



# Is the existence of breeding places and cattle pens a risk factor for the incidence of filariasis in Indonesia?

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## Abstract

Filariasis is a neglected tropical disease that is still a health problem because it can cause disability and paralysis and there are 9,839 chronic cases recorded in Indonesia. This study aims to analyze the existence of breeding places as well as livestock pens as risk factors for filariasis transmission. We performed a case-control design of 23 patients who were positive for microfilariae based on the results of the Filariasis Finger Blood Survey and 46 controls were people who were negative for microfilariae out on Doang-Doangan Caddi Island and Bangko-Bangkoan Island, Pangkep Regency. Data analysis using Stata Program with Odds Ratio (OR) test and 95% confidence interval (CI). The results showed that the case group had more breeding places (82.6%) than the control group (26.1%). Residents whose homes have breeding places have an OR of 13.45 (95% CI, 3,388 to 62,7125). Regarding the existence of cattle pens, respondents who do not have cattle pens in the case group are the same as those in the control group 78.3%. The results of the analysis for the variable presence of cattle pens obtained the value of OR 1; (95% CI, 0,232-3,825). This shows the existence of breeding places and the incidence of filariasis, which means that people who live around their homes are at risk of developing filariasis. Stagnant water is a place with a higher density of mosquito breeding than other breeding places and the distance of these breeding places is very close to the location where people live. Breeding places are more strongly associated with filariasis than the presence of cattle pens, Future research should include other factors that allow filariasis to occur to validate this research.

**Keywords:** Filariasis, Breeding Place, Cattle Pens, Risk Factors.

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## 1. Introduction

Filariasis is a neglected tropical disease carried by mosquitoes [1], with chronic levels of pain [2], and is widespread especially in rural areas [3]. Currently, in the world, there are eight hundred and ninety-two million people in forty-eight countries at risk of contracting filariasis disease or also known as elephant foot disease. About fifty million people become disabled and paralyzed by this case. Of all patients, there are 25 million male sufferers who have genital diseases (generally suffering from hydrocele) and nearly 15 million people who are mostly women suffering from lymphedema or elephantiasis in their legs [4]. This disease is transmitted by Mansonian mosquitoes, Anopheles, Culex, and Armigers. Species filaria worms cause filariasis the most commonly found is *Wuchereria bancrofti*, while the species filariasis worms for the Asia state that are the most numerous are *Brugia malay*, and *Brugia timor* [5]. Epidemiologically, sixty million people in Indonesia are in many sites that are at high risk of contracting filariasis, with six million of them having

suffered/been infected. Filariasis is still a health problem for the community in Indonesia, especially in rural areas (5). It is known that 233 regencies/cities in Indonesia have endemism of filariasis with an average microfilaria number of 3.61%, among 233 districts endemic filariasis in Indonesia [6]. The areas of Doang-Doangan Caddi and Bangko-Bangkoan islands, Kanyurang village, and Liukang Kalmas sub-district, have many swamps, ditches, and puddles of water which are breeding places for filariasis vectors. In addition, the existence of vectors is influenced by the number of resting places for mosquitoes and breeding places for mosquitoes. Mosquito resting places include tree holes, animal dwellings, and rocks, aquatic plants, puddles, and the presence of cattle pens. According to Abdullahi (2015) [7], swamp conditions with lots of aquatic plants are very suitable for mosquito breeding, especially the *Mansonia* mosquito which is one of the species of filariasis vector mosquitoes [7]. Research conducted [8] states that environmental factors that are risk factors are the existence of mosquito habitats or breeding places around the house

and the existence of mosquito resting places or resting places in the house. Meanwhile, Purnama's research (2017) [9] shows that there is a significant relationship between the existence of breeding places and the incidence of filariasis. Household whose have breeding places have a 9.345 times greater risk of contracting filariasis linked to respondents whose homes do not have breeding places [9]. There are still resting places (83.3%) around the houses of filariasis sufferers in the form of open puddles and bushes which are suitable habitats for mosquitoes suspected of being filariasis vectors [10].

