Journal of Environmental and Development Studies
Journal homepage: https://talenta.usu.ac.id/jeds

Environmental Factors Associated with the Occurrence of Filariasis in Asahan Regency, North Sumatra Province

Israyani Ismili[1*], Sri Malem Indirawati[1,2], Zulkifli Lubis[1,3]
[1]Natural Resources and Environment Management Study Program, Postgraduate School, Universitas Sumatera Utara, Medan, 20155, Indonesia
[1,2*]Faculty of Public Health, Universitas Sumatera Utara, Medan, 20155, Indonesia
[1,3*]Faculty of Social and Political Science, Universitas Sumatera Utara, Medan, 20155, Indonesia

*Corresponding Author: i.ismili@yahoo.com

ARTICLE INFO

Article history:
Received 26-07-2024
Revised 28-08-2024
Accepted 09-09-2024
Available online 11-09-2024

E-ISSN: 2745-4592

How to cite:
Israyani Ismili, Sri Malem Indirawati, & Zulkifli Lubis. Environmental Factors Associated with the Occurrence of Filariasis in Asahan Regency, North Sumatra Province. Journal of Environmental and Development Studies 2024. 5(2): 90-99

http://doi.org/10.32734/jeds.v5i02.16494

ABSTRACT

Filariasis is a serious parasitic infection caused by thread-like worms known as filariae. These worms are transmitted to humans through the bites of infected mosquitoes. The infection mainly affects the lymphatic system, which is part of your body's immune system. Poor sanitation and lack of proper housing infrastructure are a few aspects causing filariasis. This research aims to to determine the environmental factors related to the incidence of filariasis in Asahan Regency, North Sumatra Province Data was collected using a purposive sampling technique and involved direct observation of the research subjects. This data was analyzed using univariate and bivariate analysis to test the hypothesis and using numerous variables like temperature, humidity, conditions around the house that become mosquito habitat. This paper found that the majority of respondents with filariasis had non-permanent walls, ceilings, and no mosquito mesh in their homes. Houses with non-permanent walls or without mosquito mesh were found to have a higher risk of filariasis. Specifically, non-permanent walls increased the risk by 4.342 times, and the absence of mosquito mesh increased the risk by 4.848 times. The condition of the ceiling was not proven to be a risk factor for the occurrence of filariasis. The presence of mosquito mesh was found to be an effective preventive measure in reducing the risk of human contact with the filariasis vector mosquitoes.

Keywords: Asahan Regency, Eniviromental Factors, Filariasis, Housing Conditions, Mosquito

1. Introduction

Filariasis, also known as elephantiasis, is a public health concern in many tropical and subtropical countries, including Indonesia. According to the World Health Organisation (WHO), lymphatic filariasis affects millions of people worldwide and is one of the leading causes of preventable morbidity in developing countries (World Health Organization, 2022). The disease is caused by infection with filarial worms transmitted through mosquito bites. The infection causes disruption of the lymphatic system leading to swelling of certain parts of the body, such as the feet and hands, which can eventually lead to permanent disability and affect the quality of life of the sufferer (Taylor, Hoerauf, & Bockarie, 2018).

In Indonesia, the prevalence of filariasis is still high, especially in areas with high humidity and lack of access to adequate health facilities (Suryaningrum & Supriadi, 2019). Risk factors such as people's living habits, the level of environmental hygiene, and lack of awareness about mosquito bite prevention contribute to the high incidence of filariasis. Filariasis also has a significant economic impact, as many sufferers are people of productive age who experience physical limitations due to this chronic infection. This results in reduced labour productivity and increases the economic burden on families and society as a whole (Hofmann, Wucherpfennig, & Becker, 2021).

There have been many efforts to prevent and treat filariasis. Filariasis elimination programmes through mass drug administration have been implemented in several endemic areas. However, the success rate of this programme is still affected by community compliance in taking drugs, as well as difficulties in controlling the vector mosquito population (Nuchprayoon, Krause, & Neafsey, 2019). Therefore, a comprehensive approach that includes health education, improved environmental sanitation, and cross-sector collaboration is needed to reduce the impact of filariasis in the long term.

The number of filariasis cases in North Sumatra Province fluctuates every year, the number of filariasis cases respectively from 2016 to 2019 was 148 cases, 132 cases, 216 cases, and 117 cases (North Sumatra Provincial Health Office, 2020). Based on filariasis data obtained from the 2020 Asahan District Health Profile, cases also decreased and increased each year, the number of filariasis cases from 2016 to 2020 was 38 cases, 40 cases, 23 cases and 39 cases (Asahan District Health Office, 2020). The highest cases of filariasis in Asahan Regency are in three sub-districts, namely Pulau Rakyat Sub-district, Sei Dadap Sub-district and Kisaran Timur Sub-district, with twelve cases for Pulau Rakyat Sub-district, four cases for Sei Dadap Sub-district and four cases for East Kisaran Sub-district.

