THE RELATIONSHIP BETWEEN PHYSICAL CONDITIONS OF HOUSE AND SANITATION WITH LEPROSY CASE IN PATIENTS AT SUMBERGLAGAH MOJOKERTO HOSPITAL

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ABSTRACT

Introduction: The prevalence of leprosy in 2017 in Indonesia shows 6.08 / 100,000 new cases of leprosy and 86.12% of which are multi-bacillary types. Determinants of leprosy events include the condition of residence. The aim of the study is to analyze the relationship between physical condition of house and sanitary facilities with the occurrence of leprosy. **Methods:** This study uses analytical observational research with a case-control study to analyze the relationship between the physical condition of the house and sanitary facilities and the incidence of leprosy in patients of Sumberglagah Hospital, Mojokerto. The sample size was 38, including 19 cases and 19 controls with simple random sampling. Research variables include individual characteristics, the physical conditions of the home, and sanitary facilities were analyzed using chi-square tests. **Result :** The results showed there was a significant relationship between physical conditions of house such as the ceiling, the type of floor, humidity, and density of the bedroom ($p < \alpha$) with leprosy cases. Meanwhile, sanitary facilities do not show a significant relationship with leprosy cases. **Conclusion:** Efforts to prevent leprosy can be done through education to the public to maintain physical condition of the house according to prevailing requirements, especially the presence of ceilings, type of floor of the house made of materials that are easy to clean, comfortable humidity, and bedrooms not used by more than two people.

Keywords: physical house, leprosy, sanitation

INTRODUCTION

Leprosy is an infectious disease that attacks the peripheral nerves and skin. In 1873, G.H. Armauer Hansen discovered the cause of leprosy, namely *Mycobacterium leprae* (The Indonesian Ministry of Health, 2012). Leprosy is a disease that can be cured and early treatment will prevent disability. WHO classifies leprosy based on clinical manifestations and skin lesions into two, namely Basiler Pausi leprosy (PB) and Multi-Bacillary leprosy (MB) (WHO, 1997). Leprosy can occur from infancy to old age (The Indonesian Ministry of Health, 2012). Close contact with persons affected by leprosy can cause the infection of leprosy (Susanti and Azam, 2016). Manifestation of leprosy is determined by the immunity of each individual (Fischer, 2017).

Data from the World Health Organization in 2017 shows 210,671 new cases of leprosy around the world and the Southeast Asia region being ranked first with the most new cases (World Health Organization, 2018). The prevalence of leprosy in 2017 in Indonesia shows as many as 6.08 / 100,000 new cases of leprosy and 86.12% of which are multi-bacillary (MB) types. Meanwhile, according to gender, 61.99% of new leprosy sufferers are male and 38.01% are female (The Indonesian Ministry of Health, 2018a). East Java is the highest province with 3,373 new leprosy cases in 2017. However, East Java has experienced a decline from the previous year to a low leprosy burden category (The Indonesian Ministry of Health, 2018b). Mojokerto Regency is an area in East Java that is highly endemic to leprosy, where there were 35 new cases of leprosy recorded in 2017. This figure didn't decrease from

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the previous year, namely 35 new cases were recorded. During 2014 - 2016 the incidence of new leprosy in Mojokerto Regency decreased significantly, even though the incidence of leprosy has not yet reached the elimination rate proclaimed by the government (Mojokerto District Health Office, 2017).

Bacteria can reproduce through environmental media, one of which is in the physical environment, namely the house. The requirements for a healthy house include the physical condition of the house, sanitation facilities and behavior (The Indonesian Ministry of Health, 1999). Components of physical condition of the house include good and clean ceilings, strong walls, waterproof and easy to clean floors, natural lighting ≥ 60 lux and not dazzling, temperature 18^0C – 30^0C, humidity ranges from 40 - 60%, a minimum bedroom area of 8 m^2 occupied by a maximum of two people and one toddler, the bedroom is equipped with ventilation facilities, and a minimum ventilation area is 10% of the floor area.

Another component of the requirements for a healthy house is availability of sanitation facilities. House sanitation facilities include water facilities for drinking and hygiene sanitation, feces disposal facilities, waste water disposal facilities, and garbage disposal facilities. Facilities for drinking water and water for sanitation hygiene, at least, come from protected springs and wells, deep ground water, and PDAM that meets health requirements (Nurcahyati and Wibowo, 2016). The requirements for a healthy waste water disposal facility, among others are do not pollute the soil surface and do not cause odor. Meanwhile, feces and garbage disposal facilities must comply with the requirements for a healthy home according to regulations (The Indonesian Ministry of Health, 1999).