The environment is very influential in the spreading of filariasis cases and the transmission, be it the physical, biological, or socio-cultural environment [5]. Environmental factors are the main initiations for the incidence of filariasis, environmental features in the household including the physical setting of the house that unmeet the standards for a healthy house such as ceiling and partition construction, lighting, and moisture are also triggers for filariasis [11]. The type of house walls, the installation of wire netting on each house ventilation, and the condition of the floor of the house are physical surroundings of the home environment that can affect the incidence of filariasis. Research conducted in Jatisampurna Bekasi found that there was an association between the physical environment in the house and the incidence of filariasis, the average filariasis patient's house did not use gauze for ventilation and did not use a ceiling on the roof of the house so that mosquitoes easily entered the house and caused filariasis transmission [12]. The existence of home ventilation that does not use wire netting, the probability of getting filariasis is 5.56% [13]. Houses that do not have screens on their home ventilation can be at risk of contracting filariasis [9]. There is an association between the presence of cattle pens and the incidence of filariasis in Bariota Kuala District with an OR value of 5.23 [14]. Environmental factors that can affect filariasis are the presence of livestock such as cattle, buffalo, and pigs, which if the presence of the cattle pen is less than 100 meters away, can be a risk factor for filariasis transmission. There is a significant correlation between cattle pens as a resting place for mosquitoes and the incidence of filariasis in Pekalongan Selatan District, Pekalongan City with an OR value of 2.17 [8]. The Liukang Kalmas Health Center Profile Data in 2019 states that the population in Liukang Kalmas District is 8,615 people spread over 5 villages (9 islands), where almost all of the people work in the sea as fishermen or fisheries and seaweed farmers. Occupational factors such as fishermen who have a habit of sailing at night can be exposed to infectious mosquitoes that breed on the beach, this is related to the habit of biting infectious mosquitoes at night. People who have this type of work will have a 4.4 times chance of getting filariasis disease compared to people who have no risky jobs [15, 16]. Research shows [17, 18] that the risk issues for filariasis in the people of Brebes District based on the order of statistical results that have a major influence include the presence of resting places, breeding places, and risky work. Therefore, efforts are needed to minimize the existence of resting places, and breeding places, and real efforts are needed from relevant agencies and health workers, and the community to work together to improve environmental conditions to make them cleaner and healthier. Nevertheless, the research *Manyullei et al., 2024*

purposes are to assess the risk of the existence of breeding places on the incidence of filariasis in Kanyurang Village, Liukang Kalmas District, Pangkajene and Islands Regency and to assess the risk of the existence of cattle pens on the incidence of filariasis in Kanyurang Village, Liukang Kalmas-District, Pangkajene and Islands Regency.

## **2. Materials and methods**

### **2.1. Type and design of research Sub-subheading**

This research is an observational study using a case-control design. A case-control study was conducted by comparing two groups, specifically cases (the group with the disease) and the control (the group without the disease), then traced whether there were risk factors that played a role [19]. Furthermore, in this study, matching will be carried out, which is selecting a control group with the same characteristics as the case group, i.e the age of the respondent.

### **2.2. Population and Sample**

The population of this study is all residents residing in Kanyurang Village, Doang-Doangan Caddi Island, and Bangko-Bangkoang Island as many as 2,556 people (30). The sample is part of the number and characteristics possessed by the population or the sample is part of the existing population. The samples in this study consisted of two groups, specifically:

#### **2.2.1. Case**

People living in the Kanyurang Village area of Doang-Doangan Caddi Island and Bangko-Bangkoan Island who are positive for Microfilariae from the Filariasis Finger Blood Survey in 2017-2020. The criteria for case inclusion are:

2.2.1.1. Residents who recorded positive Mf and live in Kanyurang Village, Liukang-Kalmas District, Pangkajene, and Islands Regency in 2017-2020.

2.2.1.2. Willing to be interviewed. The exclusion criteria for the case is not willing to be a respondent.

#### **2.2.2. Control**

Residents living in the area of Kanyurang Village, Doang-Doangan Caddi Island and Bangko-Bangkoan Island who are negative for Microfilariae. The control inclusion criteria are:

2.2.2.1. Neighbors whose residences are close to cases, and are not recorded as positive Mf patients and domiciled in Kanyurang Village, Liukang Kalmas District, Pangkajene and Islands Regency in 2017-2020.

2.2.2.2. Domiciled in Kanyurang Village, Liukang-Kalmas District, Pangkajene regency and islands.

1. Can communicate well and is willing to be interviewed. The exclusion criteria for case is not willing to be a respondent.

2. Data collection was carried out through direct interviews with 69 respondents (23 case respondents and 46 control respondents) using questionnaires and was carried out in Kanyurang Village, Doang-Doangan Caddi Island, and Bangko-Bangkoan Island on May 26 to July 02, 2021. The data was collected by researchers assisted by cadres and managers of the Puskesmas Liukang Kalmas filariasis program. The data collected through observation are the existence of breeding

places, namely seeing directly the existence of mosquito shelters in the form of shelters, bushes or swamps, coastal suburbs, and sewers that are close to the respondent's house (< 100 meters) and the existence of livestock sheds, which is to see firsthand the existence of livestock pens close to the respondent's house (< 100 meters).