Environmental factors such as the physical condition of the house can influence the incidence of chronic filariasis, including the type of walls of the house, the installation of wire mesh in the ventilation of the house, and the condition of the ceiling of the house (Rizka & Cut, 2017). The abundance of mosquito resting and breeding sites, such as swamps, aquatic plants, puddles, and cowsheds, as well as animal resting places, tree holes, and rocks, all impact the prevalence of the vector (Milati & Siwiendrayanti, 2021). Most of the residents' work in these three sub-districts is gardening, apart from gardening they are also plantation employees (Central Bureau of Statistics, 2022). Plantation workers have contact with puddles of water which act as breeding and resting places for mosquitoes, while plantation workers who are active at night are one of the chronic factors that influence the incidence of filariasis. This research also aims to determine the enviromental factors that are related to the incidence of filariasis in Pulau Rakyat Sub-district, Pulau Bandring Sub-district, and Sei Dadap Sub-district, Asahan Regency, North Sumatra Province.

2. Method

2.1. Time and Research Location

This research was conducted in Pulau Rakyat District, Sei Dadap District and Kisaran Timur District. This research was carried out at this location because these three sub-districts are sub-districts with high cases of filariasis in Asahan Regency, North Sumatra Province. This research will be carried out July 2023.

2.2. Type of Research

Observational analytic research is a type of research used to look at environmental factors, mosquito habitats, and behaviours that cause filariasis disease to appear. This study was designed as a case control, and the sampling technique was purposive.

2.3. Population and Sample Size

The population in this study were (1) individuals with filariasis who showed clinical symptoms, such as swelling of the limbs or other physical limitations in the study area, considered as case samples, and (2) control samples, which were people who lived in the same village or kelurahan as filariasis patients and did not show clinical symptoms of filariasis according to the health centre in the study area. The control sample also had comparable characteristics to the case sample.

The sample size for case-control research is calculated using the following formula (Lemeshow, Hosmer, & Klar, 1997):

$$P_1 = \frac{(OR)P_2}{(OR)P_2 + (1 - P_2)}$$

$$n = \frac{Z^2{}_{1-}a/2\{\frac{1}{[P_1(1-p_1)]} + \frac{1}{[P_2(1-P_2)]}\}}{[ln\, ln\,(1-\varepsilon)\,]^2}$$

Information:

Z1-a/2: Standard normal distribution value, the amount depends on the level of confidence (TK), amounting to 1.96 (95%)
P1 : The proportion exposed in the case group is 0.4
P2 : The proportion exposed to the control group was 0.25
ε : Acceptable (relative) deviation size, 0.20
OR : The risk of risk exposure is 2
n : Sample size

From the results of the above calculations, the research sample was obtained as many as 57 respondents. From the number of samples obtained, this is the minimum number for this research so it can be explained that the ratio of the number of cases and controls is 1:2 with 20 cases and 40 controls, so the total number of respondents is 60 respondents. The sampling technique used in this research is purposive sampling technique. Purposive sampling is a sampling technique using certain considerations according to the desired criteria to determine the number of samples to be studied (Sugiyono, 2018).

2.4. Sampling Technique

Primary data collection techniques are carried out using interviews and questionnaires as interview guides and observations are carried out by observing directly at the object to be studied using a checklist sheet on the observation sheet. Data analysis was carried out to process data in the form of Univariate and Bivariate Analysis.

Initial data collection was conducted through direct observation of the research object, using a check-list sheet on the observation sheet. Before the interview was conducted, respondents were informed about the purpose of the study and asked to give their consent in accordance with standard research ethics.

2.5. Research Instrument

In this study using questionnaires and before conducting interviews the respondents were given informed consent to ensure that respondents voluntarily and with full understanding of the research being conducted. The purpose of giving informed consent is to provide clear information to respondents about the purpose of the research, the procedures to be carried out, the duration of the research, the potential risks, and the benefits that might be obtained, guarantee freedom of choice, protect respondents' rights, reduce risks, increase transparency and trust, and comply with ethical principles.