Several previous studies have proven that the physical condition of a house has a relationship with incidence of leprosy. The house as a residence must meet the requirements for a healthy home according to the regulations. Leprosy has a relationship with personal hygiene, socioeconomic factors, ventilation area and occupancy density (Wicaksono, Faisya and Budi, 2015). According to Ratnawati (2016), there is a significant relationship between housing sanitation and community characteristics with the incidence of leprosy. Meanwhile, research by Andita (2017) proves that there is a relationship between a house that has healthy environment and the incidence of leprosy in Sampang Regency (Andita, 2017). Based on this explanation, a study was conducted which aims to determine the relationship between physical condition of houses and sanitation facilities with the leprosy case among patients at Sumberglagah Hospital, Mojokerto.

METHODS

This research used an analytic observational study with a case control design to examine the relationship between the physical condition of the house and sanitation facilities with the incidence of leprosy in patients at Sumberglagah Hospital, Mojokerto. The study design was retrospective because researchers traced back the exposure, namely the physical conditions of houses and sanitation facilities related to the incidence of leprosy. The research was conducted at the hospital of Sumberglagah Hospital among patients who live in Mojokerto Regency. Cases are new leprosy sufferers, both PB and MB leprosy who were diagnosed and registered at the Sumberglagah Hospital during January - September 2018 who resided in Mojokerto. Controls were patients who were registered and diagnosed with skin disease at Sumberglagah Hospital during January - September 2018, but were not diagnosed with leprosy and tuberculosis who resided in Mojokerto. Sample size of the study was 38 which was taken by simple random sampling. The case sample was 19 people and the control sample was 19

people. The dependent variable is the incidence of leprosy in patients at Sumberglagah Hospital, Mojokerto. The independent variables include the physical condition of the house (ceiling, walls, floor, bedroom, bedroom window, living room window, ventilation, lighting, bedroom occupancy density) and sanitation facilities (water for hygiene and sanitation, feces disposal, disposal), waste water, and waste disposal). The tools used in observing the physical condition of the house are a metline roll to measure floor area and ventilation, a lux meter to measure lighting, and a thermohygrometer to measure temperature and humidity. The analysis results are shown by cross-tabulation and description. The statistical test used was the chi-square test ($\alpha = 0.05$) with the odds ratio (OR) as a measure of the association between the independent variable and the dependent variable. The p value <0.05 means that there is a significant or significant relationship between the independent and dependent variables. If the 95% confidence interval (CI) value exceeds 1 between the lower and upper limits, the OR value is significant. Research permit approval was obtained from the Health Research Ethics Committee of Sumberglagah Hospital with number 814 / 102.6 / 2018.

RESULTS

Characteristics of the individuals studied were age, gender, and income. The age variable is classified into two, namely age <25 years (young people) and age> 25 years (adult). The gender variable is classified into two, namely male and female. Income variables are categorized into two, namely smaller and greater than the District Minimum Wage (UMK) in Mojokerto. The district minimum wage (UMK) in Mojokerto in 2018 is Rp. 3.565 million. After all the individual characteristic variables were analyzed by using the chi-square test, it was found that the individual characteristic variables had no significant relationship with the incidence of leprosy (p value> 0.05). The table of the relationship between individual characteristics and the incidence of leprosy in patients at Sumberglagah Hospital is presented in Table 1.

The physical condition of house studied were the ceiling, type of wall, type of floor, natural lighting, temperature, humidity, density of bedroom, presence of bedroom and living room windows and ventilation area. The results of the analysis between the physical condition of the house and the incidence of leprosy are presented in Table 2.

The ceiling variable is categorized into two, namely non-existent and existing. After being analyzed by using chi-square test, it shows that the house ceiling variable has a significant relationship with the incidence of leprosy (p value = 0.00). The OR value is obtained at 10.5, meaning that respondents whose house has no ceiling have a chance of experiencing leprosy 10.5 times compared to respondents whose house has a ceiling. Variable types of house walls are categorized into two, namely semi-permanent and permanent. After the variables of the types of house walls were analyzed using chi-square test, it was found that the type of house walls was not significantly associated with the incidence of leprosy (p value = 1.00).

The variable types of house floors are categorized into two, namely not eligible (dirt floors, boards, plaits, damaged plaster) and eligible (good plaster, tiles, ceramics). After being analyzed using chi-square test, it shows that the variable type of house floor is significantly associated with the incidence of leprosy (p value = 0.00). The OR value was obtained at 153, which means that the floor of the house that is not eligible is 153 times more at risk of leprosy compared to the floor of the house that is eligible. The natural lighting variables in the bedroom are categorized into two, namely not eligible (<60 lux) eligible (> 60 lux). The temperature air quality variables are categorized into two,

namely temperatures> 30^0C and temperatures of 18^0C – 30^0C. After being analyzed using the chi-square test, it showed that the natural lighting in the bedroom and temperature had no significant relationship with the incidence of leprosy (p value> 0.05).