3. Analysis data are presented descriptively in the form of a frequency distribution table for univariate analysis, and bivariate analysis to determine the significance of the relationship of independent variables (type of work, level of economic status, adherence to filariasis prevention medication behavior, and presence of breeding places, and presence of cattle pens with the dependent variable (filariasis incidence) using the association measure Odds Ratio (OR), as well as multivariate analysis to determine the riskiest factors for the incidence of filariasis in the community in Kanyurang Village using logistic regression analysis.

### 2.2.3. Ethics approval of research

This research was carried out after obtaining a certificate of passing the ethics review from the Ethics Committee for Health Research, Public Health Faculty, Hasanuddin-University with number 3486 / UN4.14.1 / TP / 01.02 / 2021, dated May 17, 2021.

### 2.2.4 Study Area

Island area Doang-Doangan Caddi and Bangko-Bangkoan Village Kanyurang, Liukang Kalmas District, has many swamps, ditches and puddles of water which are vector breeding places. filariasis. Apart from that, the environment around the house has many trees or bushes that allow mosquitoes to breed. The presence of vectors is influenced by the number of mosquito resting places and mosquito breeding places. Mosquito resting places include tree holes, animal dwellings, and rocks, while mosquito breeding places include swamps, aquatic plants, puddles of water, and livestock pens. According to Abdullahi (2015) [7], swamp conditions with lots of aquatic plants are very suitable for the breeding of mosquitoes, especially *Mansonia* mosquitoes which are one of the species of filariasis vector mosquitoes.

## 3. Results

The sample size in this study was 69 samples for each group. However, the number of cases in Pangkajene and Islands Regencies is less than the minimum number that should exist, so the number of controls is 2 times more than the number of cases (1:2). In this study, all patients registered from 2017 to 2020 were taken. The total sample was 69 samples consisting of 23 people of cases and 46 people of controls. The distribution of cases and regional controls can be seen in the following table : The univariate analysis aims to obtain an overview of the research by describing the variables used in the research. The results of the univariate analysis are as follows:

### 3.1. Characteristics of Respondents

The characteristics of respondents that will be described in this study include age, gender, ethnicity, and final education. In the age group, the largest proportion was in the age group of 30-49 years (47.8%). For the sex variable, in

the male sex, it was 58% and in the female, it was 42%. Based on the tribe in both the case and control groups, most respondents were found in the Mandar tribe, specifically 91.3% and 84.8%, respectively. Primary school education was the highest level of education found in respondents, explicitly 68.1%.

### 3.2. Risk Factors of Filariasis

The distribution of filariasis events in communities in Kanyurang Village, Liukang Kalmas District, Pangkajene and Islands Regencies, and Bivariate Analysis based on research variables can be seen in table 5 below: Based on economic status, it is known that economic status is not a risk factor because the OR value = 0.48 is obtained, and the lower limit and upper limit (LL-UL) values include a value of 1. Residents around whose homes have breeding places are at 13.45 times greater risk of suffering from filariasis compared to residents who do not have breeding places, where the lower limit and upper limit (LL-UL) values do not include a value of 1, thus there is a statistically meaningful relationship between the existence of breeding places and the incidence of filariasis. Furthermore, The existence of cattle sheds obtained or = 1 values with a lower limit and upper limit (LL-UL) values which include a value of 1. This means that the presence of cattle sheds is not a risk factor for filariasis events.