2.6. Data Analysis

In this study, the incidence of filariasis was the dependent variable, while risk factor characteristics, environmental factors, mosquito habitat, and behavioural factors were independent variables. Data analysis was conducted in the following stages to make the data easier to read and interpret. The purpose of this analysis is to statistically test the hypothesis that has been made (Sumantri, 2011):

1) Univariate Analysis
   Univariate analysis is described to describe descriptively the frequency distribution and proportion of each variable studied, both independent and dependent variables. Univariate analysis aims to explain or describe the characteristics of each research variable. The variables studied were temperature and humidity conditions in the house, the condition of the respondent's house, and the conditions around the house that become mosquito habitats.
2) Bivariate Analysis
   If the univariate analysis has been carried out previously, the results will know the characteristics or distribution of each variable, bivariate analysis can be continued. Bivariate analysis is carried out on two variables that are thought to be related or correlated. This analysis is used to test the hypothesis by determining the relationship between the independent variable and the dependent variable through the Chi-squar statistical test.

2.7. Research Ethics

This study applies research ethics to ensure that research is conducted responsibly, safely, and respects the rights, dignity, and welfare of all parties involved, including research subjects, the community, and the environment. The basic principles of research ethics in research are (1) justice; all parties are treated fairly and equally, including in access to research results and treatment during the research process. (2) Freedom and informed consent; providing clear, complete and honest information to respondents about the purpose, procedures, risks, and benefits of the research, and respondents are given the opportunity to give their consent voluntarily without pressure. (3) Nonmaleficence; avoiding actions that may cause harm or loss, both physical and psychological to respondents. (4) Beneficence; providing positive benefits to respondents, society, and the development of science in general. (5) Data confidentiality and privacy; respondents' personal data are protected and kept confidential, used only for research purposes, and not disseminated without permission. (6) Integrity and accuracy; reporting research results honestly, not falsifying, altering, or manipulating results to achieve specific goals. (7) Social responsibility; considering the wider impact on society and the environment, and contributing to the common good and public welfare.

3. Result and Discussion

The characteristics of the respondents showed that in the case group (people with filariasis), the majority of the respondents were equally divided between male and female; and the age of most cases of filariasis in the age group above 75 years as many as 5 respondents (25%). In the control group (no filariasis patients), the gender of the respondents was equal between men and women; and the most age not experiencing filariasis cases in the age range above 75 years, namely as many as 10 respondents (25%). The characteristics of respondents can be seen in Table 1 below.

Table 1. Characteristics of Respondents

Characteristics	Case		Control	
	n=20	**%**	**n=40**	**%**
Sex				
Male	10	50.0	20	50.0
Female	10	50.0	20	50.0
Age				
20 - 24	1	5.0	0	0.0
25 - 29	0	0.0	0	0.0
30 - 34	0	0.0	2	5.0
35 - 39	0	0.0	2	5.0
40 - 44	3	15.0	2	5.0
45 - 49	2	10.0	7	17.5
50 - 54	3	15.0	3	7.5
55 - 59	1	5.0	6	15.0
60 - 64	1	5.0	4	10.0
65 - 69	3	15.0	3	7.5
70 - 74	1	5.0	1	2.5
+75	5	25.0	10	25.0

3.1 Univariate Analysis

3.1.1. Temperature and Humidity Conditions in the House. The temperature and humidity conditions in the respondents' homes included in the environmental factors showed that in the case group (filariasis patients), the temperature in the house measured in the range of 24-30°C was 5 houses (25%), and the temperature above 30°C was 15 houses (75%). In the control group, the temperature in the 24-30°C range was 10 respondents (25%) and the temperature above 30°C was 30 houses (75%). For humidity in the house in the case and control groups, where all houses with humidity ≤60%. The results showed that the air temperature in the house in July 2023 ranged from 28.2OC - 35.6OC and air humidity ranged from 51% - 60%. According to Shidqon's (2016) research conducted in Banyurip Village, South Pekalongan District, Pekalongan City, Culex sp. mosquito larvae and eggs can breed at temperatures between 25 and 28 degrees Celsius. In Asahan District, there was no rain during the study period. Temperature and humidity conditions inside the house can be seen in Table 2.

Table 2. Temperature and Humidity Conditions in the House

Temperature and Humidity	**Case**		**Control**	
	n=20	**%**	**n=40**	**%**
Temperature				
24-30°C	5	25.0	10	25.0
>30 °C	15	75.0	30	75.0
Humidity				
≤60%	20	100.0	40	100.0
>61%	0	0.0	0	0.0

The air temperature between 20 and 30 degrees centigrade is ideal for mosquito growth, the results showed the temperature range inside the house was 28.2 - 35.6°C with the average temperature inside the respondent's house was 31.61°C, so it can be stated that the results of the study revealed that the temperature was not at the optimal condition for mosquito breeding. Humidity also affects mosquito breeding. The ideal and optimal temperature for mosquito breeding is between 60-80%, with the average humidity in respondents' homes being 58.41% and 51%-61%. Humidity and rainfall index have an influence on the age of mosquitoes in Mandomai village and may favour the development of mosquitoes as vectors, as the mosquitoes were found to be Mansonia mosquitoes were found to be older than 14 days old, while temperature was found to be (Ridha, Juhairiyah, & Fakhrizal, 2018). Temperatures in this range are the best for mosquito breeding. This can be seen in Table 3.

