



Mapping Risk Factors In The Event Of Leprosy In Adiwerna District, Tegal Regency

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Abstract

Leprosy is an infectious disease caused by the bacterium *Mycobacterium leprae*. The problem of the study is what factors play a role in the occurrence of leprosy in Adiwerna District. The purpose of the study was to determine the relationship of risk factors with leprosy cases and to determine the spread of leprosy cases in Adiwerna District, Tegal Regency. The research method uses the design of a

control case study. The case is a resident of Adiwerna Subdistrict, Tegal Regency who has been diagnosed with leprosy by health workers. The control is a resident of Adiwerna Subdistrict, Tegal Regency who has been diagnosed with leprosy by health workers. Samples were taken based on fixed disease sampling. Analytical method, bivariate and multivariate. The results of the occupancy density assessment showed that most respondents lived in the dense category of residents who met the criteria of 88.2%. There is a meaningful relationship between the ventilation area and the incidence of leprosy obtained p value = 0.000 (< 0.05). There is a meaningful relationship between ventilation area and leprosy incidence obtained $<$ value. No meaningful relationship between residential density and leprosy incidence was obtained. Obtaining a map of the spread of leprosy cases.

Keywords: leprosy, :personal higiene, : ventilation, : adiwerna district.

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Introduction

Leprosy is an infectious disease caused by the bacterium *Mycobacterium leprae*. *Leprae* bacteria undergo a long division process between 2-3 weeks. These bacteria have the endurance to live for 9 days outside the human body. In addition to the division process and long survival, the incubation period of lepra bacteria also reaches 2-5 years, it can even be more than 5 years. Poor case management can cause leprosy to become progressive so that it can cause permanent damage to the skin, nerves, limbs, and eyes. Thus, leprosy can reduce the quality of life of the sufferer if it is not found and treated early. (Dinkes Kabupaten Tegal, 2019)

The number of leprosy cases in Indonesia based on the health profile in 2019 was 17,439 cases, while the number of new cases of disabled leprosy 0 was 14,909 cases and disabled leprosy 2 was 1,121 cases, where the data increased from 2018. Meanwhile, the number of leprosy cases in Central Java Province registered in 2018 was as many as 2,133 cases, while in 2019 leprosy patients experienced a decrease in the number of cases to 1,449 cases. Three cities that have the highest number of new cases of leprosy or CDR (Case Detection Rate) are, among others, the City of Pekalongan, Rembang and Tegal regencies. (Dinkes Kabupaten Tegal, 2019)

In 2019, the number of leprosy cases in Tegal Regency was 208 cases. This number decreased from 2018 with 232 cases. The highest number of leprosy cases in 2019 was located in Adiwerna District, which is located in 2 Public health center areas, namely the Pagiyanten Health Center area with 30 cases and Adiwerna Health Center with 20 cases. Based on data for the last 5 years, the distribution of leprosy cases in Adiwerna District was highest in Lumingser Village with 8 cases, then Harjosari Kidul, Pecangakan, Penarukan, Pesarean and Tembok Banjaran Villages, each of which there was 2 cases in each village. The distribution of leprosy cases was also found in the villages of Adiwerna, Harjosari Lor, Kalimati, Pedeslohor, Tembok Luwung and Ujungrusi where each village had 1 new case of leprosy. (Dinas Kesehatan Kabupaten Tegal, 2019)

Based on the theory of H.L. Blum explained that health status is determined by 40% environmental factors, 30% behavioral factors, 20% health care factors and 10%



genetic/hereditary factors. Environmental and behavioral factors are the dominant factors for the high and low health status. Several spatial analysis studies have been carried out on a disease to look at the distribution of the disease based on environmental factors such as Amalia's research on spatial analysis of the incidence of pneumonia in infants and toddlers, describing the average age of the patient, gender of the patient, population density and the condition of the patient's house. (Mardziyah, 2015) Similar research was also conducted by Ifka regarding the incidence of leprosy with the physical environment of the house, showing that there is a significant relationship between physical factors (lighting, ventilation area, type of floor, type of wall, residential density, and contact history) with the incidence of leprosy in the community. in the city of Semarang. (Kobis and Wahyungisih, 2018)

In the era of globalization, information technology is growing rapidly so that it can open new insights and paradigms in the decision-making process and information dissemination. The data obtained can be stored and processed so that it can be presented in simple forms and as needed. The data will be better if it can be presented with geographic locations in a Geographic Information System (GIS).(Prahasta, 2002)

Geographic Information System has 5 concepts called 5M which include measurement, modeling, mapping, monitoring and management. GIS is very important to be able to see a picture of the spatial distribution of leprosy events that occur. spatial factors that influence disease incidence and thus provide clues where effective public health interventions should be applied.(Prahasta, 2002)

Methods

This study uses an analytical survey study with a case-control approach. This study emphasizes numerical data to be processed using Excel and SPSS. The population is all leprosy patients who have been diagnosed with leprosy by health personnel and recorded in the Leprosy P2 registration book at the Tegal District Health Office in 2021. The sample in this study was calculated using a 1:2 ratio to produce a sample of 17 respondents as cases and 34 respondents as controls. selected using total sampling with inclusion criteria. The independent variables in this



study were the level of lighting, ventilation area, type of floor, occupancy density, and personal hygiene. Data were obtained from primary data (interviews and observations and secondary data from related agencies. This study used univariate and bivariate analysis with Chi-Square Test to analyze the data.