Humidity variables are categorized into two, namely humidity> 60% and humidity 40% - 60%. After being analyzed using the chi-square test, it shows that the humidity variable has a significant relationship with the incidence of leprosy (p value = 0.02). The OR value was obtained at 6.07, which means that the humidity> 60% has 6.07 times the opportunity for incidence of leprosy compared to the humidity of 40% - 60%.

Table 1. Relationship between Individual Characteristics and Incidence of Leprosy in Patients at Sumberglagah Hospital 2018

Individual Characteristics	Case		Control		*p-value*
	N	%	N	%	
Age					
≤ 25 years	3	15.80	3	15.80	1.00
> 25 years	16	84.20	16	84.20	
Gender					
Male	14	73.70	14	73.70	1.00
Female	5	26.30	5	26.30	
Income					
< UMK	12	63.20	10	52.60	0.74
≥ UMK	7	36.80	9	47.40	
Total	19	100,.00	19	100.00	

Table 2. Relationship between Physical Conditions of House and Incidence of Leprosy in Patient at Sumberglagah Hospital 2018

Physical Conditions of House	Case		Control		*p-value*	OR	95% CI
	N	%	N	%			
Ceiling of House	14	73.70	4	21.10	0.00	10.50	2.34 – 47.20
Non-existent	5	26.30	15	78.90			
Existing							
Type of Wall							
Semi-permanent	1	5.30	0	0.00		-	-
Permanent	18	94.70	19	100.00			
Type of Floor							
Not eligible	17	89.50	1	5.30	0.00	153	12.68 – 1845.92
Eligible	2	10.50	18	94.70			
Natural Lighting							
Not eligible	13	69.40	7	36.80	0.10	-	-
Eligible	6	31.60	12	63.20			
Temperature							

Physical Conditions of House	Case		Control		*p-value*	OR	95% CI
	N	%	N	%			
Temperature > 30^0C	15	78.90	9	47.40	0.09	-	-
Temperature 18^0C-30^0C	4	21.10	10	52.60			
Humidity							
Humidity >60%	14	73.70	6	31.60	0.02	6.07	1.49 – 24.76
Humidity 40%-60%	5	26.30	13	68.40			
Density of Bedroom							
Dense	10	52.60	2	10.50	0.02	9.44	1.69 – 52.73
Non-dense	9	47.40	17	89.50			
Bedroom Windows							
Non-existent	4	21.10	2	10.50	0.66	-	-
Existing	15	78.90	17	89.50			
Living Room Windows							
Non-existent	0	0.00	4	21.10	0.11	-	-
Existing	19	100.00	15	78.90			
Ventilation Area							
Not eligible	17	89.50	14	73.70	0.40	-	-
Eligible	2	10.50	5	26.30			
Total	19	100.00	19	100.00			

Bedroom density variables are categorized into two, namely dense and non-dense. After being analyzed using the chi-square test, it showed that the variable density of the bedroom had a significant relationship with the incidence of leprosy (p value = 0.02). The OR value was obtained at 9.44, which means a dense bedroom, used by more than two adults, the user will have a 9.44 times greater chance of leprosy compared to a bedroom that is not crowded (non-dense).

The variables for the existence of bedroom windows are categorized into two, namely non-existent and existing. The variable of the existence of the living room window is categorized into two, namely non-existent and existing. The variable of ventilation area is categorized into two, namely not eligible and eligible. After being analyzed using the chi-square test, it shows that the variables of the presence of bedroom windows, the presence of living room windows, and ventilation have no significant relationship with incidence of leprosy (p value> 0.05).

The results of the analysis between sanitation facilities and incidence of leprosy are presented in Table 3. The variables of clean water facilities are categorized into two, namely not eligible and eligible (good physical quality). There are two categories for the means of feces disposal facility, they not eligible (open, not goose neck and not septic tank) and eligible (closed, use goose neck and septic tank). The variables of the waste water disposal facility are categorized into two, namely not eligible (there is a pool around the house) and eligible (there is infiltration and does not pollute the water source). The variable of garbage disposal facilities is categorized into two, namely non-existent and existing. After being analyzed using the chi-square test, it shows that all components of the sanitation facilities studied have no significant relationship with the incidence of leprosy (p value> 0.05).