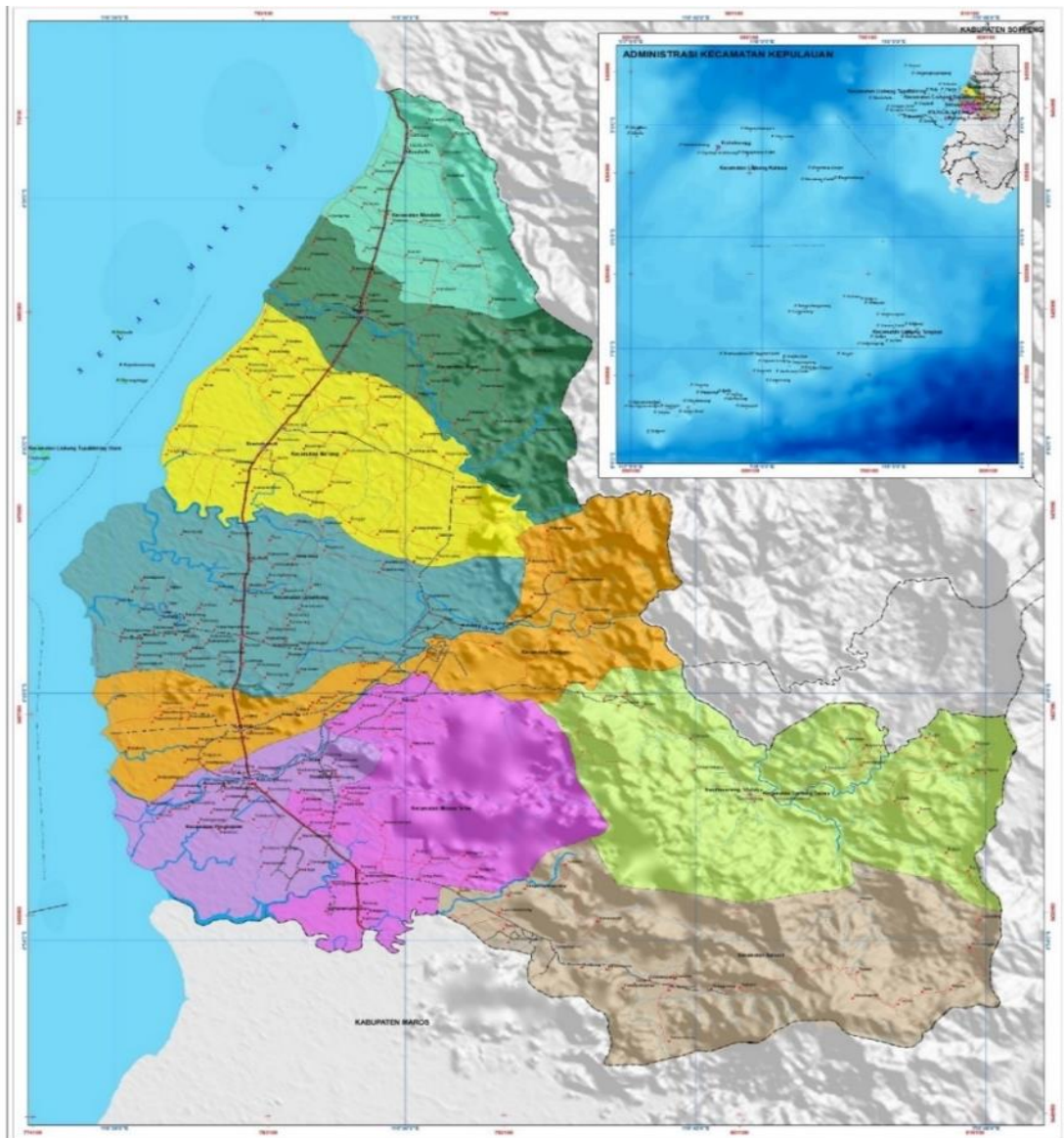
## 4. Discussion

Research gained results that the presence of breeding places or mosquito shelters around the house was related to the incidence of filariasis. This is in line with research conducted by Salim (2016), that the existence of breeding places around residents' homes will result in the risk of suffering from filariasis. The same results were obtained in another study that there is an association between the existence of breeding places and the incidence of filariasis, which means that people who are around their homes are at risk of filariasis. Puddles are places with a higher density of mosquitoes than other places such as used cans or bottles filled with rainwater [20, 21]. Studies have also found that there is a meaningful relationship between the incidence of filariasis and the presence of breeding places [17]. Likewise, in Purnama's research (2017) [9] conducted in Ketapang, West Kalimantan, the results of statistical analysis showed that there was an association between the existence of breeding places and the incidence of filariasis. Meanwhile, observations in Kanyurang Village showed that environmental conditions were found in many bushes and swamps which are mosquito breeding sites. The swamps are in a state waterlogged, dirty, and also found a lot of garbage so it is very suitable for mosquito breeding sites and the distance of these breeding places is very close to the location where the community lives. The results of research in West Africa found that the strategy of administering filariasis prevention drugs must be combined with vector control as an effort to eliminate infection and overcome the transmission of filariasis in an endemic area [22, 23]. Also, research in Yemen that the successful elimination of filariasis was carried out by mosquito removal control measures in the form of spraying larvicides and distributing mosquito repellent nets [24, 25]. Based on this study, the results were obtained that the variable existence of cattle sheds is not at risk of the incidence of filariasis.