Results (or Results and Discussion)

1. Discriptive Analysis

a. Age

The age of respondents ranged from 16th to 65th after being group, most of the study respondents had an age of 36-45 years as many as 16 people or 31.4%. Respondents who were the least aged 56-65 years were 4 people or 7.8% while the least responded was 16-25 years old, there were 10 people or 19.6%.

b. Gender

Respondents with male sex as many as 24 people or 47.1%, most respondents both cases and controls of the female sex (52.9%).

c. Education

Most of the respondents had a high school education level of 23 people or 45.1%, while a small percentage of respondents had a level of education not finished elementary school, which was only 2 people or 3.9%.

d. Work

Most of the respondents worked as workers, namely 17 people or 33.3%, while the smallest type of work was farmers as many as 4 people or 7.8%.

e. Personal Hygiene

Personal hygiene scores range from 62.5 to 100. After being grouped, all respondents had good personal hygiene.

f. Density of Occupancy



After being grouped, the majority of respondents were included in the density level of ≥ 9 m² for 1 person (qualified) in the case group, which is as many as 15 people or 88.2% and all respondents in the control group were also included in the density ≥ 9 m² for 1 person which means that they have met the requirements.

g. Ventilation Area

After being grouped, the majority of respondents were included in the ventilation area $< 10\%$ (ineligible) in the case group, namely as many as 14 people or 82.4%, and most of the respondents in the control group were included in the density of $\geq 10\%$ which means that it has met the requirements.

Table 1. Descriptive analysis of age, gender, education, occupation, personal hygiene, the density of occupancy, and ventilation area

Variable	Case		control		Total	
	n	%	n	%	N	%
Age						
1. 16-25 years old	4	23,5	6	17,6	10	19,6
2. 26-35 years old	4	23,5	8	23,5	12	23,5
3. 36-45 years old	5	29,4	11	32,4	16	31,4
4. 46-55 years old	3	17,6	6	17,6	9	17,6
5. 56-65 years old	1	5,9	3	8,8	4	7,8
Gender						
1. Man	8	47,1	16	47,1	24	47,1
2. Woman	9	52,9	18	52,9	27	52,9
Education Level						
1. Not finished Elementary School	2	11,8	0	0	2	3,9
2. Primary School	6	35,3	5	14,7	11	21,6
3. Junior High School	3	17,6	12	35,3	15	29,4
4. Senior High School	6	35,3	17	50,0	23	45,1
Type of Work						
1. Not Working	6	35,3	5	14,7	11	21,6
2. Laborer	3	17,6	14	41,2	17	33,3
3. Farmer	2	11,8	2	5,9	4	7,8
4. Private	1	5,9	5	14,7	6	11,8
5. Miscellaneous	5	29,4	8	23,5	13	25,5
Personal Hygiene						
≤ 50 % (not eligible)	0	0	0	0	0	0
> 50 % (qualify)	17	100	34	100	51	100



Density of Occupancy						
< 9 m ² per orang (not eligible)	2	11,8	0	0	2	3,9
≥ 9 m ² per orang (qualify)	15	88,2	34	100	49	96,1
Ventilation Area						
< 10% dari luas Lantai (not eligible)	14	82,4	7	20,6	21	41,2
≥ 10% dari luas Lantai (qualify)	3	17,6	27	79,4	30	58,8

2. Bivariate Analysis

a. Relationship between personal hygiene and leprosy.

Table 2 showed that 34 respondents who had personal hygiene qualified in the control group (66.7%) and 17 respondents in the control group (33.3%). As is known that the transmission of leprosy can occur through long and close direct contact through the surface of the skin of hair follicles and sweat glands, therefore it is necessary to maintain personal hygiene. (Aprizal, Lazuardi and Soebono, 2017)

Table 2. Relationship between personal hygiene and leprosy.