Table 3. Range, Mean and Standard Deviation for Temperature and Humidity

	Range		*Mean*	*Standard Deviation*
	Minimum	*Maximum*		
Temperature	28.2 °C	35.6 °C	31.61 °C	1.70
Humidity	51%	61%	58.41%	2.05

3.1.2. Respondent's Home Condition. The condition of the respondents' houses showed that in the case group (filariasis patients), the majority of respondents answered that they had non-permanent walls as many as 11 respondents (55%); had a ceiling as many as 12 respondents (60%) and did not have wire mesh as many as 15 respondents (75%). In the control group (no filariasis patients), the majority of respondents answered that they had permanent walls as many as 29 respondents (72.5%); had a ceiling as many as 27 respondents (67.5%); had wire mesh as many as 22 respondents (55%). The condition of the respondents' houses is almost the same as the research conducted by (Annashr & Amaia, 2021), most of the respondents in the case group did not install wire mesh on the ventilation of their houses, namely 87.5%. In the control group, the proportion of respondents who did not install gauze and installed gauze was almost the same or the comparison was not significant, namely 56.3% and 43.8%. The proportion of respondents in the case group who had houses with ceiling construction in good condition was higher (56.3% and 43.8%, respectively) with good condition, more (56.3%) than those with poor construction (43.7%), in the control group, most respondents had houses with good ceiling construction (75%). The condition of the respondents' houses can be seen in Table 4.

Table 4. Respondent's Home Condition

Home Condition	**Case**		**Control**	
	n=20	**%**	**n=40**	**%**
House Wall Type				
Permanent	9	45.0	29	72.5
Not Permanent	11	55.0	11	27.5
House Ceiling Condition				
Available	12	60.0	27	67.5
Not Available	8	40.0	13	32.5
Existence of Wire Gauze				
Available	5	25.0	22	55.0
Not Available	15	75.0	18	45.0

3.1.3. Conditions Around the House that Become Mosquito Habitat. In the case group (filariasis patients), the majority of respondents answered that there were no swamps around the house of 15 respondents (75%); the presence of stagnant water around the house of 16 respondents (80%); the presence of bushes around the house of 19 respondents (95%); the absence of water pools around the house of 14 respondents (70%); the presence of animal cages of 13 respondents (65%); and the distance of cages less than 100 metres of 12 respondents (60%). In the control group (no filariasis patients), the majority of respondents answered that there were no swamps around the house by 36 respondents (90%); the presence of stagnant water around the house by 27 respondents (67.5%); all respondents (100%) stated that there were bushes around the house; there was no pond around the house by 36 respondents (90%); the presence of animal cages around the house by 37 respondents (92.5%); and the distance of the cage was less than 100 metres from the house by 34 respondents (85%). Conditions around the house that can serve as mosquito habitats can be seen in Table 5.

Table 5. Conditions Around the House that Become Mosquito Habitat

Mosquito Habitat	Case		Control	
	n=20	%	n=40	%
Existence of Marshes				
Available	5	25.0	4	15.0
Not Available	15	75.0	36	85.0
Existence of water puddles				
Available	16	80.0	27	67.5
Not Available	4	20.0	13	32.5
Existence of Bushes				
Available	19	95.0	40	100.0
Not Available	1	5.0	0	0.0
Existence of a Water Pool				
Available	6	30.0	4	10.0
Not Available	14	70.0	36	90.0
Existence of Animal Cages				
Available	13	65.0	37	92.5
Not Available	7	35.0	3	7.5
Animal Housing Distance				
Less than 100 m	12	60.0	34	85.0
More than 100 m	8	40.0	6	15.0

3.2. Bivariate Analysis

Chi-square statistical test was used in the bivariate analysis. The purpose of this analysis was to determine and evaluate the association between the independent variables (environmental factors, mosquito residence, and behaviour) and the dependent variable (filariasis incidence). Based on the results of the bivariate analysis, it was found that there was an association between the incidence of filariasis and the variables of wall type, and the presence of wire mesh with a p-value <0.05. Houses with unsealed wire mesh had a 4.848 times higher risk of filariasis disease than houses with permanent walls; non-permanent walls had a 4.342 times higher risk than permanent walls. The results of the chi-square test for environmental factors can be seen in Table 6.