Table 3. Relationship between Sanitation Facilities and Incidence of Leprosy in Patients at Sumberglagah Hospital 2018

Sanitation Facilities	Case		Control		*p-value*
	N	%	n	%	
Clean Water Facility					
Not Eligible	2	10.50	0	0.00	0.13
Eligible	17	89.50	19	100.00	
Feces Disposal Facility					
Not Eligible	2	10.50	1	5.30	1.00
Eligible (septic tank)	17	89.50	18	94.70	
Waste Water Disposal Facility					
Not Eligible	5	26.30	7	36.80	0.73
Eligible	14	73.70	12	63.20	
Garbage Disposal Facility					
Non-existent	6	31.60	2	10.5	0.23
Existing	13	68.40	17	89.50	
Total	19	100.00	19	100.00	

DISCUSSION

In this study, the age of respondents has no significant relationship with the incidence of leprosy. This result is in line with research by Muntassir, Snow and Rulianti (2018) that there is no relationship between age and the incidence of leprosy. Young and productive age is the age that most experiences leprosy (The Indonesian Ministry of Health, 2018a). This study shows that gender does not have a significant relationship with the incidence of leprosy. This result is in line with research by Yunus, Kandou and Ratag (2015) that gender is not related to the incidence of leprosy. Leprosy attacks more men because they often do activities outside more than women (Putra, Fauzi and Agusni, 2009). Men usually experience leprosy when they are older than younger (Gaschignard et al., 2016). The results of this study indicate that the income variable has no significant relationship with the incidence of leprosy. Different results are shown by Ratnawati's (2016) research that income has a significant relationship with leprosy. It was found that the OR was 7.48 which means that income is at risk of causing leprosy (Ratnawati, 2016). Low immunity can be caused by insufficient nutritional needs due to insufficient income, thus increasing the risk of contracting the disease. Health status can also be caused by low public knowledge (Soemirat, 2009).

Most (73.7%) research respondents who experienced leprosy did not have a ceiling. The results of the analysis prove that there is a significant relationship between the ceiling of the house with the incidence of leprosy. A healthy house must have a ceiling because it functions to absorb the sun's heat that enters through the house tiles. The ceiling must meet physical and biological requirements, namely clean and in good condition (The Indonesian Ministry of Health, 1999).

The results of the analysis prove that the type of house wall has no significant relationship with the incidence of leprosy. Different results are shown by Siswanti and Wijayanti's (2018) research that the type of house wall is related to the incidence of leprosy. A house wall that is not waterproof has a 5.83 times risk of causing leprosy (Siswanti and Wijayanti, 2018). A house construction that is not good, such as walls that are not waterproof, causes high humidity so that it is bad for residents and becomes a supporting environmental factor for the microorganisms that cause leprosy

and other microorganisms (Patmawati and Setiani, 2015).

The results of the analysis prove that the type of house floor has a significant relationship with leprosy. Research conducted by Aprizal, Lazuardi and Soebono (2017) also shows that house floors are associated with leprosy. House floors that are not eligible, such as dirt or mud floors, can allow residents to contract leprosy (World Health Organization, 2010). *Mycobacterium leprae* can be found in soil samples in leprosy endemic areas of India. This happens because the soil is likely contaminated by patients (Turankar et al., 2016). In this study, 89.5% of respondents who suffer from leprosy have house floors that are not eligible.

The results of the analysis proved that natural lighting in the bedroom was not significantly associated with the incidence of leprosy. Research by Siswanti and Wijayanti (2018) also shows that there is no relationship between house lighting levels and the incidence of leprosy. Less natural lighting occurs due to the small ventilation area so that the sunlight entering the room is insufficient (Efrizal, Lazuardi and Seobono, 2016).

The results of the analysis prove that temperature has no significant relationship with the incidence of leprosy. Research by Amira and Sulistyorini (2016) also shows that temperature is not related to the incidence of leprosy. However, in other studies, temperature can be a risk factor for leprosy (Prasetyaningtyas, 2017). The existence of *Mycobacterium leprae* is influenced by the temperature in the environment (Elderson, Franciely and Eliane, 2015). In patients with type MB leprosy, the presence of leprosy bacteria is found in the nasal mucosa. Healthy people can get it through the spread of the bacteria Mycobacterium leprae when a person coughs or sneezes and accidentally inhales (The Indonesian Ministry of Health, 2012).

In this study, 73.7% of respondents with leprosy have air humidity above 60% and the analysis results prove that humidity has a significant relationship with the incidence of leprosy. Research by Patmawati and Setiani (2015) also shows that humidity is significantly associated with the incidence of leprosy. Humid places are media where leprosy bacteria can survive for several hours (Cendaki, 2018).