Personal Hygiene	Kejadian Kusta				Total		OR 95% CI	p-value
	Kasus		Kontrol					
	N	%	N	%	N	%		
Memenuhi syarat	17	33,3	34	66,7	51	100	-	-
Total	17	33,3	34	66,7	51	100		

This is in accordance with the statement that personal hygiene improvements can prevent infectious diseases, such as leprosy, which is also transmitted through direct contact with the old skin, because of tight and repeated associations, therefore this disease can disappear by itself if there is an effort to improve personal hygiene. A body that is maintained clean will provide the benefits of self-protection against germs that cause a certain disease. (Achmadi, 2012)

Germs that cause leprosy (*M.leprae*) are selected through hair follicles and sweat glands, so maintenance of skin health and cleanliness is needed, to avoid the onset of disease transmission that can take place through the skin. In relation to body hygiene, clothing also has an important role in preventing the transmission of a disease, especially



skin diseases. For this reason, regular clothing changes also need to be done and do not exchange clothes with others, especially those who have a history of infectious skin diseases. (Soekidjo Notoatmodjo, 2007)

The results of this study are different from studies that have been conducted that respondents with low personal hygiene have a 4,214 times greater risk of leprosy when compared to respondents with good personal hygiene in bivariate analysis (OR = 4,214) CI = 2,062 –8,613.

b. Relationship between residential density and leprosy event

Respondents with dense categories of habitation in the house in the case group amounted to 11.8%, while respondents with the category of not densely inhabited in the house majority in the control group by 100%. There is no meaningful relationship between the density of dwellings in the house and the occurrence of leprosy. $p = 0.107 (< 0.05)$, odd ratio (OR) = 3.267.

Table 3. Relationship between residential density and leprosy incidence.

Kepadatan Hunian Rumah	Kejadian Kusta				Total		OR 95% CI	<i>p-value</i>
	Kasus		Kontrol					
	N	%	N	%	N	%		
Padat	2	11,8	0	0	2	3,9	3,267 (95% 2,143- 4,979)	0,107
Tidak Padat	15	88,2	34	100	49	96,1		
Total	17	100	34	100	51	100		

The results of this study are in accordance with the results of previous studies that stated that the risk of suffering from leprosy in people who fall into the dense category of residents has a risk of 4.8 times in bivariate analysis (OR = 4,800 CI = 1,806-12,759).

The density of housing in the house has a great influence on the occurrence of pain levels such as infectious diseases. A large family and living jostling in a house that is limited in size, will facilitate the transmission of the disease very quickly among family



members. It is known that leprosy germs can be transmitted through direct skin contact, body fluids that come out of the patient and can also be through respiration. (Widoyono, 2011)

Germ that cause leprosy (*M. leprosy*) are germs that can live well at a temperature of 27-30 °C then if the temperature in the house is too stuffy or does not meet normal temperatures (18-20 °C), then the house has the potential to spread leprosy germs. The temperature in the house is influenced by the number of residents in the house and the area of the house occupied. The imbalance between the number of residents in the house and the area of the house will result in an increase in the temperature in the house and this condition can transmit leprosy. (Aprizal, Lazuardi and Soebono, 2017)

Not densely populated if inhabited by 1 person/9 m² and densely populated if inhabited by more than 1 person/9 m². Transmission of the disease is more susceptible to occur at high density of houses, which are inhabited by more than 1 person/9 m².

c. The relationship between Ventilation Area and leprosy events.

Table 4 shows a meaningful relationship between the ventilation area of the house and the occurrence of leprosy (p-value = 0.000). Or (95% CI) = 18,000 (95% 4,022-80,562). OR of 18,000 > 1 means that heightening the risk means that the ventilation area of the house is a risk factor to increase the incidence of leprosy. The confidence interval (CI) lower limit is 4,022 and the lower limit is 80,562, so it is said that the stronger the suspicion if the area of home ventilation is a risk factor to increase the incidence of leprosy.

Table 4. The relationship between Ventilation Area and leprosy events.

Luas Ventilasi Rumah	Kejadian Kusta				Total		OR 95% CI	<i>p-value</i>
	Kasus		Kontrol					
	N	%	n	%	n	%		
Tidak memenuhi	14	66,7	7	33,3	21	100	18.000 (95%	0,000



syarat							4,022 – 80,562	
Memenuhi syarat	3	10	27	90	30	100		
Total	17	33,3	34	66,7	51	100		

The presence of ventilation in an open state during the day as a condition that determines the quality of the air so as not to be stuffy and moist that causes the potential life of microorganisms. Microorganisms in the air are an element of pollution as a cause of symptoms of various diseases, including skin diseases. Microorganisms can be in the air through various means, especially from flying dust. A dirty room will contain air that contains a lot of microorganisms, in order for the exchange of indoor air to run well, it is necessary to make cross ventilation. The ventilation function is also the regulation of ultraviolet light that enters the room and kills germs including *M. leprosy*. (Rismawati, 2014)

Windows and ventilation of the house (<10% floor area) have less adverse effect on its inhabitants the growth of leprosy bacteria and other microorganisms. (Idayani, Windraswara and Prameswari, 2017). The existence of ventilation has the potential to live microorganisms and ventilation function affects the regulation of ultraviolet light to kill *M.leprae* germs.