Table 6. The results of bivariate analysis using Chi-square for environmental factors

Variable	P-*value*	OR (Odds Ratio)	95% Confidence Interval	
			Lower	*Upper*
Environmental Factors				
Temperature	1.000	0.000	0.290	3.454
Humidity	-	-	-	-
House Wall Type	0.037	4.342	0.101	0.953
House Ceiling Condition	0.566	0.330	0.237	2.197
Existence of Wire Gauze	0.028	4.848	0.083	0.895

3.2.1. Effect of Temperature on the Incidence of Filariasis. In the results of this study can be seen in Table 4. with the results of statistical tests (p-value = 1.000; p>0.05, OR = 0.000), these results indicate that there is no significant relationship between temperature and the incidence of filariasis because from the results of the research all temperatures above 27°C so that the temperature results obtained can be concluded that the temperature is not an ideal place for mosquito development. According to Agus, et al (2019), the ideal temperature range for successful mosquito growth is 25 degrees Celsius to 27 degrees Celsius; tolerance to temperature depends on the species because each species has a different response to temperature.

In general, indoor temperature has a significant impact on mosquito development. This factor can affect various stages of the mosquito life cycle, including egg and larval growth. Higher temperatures tend to accelerate this process, allowing mosquitoes to develop faster. In addition, temperature also affects mosquito activities, including prey finding and blood feeding. Higher temperatures tend to make mosquitoes more active, increasing the risk of disease transmission. Therefore, the management of mosquito-borne disease vectors may rely heavily on our ability to understand how indoor temperatures affect mosquito growth.

Environmental temperature affects the metabolism and life cycle of mosquitoes. As stated by Prastiani (2017), Even at lower temperatures, such as 10 degrees Celsius, mosquitoes can survive. However, when the temperature drops to a critical point (4.5 degrees Celsius), its metabolism stops and all physiological processes cease. In another study, Herdianti (2017) found that even though their metabolism decreases or even stops, mosquitoes can survive at low temperatures. Temperatures higher than 35°C also slow down physiological processes; an average temperature of 25-27°C is the ideal temperature for mosquito growth, and if the temperature drops by more than 10°C or over 40°C, mosquito growth will stop altogether.

*3.2.2. Effect of Humidity on the Incidence of Filariasis***.** In the results of this study can be seen in Table 6 with the results of statistical tests, namely (p-value =-; p>0.05, OR =-) it can be interpreted that there is no real influence between humidity on the incidence of Filariasis. This is appropriate because the temperature results also obtained no relationship to the incidence of filariasis. This is supported by the research of Paiting et al, (2012), mosquito biting habits and mosquito age are influenced by temperature and humidity. These conditions give microfilariae in the mosquito body sufficient time to develop into pathogenic larvae.

The results of this study are consistent with the results of Bone. et al, (2021), who found that there was no significant correlation between humidity and dengue cases (p = 0.299) with weak correlation strength (r = 0.124). However, the highest limit for mosquitoes to survive is around 81.2% humidity, which impacts the infectivity rate of.

Humidity is one of the components that can affect the presence of larvae. The level of air humidity in a place can affect the age of mosquitoes. Humidity and air temperature are related. Due to high water vapour content, high temperatures make the air wetter, while low temperatures make the air feel dry. It is clear that humidity affects the life and breeding of mosquitoes. The tolerance of mosquitoes for survival and breeding is also limited. The ideal humidity for mosquito growth is between 60 - 80 per cent. If the humidity is less than 60 per cent or more than 80 per cent, it will interfere with the mosquito's life and growth functions, such as slowing or failing its growth or even shortening its lifespan. Air humidity affects mosquito lifespan through their respiratory system; low humidity causes the mosquito's body to evaporate a lot of water, and high humidity causes the opposite (Izhar & Syukri, 2022).

*3.2.3. Effect of House Wall Type on the Incidence of Filariasis***.** According to the Director-General of Communicable Disease Eradication and Public Health, there is a very close relationship between house walls and filariasis. The World Health Organisation states that the design and construction of houses can reduce human contact with mosquitoes, so the risk of getting filariasis can be reduced (World Health Organization, 2005). If the walls of the house have gaps, mosquitoes can enter, causing mosquito bites that cause filariasis. In other words, these gaps can serve as intermediaries for the transmission of filariasis.

Based on direct observation of the type of walls of the respondents' houses, it shows that respondents who have semi-permanent houses in the case group are 55% and for the control group are 27.5%. The respondents' houses are made of boards where there are gaps between the boards that allow mosquitoes to enter the house. The results showed that there was an association between the type of wall and the incidence of filariasis (p-value=0.037; p<0.05; OR=4.342). This means that the risk of filariasis that has a non-permanent house is 4.342 times increased risk compared to houses that are harvesters.