**Tabel 1:** Distribution of Case and Control by Island in Kanyurang Village, Liukang Kalmas District, Pangkep Regency

No	Desa Kanyurang	Sample Count				Total	
		Case		Control		n	%
		n	%	n	%		
1	P. Doang-Doangan Caddi	13	56.5	26	56.5	39	56.5
2	P. Bangko-Bangkoang	10	43.5	20	43.5	30	43.5
	Total	23	100	46	100	69	100

Source: Primary Data, 2021



**Figure 1:** Map of Pangkajene Regency and Islands

Source: Profile of Pangkajene and Islands Regency, 202

**Table 2:** Distribution of Characteristics Respondents in Pangkajene and Islands Regencies in 2021

Characteristics of Respondents	The Occurrence of Filariasis				Total	
	Case n= 23	%	Control n=46	%	n= 69	%
<b>Age Group (years)</b>						
10 – 29	2	8.7	4	8.7	6	8.7
30 – 49	11	47.8	22	47.8	33	47.8
50 – 69	8	34.8	16	34.8	24	34.8
70 – 89	2	8.7	4	8.7	6	8.7
<b>Gender</b>						
Female	11	47.8	18	39.1	29	42.0
Male	12	52.2	28	60.9	40	58.0
<b>Ethics</b>						
Bugis/Makassar	2	8.7	7	15.2	9	13.0
Mandar	21	91.3	39	84.8	60	87.0
<b>Recent Education</b>						
Tidak sekolah	1	4.3	1	2.2	2	2.9
SD	19	82.6	28	60.9	47	68.1
SMP/SMA	2	8.7	15	32.6	17	24.6
S1/S2	1	4.3	2	4.3	3	4.3

Source: Primary Data, 2021

**Table 3:** Distribution of Respondents Based on Risk Factors in Kanyurang Village, Liukang Kalmas District, Pangkejene and Islands Regency in 2021

Research Variables	The Occurrence of Filariasis				P	OR	Total CI 95%
	Case n= 23	%	Control n=46	%			
Type of Work							
Manual Worker	14	60.9	22	47.8	0.306	1.69	0.548-5.380
Non-Manual Worker	9	39.1	24	52.2			
Economic Status							
<Rp. 3.191.279	22	95.7	45	97.8	0.611	0.48	0.006-40.102
>Rp. 3.191.279	1	4.3	1	2.2			
The Occurrence of <i>Breeding Places</i>							
Yes	19	82.6	12	26.1	0.000*	13.45*	3.388-62.7125*
No	4	17.4	34	73.9			
The Occurrence Of Cattle Sheds							
Yes	5	21.7	10	21.7	1.000	1	0.232-3.825
No	18	78.3	36	78.3			

\* Variable Significant  
Source: Primary Data, 2021

Similarly, the results of research by Wulandari (2010), that the existence of livestock pens as mosquito resting places and mosquito breeding sites is not at risk of filariasis events. This result can occur because based on the results of observations in Kanyurang Village, Liukang Kalmas District, only 15 people have livestock pens, in both cases, and controls from 69 respondents. As an island village, people's interest in raising livestock is very small in Kanyurang Village. In contrast, the research shown by Rahmat (2020) [14], that respondents who have cattle pens around the house have a risk of being exposed to filariasis. Then the research from Windiastuti (2013) [8] also showed a significant correlation between cattle pens as a place for mosquito resting with the incidence of filariasis in the South Pekalongani District. The existence of cattle pens can increase the risk of transmitting filariasis, because of the overcrowding of mosquitoes, many are found in cattle pens that have ideal temperatures, temperatures, and humidity for mosquitoes to breed. Prevention of filariasis can be done by controlling vectors and placing the broodstock and its rest. The existence of a cattle pens is a place to rest for mosquitoes, where a cattle pens shouldn't be in a house or reduce the distance from 100 meters from the house [26, 27]. The factor of limited land for cattle and the difficulty of providing animal feed are the reasons for people in Kanyurang Village not to raise livestock, this is a good thing when viewed from the risk of filariasis transmission that can be caused by the presence of cattle pens [28]. The existence of swamps and bushes can be a potential place for mosquitoes to breed, density of mosquitoes is higher than those found in swamps/bushes because it is a place that is favored by mosquitoes and has a larger size compared to other breeding plants [29]. The control of filariasis vector is carried out by focusing on improving the environment, one of which is improving drainage and improving waterlogging in the swamp to reduce the breeding of mosquitoes. The environmental changes cause the loss of mosquito habitat, so as to reduce endemicitation and even eliminate filariasis.

## 5. Conclusions

Breeding places are more strongly associated with filariasis than the presence of cattle pens. Hence, it is essential to uplift the socio-economic conditions by providing better facilities like a clean environment, affordable education, and frequent visits of health officials to monitor the disease transmission which might help reduce the filariasis burden in endemic areas.

## Use of AI tools declaration

The authors declare they have not used Artificial Intelligence (AI) tools in the creation of this article.

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## Conflict of interest

The authors declare no conflict of interest.

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