The results of the analysis prove that bedroom density has a significant relationship with the incidence of leprosy. Research by Silaban, Kaunang and Wariki (2017) also shows that bedroom density has a significant relationship with the incidence of leprosy. The density of bedrooms that are not suitable for healthy house has an effect on the transmission of infectious diseases. Dense bedroom conditions can increase contact between individuals, lack of oxygen and facilitate the transmission of leprosy to other family members (Siswanti and Wijayanti, 2018). The incidence of leprosy is related to the direct contact of a person with leprosy to a healthy person (Nurzila and Adriyani, 2019). In this study, 52.6% of the bedrooms of respondents' with leprosy were inhabited by more than two adults.

This study shows that the presence of a window in the bedroom is not significantly associated with the incidence of leprosy. Research also shows that the presence of windows with the incidence of leprosy is not significantly related (Ratnawati, 2016). However, the existence of a bedroom window is very important as it serves as an entryway for sunlight. A healthy house should have windows with an area of at least 15-20%. Therefore, the existence of windows is very important as a way to enter sunlight and exchange air in the room.

The results of the analysis prove that the existence of the living room window has no significant relationship with the incidence of leprosy. Different results are shown by Siswanti and Wijayanti's (2018) research that the habit of opening house windows is related to incidence of leprosy. The habit of not opening windows has risk of leprosy by 5.29 times more than the

ability to routinely open windows every day (Siswanti and Wijayanti, 2018).

The results of the analysis prove that the area of house ventilation is not significantly associated with incidence of leprosy. Different results are shown by Siswanti and Wijayanti's (2018) research that there is a relationship between the area of house ventilation and incidence of leprosy. House ventilation area <10% risk of leprosy incidence of 4.71 times compared to house ventilation area> 10% of floor area (Siswanti and Wijayanti, 2018). The presence of ventilation affects the survival of the leprosy bacteria (Al-Hunaiti et al., 2017). Ventilation that is eligible can inhibit the growth of leprosy bacteria because leprosy bacteria like to live in humid places and die when exposed to sunlight (Siswanti and Wijayanti, 2018). Ventilation is an important component of a healthy house which functions to keep the air in the house fresh and regulate the entry of sunlight into the house to kill leprosy bacteria.

The results of the analysis prove that clean water facilities have no significant relationship with incidence of leprosy. Different results are shown by research by Oktaviani and Nurmala (2016) which shows that there is a relationship between clean water facilities and incidence of leprosy. People who use water contaminated by Mycobacterium leprae bacilli for daily purposes will be exposed to leprosy. (Wahyuni, 2009). In the protozoa *Acanthamoeba sp* in water samples, leprosy bacilli can survive for three months and if the water is used continuously it will cause leprosy (Wahyuni et al., 2010).

The results of the analysis of this study prove that feces disposal facilities have no significant relationship with the incidence of leprosy. Different results are shown by Ratnawati's (2016) research that ownership of a healthy latrine is related to the incidence of leprosy. Ownership of unhealthy latrines has 5.18 times the risk of leprosy compared to ownership of healthy latrines. Every house must have sanitary facilities in the form of a healthy toilet. Healthy latrines have the characteristics, among others, that they do not cause contamination of hazardous materials due to feces disposal and do not cause disease transmission due to the presence of vectors (The Indonesian Ministry of Health, 2014).

The results of the research analysis prove that waste water disposal facilities are not significantly associated with the incidence of leprosy. Research by Ratnawati (2016) also shows that waste water disposal facilities are not related to the incidence of leprosy. The requirement for waste disposal is that it does not contaminate water sources and soil surfaces and does not cause odor (The Indonesian Ministry of Health, 1999).

Trash bins must be in sufficient quantity, easy to reach, and closed so that they do not become a place for various disease agents to develop (Purwanti, 2018).

CONCLUSION

The physical condition of a house, which includes the presence of the ceiling, type of floor, humidity and bedroom density, has a significant relationship with the incidence of leprosy. Meanwhile, other house condition variables such as the type of house walls, natural lighting in the bedroom, temperature, presence of bedroom windows, presence of living room windows, ventilation area and sanitation facilities (clean water, feces disposal, waste water disposal, and garbage disposal) have no significant relationship with the incidence of leprosy. Efforts to prevent leprosy can be made through education to the public. This education includes maintaining the physical condition of the house according to applicable requirements, especially presence of a ceiling, type of made from materials that are easy to clean, comfortable humidity, and the bedroom is not used by more than two people.

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