In a recent study by Komaria, (2016), discovered that dwellings with wall gaps were 13.2 times more likely to have filariasis than houses without them. In addition, the chance of contracting filariasis was 3.57 to 48.67 times greater in residents of houses with wall gaps than those without. According to Rufaidah (2004), people living in non-permanent or semi-permanent housing have a 3.115 times greater chance of contracting filariasis than people living in permanent housing. The semi-permanent wooden walls of the study participants' houses had gaps between joints that allowed mosquitoes to enter the house.

*3.2.4. The Effect of House Ceiling Condition on the Incidence of Filariasis***.** Ceiling according to the Big Indonesian Dictionary is the ceiling of the house, which is the layer of insulation between the roof and the floor of the house, the ceiling is very important to prevent mosquitoes from entering the house through the gap, which can bite residents and cause transmission of filasriasis (Ernawati, 2017).

The condition of the ceiling in the study was not proven as a risk factor for the incidence of filariasis (p-value=0.566; p>0.05; OR=0.330). Based on direct observation, the type of ceiling of the respondents varied, starting with no ceiling at all in all rooms of the house, ceilings made of boards that did not cover the entire room of the house so that there were still gaps that allowed mosquitoes to enter the house, in the living room had a ceiling but in the kitchen did not have a ceiling at all to respondents whose entire house was covered with ceilings whose materials also varied, some were made of asbestos and even gypsum boards. In the case group (filariasis patients), 60% of the respondents stated that their house had a ceiling, while 40% stated that their house did not have a ceiling. On the other hand, in the control group (no filariasis patients), 67.5% of the respondents stated that their house had a ceiling, while 32.5% stated that their house did not have a ceiling.

Previous research by Kartika, et al (2019) revealed no significant relationship between the number of filariasis cases found in Barito Kuala Regency and factors such as breeding sites, resting places, house ceilings, knowledge, attitudes, leaving the house at night, mosquito repellent, mosquito nets, and the habit of opening windows at night. Some findings were found by Nurhayatai, (2017) when conducting research in the working area of the Sungai Kerawang Community Health Centre, Batu Ampar District, Kubu Raya Regency. Based on the research, the risk of contracting filariasis is 6,929 times higher in houses with open ceilings than houses with closed ceilings. A good ceiling can reduce the number of mosquitoes entering the house, but an inadequate ceiling will increase the likelihood of mosquitoes entering, increasing the risk of exposure to filariasis.

*3.2.5. The Effect of Wire Mesh Presence on the Incidence of Filariasis***.** The mosquito barrier created by the wire mesh keeps them from entering the house. The danger of human-mosquito interaction increases with a ventilation system without wire mesh. By installing wire mesh, human contact with mosquitoes inside the house can be significantly reduced, thereby lowering the risk of transmitting diseases such as filariasis.

The incidence of filariasis in this study was correlated with the use of wire mesh in ventilation (p-value=0.028; p<0.05; OR=4.848). Therefore, the probability of filariasis is 4.848 times greater if there is no wire mesh than if there is closed wire mesh in the ventilation of the house.

In the case group (filariasis patients), 25% of respondents stated that their houses were equipped with wire mesh, while 75% stated that their houses were not equipped with wire mesh. On the other hand, in the control group (no filariasis patients), 55% of respondents stated that their houses were equipped with wire mesh, while 45% stated that their houses were not equipped with wire mesh. Observations made during the study revealed that the wire mesh on the respondents' vents varied, the tightly closed wire mesh on the vents had fine mesh so that mosquitoes could not enter the house, while the absent wire mesh consisted of vents that did not have wire mesh at all and vents with wire mesh already equipped with wire mesh have the potential to block the entry of filariasis vector mosquitoes and reduce the risk of disease transmission. Therefore, the presence or absence of wire mesh in the home can be considered as an effective preventive measure in reducing the risk of human contact with filariasis vector mosquitoes.

Research by Juriastusi, (2010) supports the findings of this study, which shows that having wire mesh at home is very important to reduce the risk of filariasis. The results showed that respondents who did not have wire mesh in their homes had a 7.2 times higher chance of getting filariasis than respondents who had wire mesh, with an Odds Ratio (OR) value of 7.2. This finding also supports the research of Uloli, (2004) who found that wire gauze significantly reduces the risk of contracting filariasis. With a p value of 0.047, this study found a statistically significant association. However, the findings of (Putra, 2007) and (Setiawan, 2008) show that both studies did not find a significant correlation between the presence of wire gauze at home and filariasis cases. In Widiastuti, (2017) studied, 87.5% of people suffering from filariasis did not install mosquito netting in their homes. Interviews revealed that many houses still used partitions, meaning that doors and windows were the only sources of ventilation. Some sufferers also stated that the reason was economic—installing mosquito netting was considered an additional cost.