The results of this study are in accordance with the results of previous studies that stated that the risk of suffering from leprosy in people whose extensive ventilation of their homes is not qualified has a 3,148 times greater risk of suffering from multibasilier leprosy than respondents with the ventilation area of the house qualifies. (Patmawati and Setiani, 2015) Ratnawati's research (2016) that home ventilation does not have a meaningful relationship with the incidence of leprosy ($p\text{-value} > 0.05$), or residential density of 7,000 means that home ventilation is not a risk factor for leprosy events. (Ratnawati, 2016)

3. Mapping the distribution of leprosy cases and patterns of the spread of leprosy cases in Adiwerna District of Tegal Regency

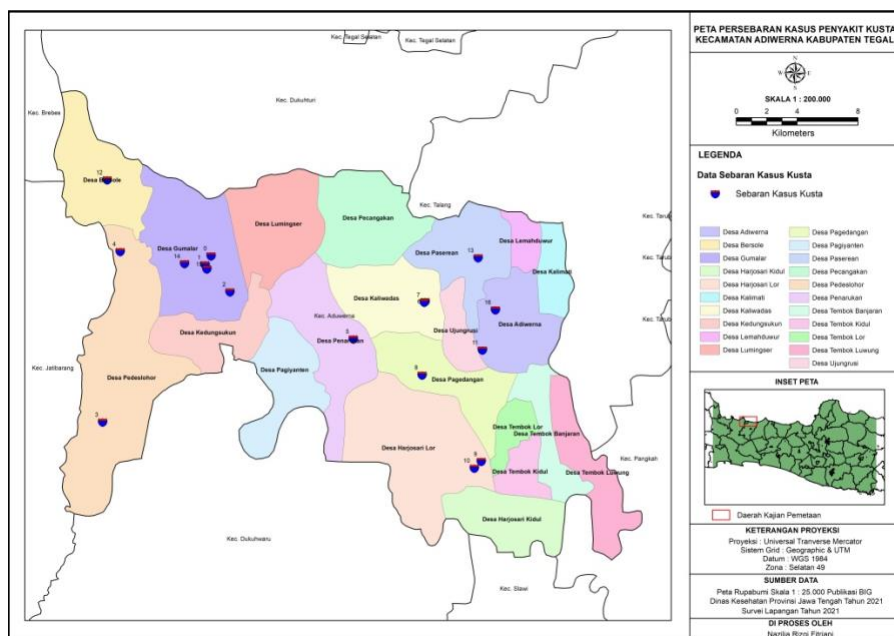


Figure 1. Map of the distribution of leprosy cases in Adiwarna Subdistrict

The results of mapping the distribution and pattern of the spread of leprosy cases in Adiwarna District of Tegal Regency spread across 9 villages are Gumalar village, Bersole village, Pedeslohor village, Penarukan village, Kaliwades village, Paserean village, Pagedangan village, Adiwarna village, and Harjosari Kidul village with a geographical location that is close to each other. The distribution of leprosy sufferers accumulates the most in Adiwarna District of Tegal Regency based on age, education level, contact history, air temperature, lighting, and personal hygienes accumulate a lot is gumalar village. The distribution of leprosy cases spread (dispersed) and only clustered (clustered) in 9 villages that are close together, and the most accumulate in Gumalar village based on age, education level, contact history, air temperature, lighting, and personal hygienes. Adiwarna District area consists of 21 villages with a distance between villages of about 1-8 km. (Perdana, 2020)

Conclusion and Recommendation

The 36-45 age group is the largest group at 31.4% and the smallest age group is 56-65 years old at 7.8%. Most of them are women as many as 27 people or 52.9%. Most of the



respondents were high school educated (45.1%). Some respondents showed 100% good personal hygiene. The results of the occupancy density assessment showed that most of the respondents died with a dense category of residents who met the criteria of 88.2%. There is a meaningful relationship between the area of ventilation and the occurrence of leprosy obtained values $p = 0.000$ (< 0.05). There is no meaningful relationship between residential density and leprosy incidence obtained value $p = 0.107$ (< 0.05). Obtained a map of the spread of leprosy cases.

Advice for puskesmas and health office results of this study can be used as input material for health policies and programs to improve the discovery of lepers actively carried out by health workers, so that early can be diagnosed and treated immediately. Regular health health counseling regarding leprosy, especially people with a history of contact with leprosy sufferers and the importance of Clean and Healthy Living Behavior in order to prevent and reduce the incidence of leprosy. It is expected to motivate the public to be more active in participating in socialization activities from health workers and maintaining clean and healthy living behaviors, and lepers can routinely do self-care and chek up to health services as recommended by doctors.

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