterways and small rivers with temperatures ranging from 21-350C, lighting 0, 22-795 lux, PH ranges from 7.2-7.7, salinity 0-0.1 ‰ with altitudes ranging from 25-117m / asl. Where the species found in the breeding habitat are An.vagus, An. barbirostris, An.annularis, Cx.vishnui, Cx bitaeniorhynchus, Cx quinquefasciatus, Ar. Kuchingensis(29).

Paiting's research (2012) states that the use of mosquito nets has no relationship with the incidence of filariasis. The percentage of cases and controls in Windesi District is almost the same, so using mosquito nets while sleeping for people in Windesi District is common. The vector of the mosquito that transmits filariasis in the Windesi District of Papua Province according to the Indonesian Health Office (2005) is *An. farauti, An. koliensis, An. punculatus, An. bancrofti, Cx. Annulirostris, Cx. bitaeniorhynchus, Cx. quinuefasciatus, Ae. kochi, and Ma. Uniformis*(30). Based on bionomics, searching for the blood of mosquitoes that transmit filariasis in Papua Province can bite during the day or at night. Taking sago sap is an average of the community work in Windesi District. Behaviors such as not wearing complete clothes when taking sago sap make the tendency for contact with mosquitoes that transmit filariasis to be greater(11)(11)˙(30).

Based on the description above, differences in the characteristics of the local community cannot make a risk factor that affects the incidence of filariasis the same in every region. The use of mosquito nets at this time is not uncommon, so other self-protection methods must be improved. For people who use bed nets, it is better to use bed nets with insecticide(31)(31).

Several studies have shown that the habit of hanging clothes is a factor that influences the incidence of filariasis infection. Clothes hangers behind doors or in rooms are one of the places where mosquitoes can breed. This research is in line with Munawwaroh, 2016 who found that hanging clothes is a factor that has a significant effect on the incidence of filariasis(32). Ardias, Setiani and Hanani (2012) also reported that respondents whose houses had mosquito resting places (cattle sheds, bushes and hanging clothes) had a risk of suffering from filariasis 4,480 times greater than respondents whose houses had no mosquito rest areas(26).

Our research found that behavioral aspects play a major role in the incidence of filariasis infection. We recommend to relevant agencies, in this case the government and health care officials, to increase health education / promotion to the public. Increasing knowledge to change behavior and habits can be done through a family approach through home visits and counseling to both patients and the control group in this study.

5. CONCLUSION

Our study provides information that the behavior of using bed nets, the habit of going out at night, and the habit are the most important risk factors in the risk of filariasis infection in Kahale Malando Village, Balaghar District, Southwest Sumba.

Gratitude note

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Table 1; Social Demographic Characteristics

Variable		Control		Case		Total	
		Qty	%	Qty	%	Qty	%
Gender	Women	41	75.9	7	70	48	75
	Male	13	24.1	3	30	16	25
Age	≤ 50 years	48	88.9	3	30	56	87.5
	> 50 years	6	11.1	7	70	8	12.5
Occupation	Not a farmer	0	0	0	0	0	0
	Farmer	54	100	10	100	64	100
Occupancy	Solid	44	81.5	10	100	54	84.4

Density	Not solid	10	18.5	0	0	10	15.6

Table 2; Characteristics of Socio-Cultural Environmental Factors

Variable		Control		Case		Total		P Value
		Jml	%	Jml	%	Jml	%	
Knowledge	Good	50	92.6	10	100	60	93.8	0.859
	Enough/less	4	7.4	0	0	4	6.3	
Mosquito nets usage	No	4	7.4	9	90	13	20.3	0.000
	Yes	50	92.6	1	10	51	79.7	
Nighttime habits	Yes	20	37.0	9	90	29	45.3	0.006
	No	34	63.0	1	10	35	54,7	
Use of mosquito repellent	No	51	94.4	10	100	61	95.3	1.000
	Yes	3	5.6	0	0	3	4.7	
Habit of hanging clothes in the room	Yes	4	7.4	7	70	11	17,2	0,000
	No	50	92.6	3	30	53	82.8	
Physical condition of the house	With risks	53	98.1	9	90	62	96.9	0.711
	No risks	1	1.9	1	10	2	3.1	
Proximity to mosquito breeding habitats	Close	31	57.4	8	80	39	60.9	0.321
	Far	23	42.6	2	20	25	39.1	
Close to people with filariasis	Close	42	77.8	7	70	49	76.6	0.899
	Far	12	22.2	3	30	15	23.4	

Table 3. Results of Multivariate Analysis of the Backward LR Method

Variables in the Equation	B	S.E.	Wald	Df	Sig.	Exp (B)	95% CI
Use of mosquito nets	5.148	1.432	12.917	1	. 000	172.101	10.388 – 2851.379
Night Out Habit	3.318	1.505	4.860	1	.027	27.596	1.445 – 527.125
Constant	-10.609	3.385	9.822	1	. 002	.000	