The findings of this study are in line with the research by Sofia, (2020) (Sofia & Nadira, 2020). Their study yielded an odds ratio (OR) of 3.71 with a 95% confidence interval (CI) of 1.808–7.597. This indicates that the risk of contracting lymphatic filariasis is 3.71 times higher in residents of houses without mosquito netting on the ventilation compared to those who have mosquito netting. The installation of wire mesh on house ventilation can increase the risk of filariasis transmission by up to seven times, according to another study (Febrianto, Maharani, & Widiarti, 2008).

4. Conclusion

The study found a significant correlation between filariasis and environmental factors like house walls and wire mesh. Homes with non-permanent walls or without wire mesh had a higher risk of filariasis, with non-permanent walls increasing the risk by 4.342 times and the absence of wire mesh by 4.848 times. Temperature and humidity did not show a direct impact on filariasis incidence, despite being above the ideal mosquito breeding range. The absence of wire mesh significantly increased the risk of filariasis, while houses without wire mesh had a 4.848 times higher chance of contracting the disease. The study suggests that environmental factors, such as wall type and wire mesh, are crucial for preventing filariasis.

References

World Health Organization. (2022). Lymphatic Filariasis. https://www.who.int/news-room/fact-sheets/detail/lymphatic-filariasis.

Taylor, M. J., Hoerauf, A., & Bockarie, M. (2018). Lymphatic filariasis and onchocerciasis. *The Lancet*, 392(10163), 993–1004. doi:10.1016/S0140-6736(17)31930-5.

Suryaningrum, E., & Supriadi, D. (2019). Factors Affecting the Incidence of Filariasis in Endemic Areas. *International Journal of Health Sciences*, 13(2), 178–184

Hofmann, H., Wucherpfennig, J., & Becker, C. (2021). Economic Burden of Neglected Tropical Diseases in Endemic Countries. *Health Policy Journal*, 12(3), 253–266.

Nuchprayoon, S., Krause, P. J., & Neafsey, D. E. (2019). The Role of Vector Control in Eliminating Filariasis. *Parasitology Today*, 35(6), 529–536. doi:10.1016/j.pt.2019.03.006.

North Sumatra Provincial Health Office. (2020). Health Profile of North Sumatra Province. Medan.

Asahan District Health Office. (2020). Health Profile of Asahan Regency.

Rizka S, Cut S. N. (2017). Analisis Risiko Penularan Filariasis Limfatik di Kabupaten Aceh Utara. Jurnal Kedokteran dan Kesehatan Malikussaleh. 6(1): 1-16.

Milati, T. P. N. dan Siwiendrayanti, A. (2021). Iklim, Sumber Agen, *Breeding Places* dan *Resting Places* Sekitar Penderita Filariasis Pesisir. *HIGEIA Journal of Public Health Research and Development*. 5(1): 133-144

Central Bureau of Statistics. (2022). Asahan Regency in Figures 2022. BPS.

Lemeshow, S., Hosmer, D., Klar, J. (1997). Besar Sampel Dalam Penelitian Kesehatan. Gajah Mada University Press. Yogyakarta.

Sugiyono. 2018. Metode Penelitian Kuantitatif, Kualitatig, dan R&D, penerbit Alfabeta,Bandung.

Sumantri, A. (2011). Metode Penelitian Kesehatan. Kencana. Jakarta.

Ridha, R, M., Juhairiyah., Fakhrizal, D. 2018. Pengaruh Iklim Terhadap Peluang Umur Nyamuk Mansonia spp di Daerah Endemis Filariasis di Kabupaten Kapuas. Jurnal Kesehatan Lingkungan Indonesia 17 (2), 2018, 74 – 79. DOI : 10.14710/jkli.17.2.74-79.

Annashr, N, K., dan Amaia, I, C., (2021). Kondisi Lingkungan dan Kejadian Filariasis Di Kabupaten Kuningan. Window of Health : Jurnal Kesehatan, Vol. 04 No. 01 (Januari, 2021) : 85-97.

Agus, R., Devi, R., Kurnia, R. 2019. Faktor-Faktor yang Berhubungan dengan Kejadian Filariasis di Kabupaten Barito Kuala. *Jurnal Keperawatan dan Kesehatan*. Agustus. 8(1):48-58.

Prastiani, I., Prasasti, C, I., (2017). Relationship between Temperature, Density Residential, Knowledge, Attitude with Density of Larvae in Sub District Gunung Anyar, Surabaya. Department of Environmental Health Faculty of Public Health, Universitas Airlangga.

Herdianti. (2017). Hubungan Suhu, Kelembababn, dan Curah Hujan Terhadap Keberadaan Jentik Nyamuk Aedes Aegepti di RT 45 Keluarahan Kenali Besar. Riset Informasi Kesehatan, Vol. 6, No.1. STIKes Harapan Ibu Jambi..

Paiting, Y. S. Onny, S., Sulistiani, S. (2012). Faktor Risiko Lingkungan dan Kebiasaan Penduduk Berhubungan Dengan Kejadian Filariasis di Distrik Windesi Kabupaten Kepulauan Yapen Provinsi Papua. Jurnal Kesehatan Lingkungan Indonesia. 11(1): 76-81

Bone, T., Kaunang, Wulan P. J.; Langi, Fima L. F. G. (2021). Hubungan Antara Curah Hujan, Suhu Udara dan Kelembaban dengan Demam Berdarah Dengue di Kota Manado Tahun 2015-2020. *Jurnal KESMAS*. 10(5).

Izhar, M., Syukri, M. (2022). Jenis Rumah dan Suhu Udara Berhubungan dengan Keberadaan Jentik Nyamuk Aedes Aegypti di Kota Jambi. Jurnal Formil (Forum Ilmiah) Kesmas Respati. DOI - 10.35842/formil.v7i2.438.

World Health Organization (2005). Global Programme to Eliminate Lymphatic Filariasis - Annual Report on Lymphatic Filariasis 2003. Geneva, Switzerland, World Health Organization: 150.

Komaria, Rahayu Hasti., Faisya, H. A. Fickry., Sunarsih, Elvi. (2016). Analisis Determinan Lingkungan Fisik dan Perilaku Preventif Terhadap Kasus Filariasis di Kecamatan Talang Kelapa dan Kecamatan Sembawa Kabupaten Banyuasin. Jurnal Ilmu Kesehatan Masyarakat. 7(2): 108-117.

Rufaidah, Y. (2004). *Faktor Lingkungan Rumah dan Karakteristik Responden yang Berhubungan dengan Kejadian Filariasis di Wilayah Kerja Puskesmas Bantar Gebang II Bekasi Tahun 2004*. [Tesis]. Depok: Universitas Indonesia, Fakultas Kesehatan Masyarakat.

Ernawati, A. (2017). Faktor Risiko Penyakit Filariasis (Kaki Gajah). Jurnal Litbang. 13 (2): 105-114.

Kartika, D. P., Nurjazuli, Yusniar, H. D. (2019). Faktor Lingkungan Dan Perilaku Masyarakat yang Berhubungan dengan Kejadian Filariasis di Kota Semarang. Pro Health Jurnal Ilmiah Kesehatan. 1(2): 12-19.

Nurhayati, Saleh, I., Tisnawati, E., (2017). Faktor Risiko Kejadian Filariasis di Wilayah Kerja Puskesmas Sungai Kerawang Kecamatan Batu Ampar Kabupaten Kubu Raya. Jurnal Mahasiswa dan Penelitian Kesehatan.

Juriastuti, P., Kartika, M., Djaja, I. M., Susanna, D. (2010). Faktor Risiko Kejadian Filariasis di Kelurahan Jati Sampurna. Makara Kesehatan, 14(1): 31-36.

Uloli, R. (2004). Analisis Faktor-Faktor Risiko Kejadian Filariasis di Kabupaten Bone Bolango Provinsi Gorontalo. [Tesis]. Yogyakarta: Universitas Gajah Mada, Fakultas Kedokteran.

Putra, A. (2007). Risiko Filariasis di Kabupaten Tanjung Jabung Barat Provinsi Jambi. [Tesis]. Fakultas Kedokteran, Universitas Gajah Mada, Indonesia.

Setiawan, B. (2008) Faktor Risiko Yang Berhubungan Dengan Kejadian Filariasis Malayi di Wilayah Kerja Puskesmas Cempaka Mulia Kabupaten Kotawaringin Timur Propinsi Kalimantan Tengah. Prosiding Seminar Nasional Sains dan Teknologi II.

Widiastuti, Putri. (2015). Karakteristik Host dan Lingkungan Penderita Filariasis di Kabupaten Tangerang Tahun 2015 [Skripsi]. Jakarta: Universitas Islam Negeri Syarif Hidayatullah Jakarta, Program Studi Kesehatan Masyarakat Fakultas Kedokteran dan Ilmu Kesehatan.

Sofia, R., dan Nadira C. S. (2020). Analisis Risiko Penularan Filariasis Limfatik di Kabupaten Aceh Utara. Avverous. 6(1): 13.

Febrianto, B., Maharani, A., dan Widiarti. (2008). Faktor Risiko Filariasis di Desa Samborejo Kecamatan Tirto Kabupaten Pekalongan Jawa Tengah. Buletin Penelitian Kesehatan. 36 (2): 48-58.